BULLETIN 24
SOUTHEASTERN ARCHAEOLOGICAL CONFERENCE

PROCEEDINGS OF THE
THIRTY-SEVENTH
SOUTHEASTERN ARCHAEOLOGICAL CONFERENCE
NEW ORLEANS, LOUISIANA
NOVEMBER 13-15, 1989

DEDICATED TO ROBERT STUART NEITZEL

Edited by
VERNON J. KNIGHT, JR., and JERALD T. MILANICH
FLORIDA STATE MUSEUM
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1981
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PREFACE

The Thirty-Seventh Southeastern Archaeological Conference was held on November 13-15, 1980, in the Fountain Key Club Hotel in New Orleans, Louisiana. The conference participants sorely missed the presence of Stan Neilson who died in August. At the business meeting, SEAC President James L. Griffin announced that the conference would be dedicated to Stan and that the honorary position which he had held in the SEAC, Fergusonanches, was officially retired. During the meeting Steve Williams eulogized Stan. Steve’s reflections and reminiscences are published in this Bulletin.

Program chairperson for the meeting was J.T. Good. The Corps of Engineers-New Orleans District and Louisiana State University served as hosts and Tom Ryan was the local arrangements organizer. More than 100 people attended the conference, the largest ever.

The number of people presenting papers at the conference necessitated restrictions on length of the contributions accepted for these proceedings. Participants who planned to submit their papers were urged to present only conclusions or summaries and keep the length to about five pages. This was not always possible. However, all of the symposia organizers who submitted the paper from their sessions took the time to integrate them, eliminating redundancies, etc. I am very grateful to all of the authors and the symposia organizers for their work, which has allowed us to publish all papers.

Unfortunately, the size of the SEAC bank account did not allow us to publish all of the papers submitted. Some requests on preliminary work were not accepted for publication; authors were urged to publish them as current research elsewhere and to publish newly after the work was completed.

I have listed Vernon J. Knight, Jr., as co-editor of this Bulletin. Jim did nearly all of the nuts-and-bolts copy-editing and handled nearly all of the correspondence. His valuable contributions should be acknowledged. Also, once again, Annette Evans of the Florida State Museum did her usual expert job in helping us. The SEAC owes her and the other members of our departmental staff here at the Museum a debt of gratitude.

J.T. Milaniich
Editor, SEAC
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Legacy of the 1880 Thomas Mound Survey: A Missouri Example—Carl H. Chapman

The Cloudsplitter Rockshelter, Menifee County, Kentucky: A Preliminary Report—C. Wesley Cowan, H. Edwin Jackson, Katherine Moore, Andrew Nickoloff, and Tristene L. Smart

A Computer Simulation of Settlement Growth and Decline During the Late Mississippian: An Example from the Piedmont Area of Georgia—William Michael Wood

Archaeological Research at Moundville: 1840-1980—Christopher S. Peebles

The West Jefferson Phase: Terminal Woodland Tribal Society in West Central Alabama—Paul D. Welch

Moundville Phase Sites in the Black Warrior Valley, Alabama: Preliminary Results of the UMAA Survey—Tandy K. Boswell

The University of Michigan Moundville Excavations: 1978-1979—C. Margaret Scarry

The Exploitation of Fauna During the Moundville I Phase at Moundville—Lauren Michals

Plant Procurement Strategies in the West Jefferson and Moundville I Phases—C. Margaret Scarry

Notes on the Relationship Between Social Status and Diet at Moundville—Christopher S. Peebles and Margaret J. Schoeninger

Relative Dating of Moundville Burials—Alice Haddy and Albert Hanson

Chronology and Community Patterns at Moundville—Vincent P. Steponaitis

Preliminary Report on the Analysis of Moundville Phase Ceramic Technology—Sander E. van der Leeuw

The Identification of Individual Style on Moundville Engraved Vessels: A Preliminary Note—Margaret Ann Haudin

Bibliography: Symposium on the Moundville Archaeological Project; Examination of the Development of Mississippian Society in the Black Warrior River Valley

Archaeological Geology: Problems in the Identification of Ghost Types and Source Areas—Ernest E. May

The Caney Creek Site Complex: Lithic Resource Conservation, and Technology—Thomas H. Guderjan

Magnetic Prospecting: Preliminary Results of the 1980 Field Season at the Tozeu Site, SLN42—Michael J. Kacmar and John Weymouth
Program of the 37th Southeastern Archaeological Conference, 1980

Thursday, November 9

Symposium: The Cooper River Rediversion Project in South Carolina
Chairperson: J. Pearson

R. D. Rucker (Corps of Engineers—South Atlantic Division): Introducing Cooper River: A Management Overview

P. Brockington (U of Kansas): Reconnaissance and Survey Stages of the Cooper River Rediversion Archeological Project

D. Anderson (Commonwealth Associates, Inc.): The 1979 Excavation at the Mattie Mae Lake Sites

V. Canaan (U of South Carolina): Middle Lake Woodland and Mississippi Subsistence Strategies in the Intraw Lower Coastal Plain of South Carolina

K. Deruing (U of South Carolina): Functional Diversity in Late Prehistoric Lithic Assemblages

H. Haskell (U of South Carolina): Variability in Vessel Morphology: A Functional Analysis of Two Ceramic Assemblages from the Middle Late Woodland and Mississippian Periods

J. Pearson (U of South Carolina): Variability in Ceramic Composition—Functional Implications for Middle Late Woodland and Mississippian Ceramic Assemblages

P. Garrow (Soil Systems, Inc.): Archeological Investigations of Two Slave Oyster Sites in Berkeley County, South Carolina

T. R. Wheaton, Jr. (Soil Systems, Inc.): Architecture at Vaughan and Carriro Plantations, Beekley County, South Carolina

Diocieros: K. Eckers (Georgia State U)

Symposium: Poverty Point: 1790-1890
Chairperson: S. I. Good

J. L. Goosn (U of Southwestern Louisiana): Speculations on the Origin and Development of Poverty Point Culture


S. I. Good (Louisiana State U): Recent Excavations at Poverty Point, Louisiana

D. Woodiel (Louisiana Office of State Parks): Sessites and Subsistence at the Poverty Point Site

P. M. Thuman (New World Research, Inc.): The Pottery of the Poverty Point Site: Settlement and Subsistence Beyond the Ridge

J. A. Waldbill (Illinois Department of Transportation): and C. E. Webb (Schreiber, Louisiana): Poverty Point Galena: Source Location and Analysis

S. A. Bass (Louisiana State U): A Closer Examination of Local Lithic Sources for Poverty Point

M. Guadino (Tulane U) and W. Speiser (Southern Archeological Research, Inc.): Descriptions of Poverty Point Burial in the Lower Tensas Basin

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Symposium: The Tlieil Archaeological Project: Some Results and Interpretations
Chairperson: J. Chapman

J. Chapman (U of Tennessee): Introduction and Background

P. A. Dezzute (U of Tennessee): Quaternary Terraces Along the Little Tennessee River, Southeastern Tennessee

J. Chapman (U of Tennessee) and A. S. Sheu (U of Tennessee): The Archaeobotanical Record: Early Archaic to Contact in the Lower Little Tennessee River Valley

A. E. Bogan (Academy of Natural Sciences of Philadelphia): Archaeological Evidence for Subsistence Patterns in the Lower Little Tennessee River Valley

R. Polhemus (U of Tennessee): Dallas and Moone Creek Pleistocene Mississippi Structures: Comments on Form and Function

G. F. Scarrott (U of Tennessee): Structures and Village Pattern at the Historic Overhill Cherokee Town of Chote and Tanss

L. R. Kessiah (U of Tennessee): A Quantitative Pattern Recognition Model of Temporal Variability in Unialgal Delicate and Blades for Early Archaic Through Historic Cherokee Lithic Assemblages in the Lower Little Tennessee River Valley

W. D. Roberts (U of Tennessee): Lithic Analysis at Chote, Tennessee


W. Baden (U of Tennessee): A Solution to the Humphray Dismal Dilemma in Ceramic Analysis: All the King's Mathematicians Could Have Put Humpty Dumpty Together Again

Discussion: C. S. Pebbles (U of Michigan)

Symposium: Late Mississippian/Proto Historic
Chairperson: H. G. Ayers

J. H. Buey (U of Alabama): The Saucermville Mound: A Mississippian Architectural Complex at Lub-

bub Creek, Alabama

M. L. Powell (Northwestern U): Late Mississippian Mortuary Variability in the Gavinsville Re-

servoir, West Central Alabama

J. A. Brown (Northwestern U): The Falcon and the Serpent: Styke Provisions in the Mississippian Southeast

T. Pettis (Southwest Missouri State U): A Model of Caldwell Culture Change: The Context Archeological Record

N. L. Tompkins (Mississippi Archeological Survey): Pine Mountain Revisited: Recent Research in the Arkansas Ozarks

H. G. Ayers (Appalachian State U), j. Lokens (Ap-}

palachian State U) and B. L. Parrington (South-

west Missouri State U): Excavations at the Wind Site, A Pisgah Village in Western North Carolina
C. Brown (U of Georgia): On the Sexual Identity of Winged Beings on a Mississippian Period Copper Plate.

SYMPOSIUM:

Problem Oriented Lithic Studies in the Southeast (Chairpersons: A. C. Goodson and R. W. Jeffries)

J. K. Johnson (U of Minnesota): Poverty Point Period Blade Technology in the Yazoo Basin, Miss.


A. C. Goodson (U of South Carolina): T. L. Michie (U of South Carolina) and B. A. Purdy (U of Florida): The Edgelow Scraper: A Distribution Study of an Early Archaic Stone Tool from the Southeastern United States.


T. Hasanov (U of South Carolina): Lithic Assemblage Variability and Environmental Variability in the Late Archaic-Early Woodland Transition in the Middle Savannah River Valley.

SYMPOSIUM:

Lower Cumberland Archaeological Project (Chairpersons: J. D. Nance)


B. Clay (Kentucky State Archaeologist): Archaeological Research in Western Kentucky to 1978.

G. County (Simon Fraser U): Culture History of the Lower Tennessee/Cumberland.

J. D. Nance (Simon Fraser U): Lower Cumberland and the Archaeological Project Regional Sampling Program.


T. Gates (U of Kentucky): Chert Resources of the Lower Tennessee-Cumberland Region.

J. Nance (Simon Fraser U): Prehistoric Chert Utilization Patterns in the Lower Tennessee/Cumberland.

P. Bochansky (Simon Fraser U): The Study of Archaeological FossilH Background.

Discussants: P. J. Watson (Washington U), B. Clay (Kentucky State Archaeologist).

SYMPOSIUM:

The Sixteenth Century Southeast (Chairpersons: M. T. Smith, C. M. Hudson, and C. B. DePratter)

P. E. Hofmeister (Louisiana State U): European Contact with the Coastal Tribes of Georgia and South Carolina, ca. 1350-1566.

H. H. Tannen (The Newberry Library): The Land and Water Communication System Utilized by the Southeastern Indians.

G. M. Hudson (U of Georgia), C. B. DePratter (U of Georgia) and M. T. Smith (Cottontail Museum): The Route of DeSoto from Apalachicola to Coosa.

R. Polhemus (U of Tennessee) and M. T. Smith (Cottontail Museum): Early Trade Goods from the East Tennessee Valley.

G. E. Lankford (Arkansas College) and C. Curran (U of Alabama): The Spanish in Alabama.


K. Dragan (Florida State): Spanish and Indian in 16th Century Florida.


H. Delany (U of Florida) and W. Swagerty (The Newberry Library): Tomoka Population in the 1660's.

CURRENT RESEARCH:

Chairperson: R. Nunnally.

W. D. McKinney (Memphis State U): Archaeological Investigations at the Rock Creek Complex on the Natchez Trace Parkway in Colbert County, Alabama.


J. A. Bense (U of West Florida): The Dead Lake Site (O9860), and the Bayou La Baze Culture in the Mobile Bay/Belta.

R. S. Dickert (Georgia State U): Introducing Archaeology to the Younger Public: An Example from Georgia.


T. Logan (Forest Service/Columbia, South Carolina): Cultural Resources Management in the Francis Marion and Sumter National Forests.

B. A. Purdy and Sharon Hall (U of Florida): Organic Cultural Remains from Prehistoric Sites in Florida.


FRIDAY, NOVEMBER 14

SYMPOSIUM:

Advances in the Archaeology of Mississippian Woodland Societies (Chairperson: J. F. Scarry)

J. F. Scarry (Florida Department of State): Fort Walton Culture: A Rededuction.

SYMPOSIUM:

Late Woodland Period Research in North Carolina
Organizer: T. E. Ward
Chairperson: J. E. Loce
P. S. Green (U of North Carolina): An Overview of Dan River Ceramics.
D. L. Moore (U of North Carolina): Fish Ceramic Variations and What It Might Mean.
D. S. Phelps (East Carolina U): Carolina Algonkian Oceanic.
Discussant: R. J. Dickens (Georgia State)

SYMPOSIUM:

Recent Man/Land Studies in the Lower Mississippi Valley Region
Chairperson: C. E. Pearson
S. M. Gagliano (Coastal Environments, Inc.): Geomorphology and the Archaeological Record in the Lower Mississippi Valley.
J. J. Dehne (Reserve, Louisiana): A Study of Prehis-

American Archaeology, December 1981

W. P. Glaese (Preprofessional Analysis) and G. Castille (Coastal Environments, Inc.): Magnetometer Survey Along the Red River, Louisiana.
R. A. Wenzler (Coastal Environments, Inc.): Measur-

E. Poisson (Coastal Environments, Inc.): Geomor-

T. J. Little (Southern Archaeological Research, Inc.) and J. L. Lott (J. P. Lott and Assoc.): Prehistoric Man/Land Relationships in the Dynamic Lower Tensas Basin, Louisiana.

SYMPOSIUM:

Topics in Subsistence and Environment in the Southeastern United States
Chairperson: M. White
R. J. Cochran (Historic Preservation Assoc.): Parkins Paleoeconomics: A Site Cachet Analysis.
B. Silsby-Lavelle (Florida State Museum): Economic Anthropolgy and Archeological Research.
B. R. Bemand (U of Florida): The Role of Mounds in Shell Midden Analysis: Devil's Walking Stick Site, Canton County, Georgia.
C. Y. Rock (U of Georgia): An Analysis of Fossilized Trees from the Alberta Site, Russell County, Alabama.
C. T. Sany (U of Montana): Aspects of the Paleo-

E. L. Redz (U of Georgia) and J. E. Kuch (Office of Louisiana State Archaeology): The Faunal Manu-

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T. J. Little (Southern Archaeological Research, Inc.) and J. L. Lott (J. P. Lott and Assoc.): Prehistoric Man/Land Relationships in the Dynamic Lower Tensas Basin, Louisiana.
ment of Client Resources in the Columbia Reservoir, Maury and Marshall Counties, Tennessee.

SYMPOSIUM: New Perspectives on the Mound Exploration Division, Bureau of American Ethnology
Chairperson: B. D. Smith
B. D. Smith (Smithsonian Institution): The Mound Exploration Division: A Centennial Retrospective
S. Williams (Harvard Peabody Museum): Will's Delusion and How It All Began
I. Brown (Iowa State University): Cyrus Thomas and the Mound Explorations of the Bureau of American Ethnology
D. and P. Morse (Arkansas Archaeological Survey): The BAE in Northeast Arkansas
M. D. Jeter (Arkansas Archeological Survey): Edward Palmer’s 1882 Excavation at Tilar Site (3B1):1, Southeast Arkansas
R. C. Godwin, C. J. Uerich, and M. Lethbridge (Smithsonian Institution): Physical Anthropology of the Tilar Site, a Late Mississippian Cemetery in Southeast Arkansas
M. A. Redman (Arkansas Archeological Survey): Contributions to the Tooke (Knapp) Site Research by the Smithsonian Institution

SYMPOSIUM: The Cl愛hsplitter Rockshelter, Menifee County, Kentucky: A Preliminary Report
Chairperson: C. W. Crow
C. W. Crow (Ohio State U): Introductory Remarks
R. E. Jackson (U of Michigan): Geoarchaeological Analysis of the Clã什hsplitter Rockshelter: Some Preliminary Results
T. L. Smart (U of Michigan): Analysis of Pollen from Archaeological Deposits in Clã什hsplitter Rockshelter
C. W. Crow (Ohio State U): Plant Remains from the Clã什hsplitter Rockshelter
K. M. Moore (U of Michigan): Faunal Remains from the Clã什hsplitter Rockshelter
A. A. Nickelloff (Ann Arbor, Michigan): Lithic Technology at the Clã什hsplitter Rockshelter
C. W. Crow (Ohio State U): Concluding Remarks
Discussion: P. J. Watson (Washington U), R. W. Jeffers (Southern Illinois University)

SYMPOSIUM: Spatial Analysis and Settlement Patternning
Chairperson: M. Wood
J. L. Reedolph and D. B. Blanton (U of Georgia): A Discussion of Mississippian Settlement in the Georgia Piedmont
J. R. Detweiler (U of Oklahoma): Social Ranking and the Centralization of Authority in the Spiro Phase
A. J. Ousen (U of Louisville/Belknap): A Research Design for Studying Settlement Patterns in the Northern Portion of Kentucky’s Western Coalfields
A. F. Rogers (Western Carolina U): Surface Distribution of Selected Late Archaic Artifacts
R. B. Lewis (U of Illinois): The Mississippian Gulf Coast Archaeological Project: Research Design for the Bay St. Louis Study
W. M. Wood (Louisiana State U): A Computer Simulation of Settlement Growth and Delineation During the Late Mississippian: An Example from the Picayune Area, Mississippi
M. Trinkley (South Carolina Department of Highways): Recent Woodland Period Research in Berkeley County, South Carolina
M. Pennington (Lownesville, South Carolina): Man and His Territory

SATURDAY, NOVEMBER 15

SYMPOSIUM: The Moumadville Archaeological Project: Examination of the Development of Mississippian Society in the Black Warrior River Valley
Organizer: M. Scarry
Chairperson: C. S. Peebles
C. S. Peebles (U of Michigan): Introduction
E. W. Seckinger (US Corps of Engineers-Mobile Division) and N. J. Jenkins (U of Alabama/Musogromus): A Ritual Society in Prehistoric Alabama
P. D. Weich (U of Michigan): The West Jefferson Phase: Last Woodland Triad Society in West Central Alabama
C. M. Scarry (U of Michigan): The University of Michigan’s Moumadville Excavations 1978-1979
J. Marsh (U of Michigan): The Exploration of Fausa During the Moumadville 1 Phase at Moumadville
C. M. Scarry (U of Michigan): Plant Procurement Strategies in the West Jefferson and Moumadville Phases
M. Schmeling (John Hopkins U) and C. S. Peebles (U of Michigan): Nutritional Correlates of Social Status at Moumadville
A. Haddy (U of Georgia) and A. Hanson (Brookhaven National Laboratory): Relative Dating of Moumadville Burials
V. P. Stipanoni (SUNY/Binghamton): Chronology and Community Patterns at Moumadville
M. Hardin (U of Maine): The Recognition of Individual Hand in the Context of Standardized Craft Production: Implications of the Technological and Stylistic Development of Moumadville Engraved Ceramics
C. S. Peebles (U of Michigan): The University of Michigan Moumadville Archaeological Project in Perspective
Discussion: J. Z. Griffin (U of Michigan), B. D. Smith (Smithsonian Institution)

SYMPOSIUM:
Lithic Analysis and Interpretation
Chairperson: J. Rafferty
J. Rafferty (Mississippi State U): Projectile Point Typology: Late Archaic Chronology, and Interpreting Settlement Pattern Change
J. Connaway and S. Brookes (Mississippi Archives and History): The Keenum Road Cache: Lawrence County, Mississippi
D. H. Jurney (Southern Methodist U): Stone Digging Tools: Evidence from the Ozark, Ouachita, and Missouri Valley Regions
E. E. May (Southern Illinois/Carbondale): Archaeological Geology: Problems in the Identification of Chert Types and Source Area
E. T. Henning and K. Dinsel (Arkansas Archeological Survey): Analysis of a Quapaw Hunting Camp on the Saline River, Southeast Arkansas
T. H. Guderjan (Southern Methodist U): The Caney Creek Site Complex: Lithic Resource Conservation and Technology

SYMPOSIUM:
Research Reports Lower Mississippi Valley and Gulf Coast
Chairperson: G. Castille
M. J. Kaczor (Arkansas Archeological Survey) and J. Weymouth (U of Nebraska): Magnetic Prospecting: Preliminary Results of the 1980 Field Season at the Tolee Site, St. Mark
J. E. Price (Southwest Missouri State U): Archeological Research in the Fourche Creek Watershed on the Ozark Border of Southeast Missouri and Northwest Arkansas
S. Williams (Harvard Peabody Museum): The Murphy Site on the Lower Wabash (Indiana) Reexamined
G. A. Houston and J. W. Sourwine (Florida State U): Archeological Sites in the Stacey Bayou Pool, St. Marks National Wildlife Refuge
J. P. Brain (Harvard Peabody Museum): SIR Survey
J. Ford (U of Mississippi): Time and Temper in the North Central Hills of Mississippi
J. W. Sourwine and G. A. Houston (Florida State U): Archaeology of Naval Live Oaks, Gulf Islands National Seashore
W. E. Limp (Arkansas Archeological Survey): Location Choice in the Sparta Upland
R. H. Lafferty III (Arkansas Archeological Survey): Site Survey and Central Place Hierarchies in the Sparta Mine Area
J. Lauro (Mississippi Department of Archives and History): Hebe Plantation: Early Archaic in the Bojo Phiala Drainage of the Southern Yazoo Basin, Mississippi

SYMPOSIUM:
Archaeology of the American Bottom and Upper Mississippi Valley
Chairperson: P. Revis
J. E. Kelly (U of Illinois/Urbana-Champaign): The Emergence of Cahokia
G. R. Miller (U of Illinois/Urbana-Champaign): Preliminary Notes on the Nature and Distribution of Mississippiian Mortuary Sites in the American Bottom
R. C. Mainfort (Tennessee Department of Conservation): Pinson Mounds (46MD4): A Middle Woodland Site in West Tennessee
M. J. Lycott (National Park Service): The Grimes Site, An Early Woodland Occupation in Southeast Missouri
M. Weinland (Kentucky Heritage Commission): A Summary of the Rowena Site: A Mississippian Mound, Russell County, Kentucky

Southeastern Archeological Conference Bulletin 21, 1981
Stephen Williams

I can't think of a more appropriate spot than the Southeastern Conference for this; New Orleans was a favorite spot of Stu's, but this isn't an obituary—I'll leave that to others, at other times and places. I'm sure that many will want to try to capture the spirit of this remarkable gentleman—call him Bob or call him Rob-er, or call him just plain "Stu," as most of his archaeo- logical friends did. It is, instead, a brief journey in remembrance.

Well, who or what was Stu? He was a good field archaeologist and a pretty fair excavator; he could make that old Buff & Brill transit that Jim Ford "bor- rowed" from the Louisiana Highway Department some time in the late thirties throw a straight line—if you knew all the tricks—I'm not sure he really liked the instrument as well, after I took it back to his master in Bosom and had it all polished up and realigned.

But let's get one thing straight—he was not, when I knew him, a great jazz musician—I don't think he even thought to himself, then he was pretty darn humble about most of his accomplishments—except for all those tales of daring and doing when he was young and able—or so he said—a hundred times. But as to the piano; yes, I know there are those who re- member the piano being hauled upstairs for a special performance at the Historical Conference at Columbia, and I must confess I never heard him play on a piano that had all its keys working or that was even partially in tune—but like life, he attacked the tunes, made some excuses for the lack of proper accompaniment, and if you didn't listen too closely (and who did late in the evening) it sounded pretty good. It was, after all, the effect that was sought.

He was a classic good reader of profiles and taught all of us in the LMS some of the finer points. Not that I agreed with all his conclusions in "Fatherland Re- visted"—perhaps that's a place where some of us failed him. Did we take his archaeological work seriously enough? Maybe we should have argued harder, but who wanted to disagree with Stu on such matters?

His caring for archaeology and anthropology was a special thing—I'm not sure I fully understood it. He liked large questions, some quite deeply philosophical, and he read widely in areas that frequently surprised me—but he was always so audacious that it was hard to argue with him too seriously. Besides, many of the discus- sions were carried on far into the night when the full sense of some of the arguments got lost. But it didn't seem to matter then or ever now.

Now I know you're thinking—I'm sure we all have our favorite memories, and they can be found to under- score almost any point. His own self-deprecating stories (almost myths) of the days at the University of Ne- braska, where he became a lifelong friend of Loren Terry and great friend of Calvin M. with Redfield and the going-on at Kincade, and his tales of adven-

"I started to draft these notes in late August, when I first heard of his death while I was on vacation. In fact, they sort of were themselves—memories of great times shared with him—something in the air like the rural woods. This will not be very good historiography, although I've checked as many of the facts and dates as possible with my field logs. The events did take place; there has been minimal editing.


That's the time we surface collected Tattle too, with Ford shipping a bending over top up sheds and Neitzel avoiding carefully the exercise of any moment. Cutting; he said he'd already done that. Nevertheless, we got a fine collection and we washed up the sheds and set off on the steps of the motel at dusk trying to figure out the significance of a very enigmatic bunch of plain pottery. Some of us are still trying to come to a rational understanding of that site. We headed into the weekend with some trepidation on the part of Ford and Neitzel as to the adequacy of the supply of whiskey on hand in this remote spot, but we made it.

Some years later Sue's friendship with Jim was in its prime the ultimate test. With Jim firmly stinted, Sue would visit him in Florida and try to cheer him up. (Jim had just finished the manuscript of the Foreman monograph, which the Smithsonian later published.) Sue's last promise was that they would now take up the long overdue Marksville site report. It was a sentimentual gesture, as Jim had only a few days left, but Sue felt good about having been able to be there with that offer.

When I think of Sue, some other scenes come to mind—at Holy Bluff, Mississippi, in June of 1968 when I was making my work at Lake George—he came over for a few weeks and helped me to get my site grid in place and the first season underway. His practical field knowledge was essential; both to me and my students as I undertook my first major excavation. His wise counsel on pottery and even a detailed site log keeping at prehistoric sites was crucial to the project. What I remember best, however, was as I tossed myself at 5:00 to throw some very heavy water on my face (with the temperature already 75° and humidity at 100%), there was Sue tiptoeing the soggy old cut that we had just tilled. He was already awake with a paperback novel in hand, despite the fact that life had been the last to hit the sack the evening before. With a goof, joking comment and a snogs-tastic smile, he was ready for another day. Where he got the energy, I'll never know. He'd make a grocery run to Yahoo City or spend the morning sewing up burlap sandbags. He just knew how to help you with no fuss or frustration.

Both at Holy Bluff (1968-69) and later (1963-64) in the Tennes, we had a standard Friday night menu—a huge charcoaled-beef steak and a tub of ice-cold beer—the set was Sue dropping in unexpectedly but very welcome for those events, adding his special laughter to the proceedings, and charming all the locals with his generous wit and down-home manner. He made us all want to be there and have a good time. Sue, I will not chronicle in detail his negotiations over the Marksville site from job was bad to Louisiana Log; politics he worked briefly for the LVA officially and unofficially. Then there were sojourns in Georgia and finally in Mississippi; he did some spot jobs for A. R. Kelly and at Ewub, and finally Miss Capers and the Mississippi Department of Archives and History, where he worked briefly with Sue in Carthage and Jackson with the inevitable hospitality of a good steak on the grid or a gumbi if the dieticians were at hand. All the while his family (Miss Cee, Sarah, and Smurt) were still in Marksville. While Sue on the surface had his days as a happy home hunter, in later years he spoke of the effect it had had on his family, having had only occasional weekend visits to Markville. His caring was not always obvious, though deeply felt.

I visited him at Fatherland in 1962, when he began his long association with Mike and Sue, and I was not yet impressed. The volume on his later work on the site will be published soon. His first excavations there were a follow-up on Motes' Chautauqua pre-war activities on the mounds. There were questions to be answered about the location of the previous work that were to plague Sue for a decade or more.

That first summer I was bringing my new wife on a trip of reconnaissance and our visit with Sue and Nettie was warm and heartening. I wanted to show off my good fortune and get his approval too. We had a great visit with some fine times at the site and at the Stradivarius Motel (no kidding).

The climactic events of 1976 was not worth the time or trouble but one in 1976 was so fulfilling for all that involved the memories of it are still vivid a decade later. Phill Phillips had his 70th birthday at the late summer of that year and we planned a small volume and a party in September to coincide with the publication of his two-volume work on the Lower Yolo. Old friends contributed letters and some even took the opportunity to journey to Cambridge. The event was not a too-well kept secret in its entirety, but parts of it did work well. As I sheltered Phil and his wife through the ordeal in a large Cambridge build-up toward the site of the dinner, we passed a couple of window-shoppers who were intent on the wares that were displayed therein. Jeez as we passed, the window-shoppers turned green with complete consternation; it was Bill Hast and Sue Neitzel, I do think that was a real surprise to Phil, and Sue always loved to evoke the memories of that event.

Sue was a great person to share happy occasions with. His very presence seemed to insure there would be laughs and a sense of camaraderie that could overcome all circumstances. So it is only natural that I should recall with special poignancy a couple of much more recent get-togethers. The first was under the best of all possible circumstances: a special Avery Island meeting in May of 1979 to honor Bill Hast's retirement. It was a surprise party too, and this time there was no question that Bill was really coaxed out of coming to the bowl under false pretenses and that Sue was part of it from the beginning—the end of the party was pure Nettie too—there had been a generous mixture of plot with plenty of the right fixings, but by the dunk of the evening it was down to just six of us sitting around the table—surrounded on great food and with plenty of beer to wash it down. We were down to the bones—just good conversation—the jokes and laughter that has made old South so special and the good spirits, with enough energy to go out looking at sites, but still not choosing any mounds like the rest of us fools.

I arrived by car from Fayetteville about 8:50 p.m., and set out to find my Lower Valley colleagues in this Caddo context. Not finding them in their room, I wandered about the motel grounds and ran into two of them looking for me. Sue was outted in the dashboard dark blue two-piece leisure suit, topped off Southwestern Archaeological Conference Bulletins 24, 1981
Deborah K. Woodie!

In 1978 a cultural resources survey and subsequent mitigative excavations were conducted at the Poverty Point site by staff of the Louisiana Division of Archaeology. During that reservation, approximately 400 acres of the site were included within the Poverty Point State Commemorative Area, operated by the Louisiana Office of State Parks. The cultural resources survey concentrated on the second phase of development at the park; this consisted of a museum, a visitors’ center, a dormitory, an archaeological laboratory, and a paved trail road through the park (Fig. 1). This task represents an excellent opportunity to investigate areas of the site which had never been tested and to formulate hypotheses of future habitation patterns. Previous excavations (Pett and Webb 1956, Karoloff 1975, Haag et al.) showed that the ridges were largely composed of midden, and although some halves had been discovered, the belief that the ridges were fosselements for houses was common among many investigators. Haag’s excavation in the plaza area within the ridge also revealed a deep midden as well as numerous large postmolds. Most of the plaza area has been tested.

Outside the ridges, few test excavations have been conducted, except those centering on the two boulevards. Thomas and Campbell (1979) reported a specialized activity and habitation area approximately 350 m in southeast of Monet A. Surface collections of the cleared field adjacent to Monet B suggested an Archaic

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rather than Poverty Point context for these artifacts, but no habitations areas associated with them have been found.

The survey covered surface, sterile testing areas within the area of the proposed facilities. These tests were done in a systematic fashion with the area divided into a grid of 100 m squares. In the interior grid of the road. The results of these tests confirmed the lack of any modern soils outside of the site. Based on this evidence and the low and random density of these areas, it appears that intensive habitation by Poverty Point peoples was concentrated elsewhere. It is suggested that these mound areas, composing a ceremonial or religious precinct, were not disturbed by ordinary living quarters and domestic activities.

The survey area north of Harlan Backour also contained no middens and few artifacts. A possible explanation in this area may also be a specialized activity area, similar to those located by Thomas and Campbell (1979), Webb (1970, 1972) and Gibbon (1978) note the relative abundance of geoglyphs in this area, and an activity area relating to these particular artifacts may have been here. Within the earth ridges, the distribution of midden

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SYMPOSIUM:
New Perspectives on the Mound Exploration Division, Bureau of American Ethnology
Chairperson: B. D. Smith
B. D. Smith (Smithsonian Institution): The Mound Exploration Division: A Centennial Retrospective
S. Williams (Harvard Peabody Museum): Wills DeMy crt and How It All Began
B. and P. Morse (Arkansas Archaeological Survey): The BAE in Northeast Arkansas
M. D. Jeter (Arkansas Archeological Survey): Edward Palmer's 1882 Excavation at Titus Site (3D1): Southeast Arkansas
R. C. Godwin, C. J. U. Tallmadge, and M. Lettsidge (Smithsonian Institution): Physical Anthropology of the Titus Site, a Late Mississippian Cemetery in Southeast Arkansas
M. A. Rodengen (Arkansas Archeological Survey): Contributions to the Toxaway (Kasnib) Site Research by the Smithsonian Institution

SYMPOSIUM:
The Cloudsplitter Rockshelter, Menifee County, Kentucky: A Preliminary Report
Chairperson: C. W. Cowan
C. W. Cowan (Ohio State U): Introductory Remarks
R. L. Jackson (U of Michigan): Geochronological Analysis of the Cloudsplitter Rockshelter: Some Preliminary Results
T. L. Smar (U of Michigan): Analysis of Pollen from Archaeological Deposits in Cloudsplitter Rockshelter
C. W. Cowan (Ohio State U): Plant Remains from the Cloudsplitter Rockshelter
K. M. Moore (U of Michigan): Faunal Remains from the Cloudsplitter Rockshelter
A. A. Nickelloff (Ann Arbor, Michigan): Lithic Technology at the Cloudsplitter Rockshelter
C. W. Cowan (Ohio State U): Concluding Remarks
Discussions: P. J. Voss (Washington U), R. W. Jeffers (Southern Illinois/Carbondale)

SYMPOSIUM:
Social Analysis and Settlement Pattern
Chairperson: M. Wood
J. L. Rudolph and D. B. Blanton (U of Georgia): A Discussion of Mississippian Settlement in the Georgia Piedmont
J. B. Icenhour (Oklahoma): Social Ranking and the Centralization of Authority in the Spiro Phase
A. J. Osteen (U of Louisville/Belknap): A Research Design for Studying Settlement Patterns in the Northern Portion of Kentucky's Western Coalfields
A. F. Rogers (Western Carolina U): Surface Distribution of Selected Late Archaic Artifacts
B. B. Lewis (U of Illinois): The Mississippi Gulf Coast Archaeological Project: Research Design for the Bay St. Louis Study
W. M. Wood (Louisiana State U): A Computer Simulation of Settlement Growth and Delineation During Late Mississippian: An Example from the Pierre Point Area
M. Trinkle (South Carolina Department of Highways): Recent Woodland Period Research in Beesow County, South Carolina
M. Pennington (Lowndesville, South Carolina): Man and His Territory

SATURDAY, NOVEMBER 15

SYMPOSIUM:
The Moundville Archaeological Project: Examination of the Development of Mississippian Society in the Black Warrior River Valley
Organizer: M. Scarry
Chairperson: C. S. Peebles
C. S. Peebles (U of Michigan): Introduction
E. W. Seckinger (Corps of Engineers-Mobile Division) and N. L. Jenkins (U of Alabama/Montgomery): A Ritual Society in Prehistoric Alabama
P. D. Weich (U of Michigan): The West Jefferson Phase: Last Woodland Triad Society in West Central Alabama
L. McPhail (U of Michigan): The Explorations at Fauns During the Moundville I Phase at Moundville
C. M. Scarry (U of Michigan): Plant Procurement Strategies in the West Jefferson and Moundville Phases
M. Schaeffers (John Hopkins U) and C. S. Peebles (U of Michigan): Nutritional Correlates of Social Status at Moundville
A. Haddy (U of Michigan) and A. Hanson (Brookhaven National Laboratory): Relative Dating of Moundville Burials
V. P. Soponias (SUNY/Binghamton): Chronology and Community Patterns at Moundville
M. Hardin (U of Maine): The Recognition of Individual Hands in the Context of Standardized Craft Production: Implications of the Technological and Stylistic Development of Moundville Engraved Ceramics
C. S. Peebles (U of Michigan): The University of Michigan Moundville Archaeological Project in Perspective
Discussions: J. E. Griffin (U of Michigan), B. D. Smith (Smithsonian Institution)

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SYMPOSIUM:
Lithic Analysis and Interpretation
Chairperson: J. Rafferty
J. Rafferty (Mississippi State U): Projectile Point Typology: Late Archaic Chronology, and Interpreting Settlement Pattern Change
J. Conners and S. Biddix (Mississippi Archives and History): The Keenen Bed Cave: Lawrence County, Mississippi
D. H. Jerney (Southern Methodist U): Stone Digging Tools: Evidence from the Ozark, Ouachita, and Missouri Valley Regions
E. E. May (Southern Illinois/Carbondale): Archaeological Geology: Problems in the Identification of Chert Types and Source Area
E. T. Henning and K. Dietsch (Arkansas Archeological Survey): Analysis of a Quapaw Hunting Camp on the Saline River, Southeast Arkansas
T. H. Guderjan (Southern Methodist U): The Canary Creek Site Complex: Lithic Resource Conservation and Technology

SYMPOSIUM:
Research Reports Lower Mississippi Valley and Gulf Coast
Chairperson: G. Castillo
M. J. Kaczor (Arkansas Archeological Survey) and J. Wymouth (U of Nebraska): Magnetic Prospecting: Preliminary Results of the 1980 Field Season at the Teller Site, Market
J. E. Price (Southwest Missouri State U): Archaeological Research in the Fourche Creek Watershed on the Ozark Border of Southeast Missouri and Northeast Arkansas
S. Williams (Harvard Peabody Museum): The Murphy Site on the Lower Wabash (Indiana) Re-examined
G. A. Huston and J. W. Stontumce (Florida State U): Archaic Sites in the Stacey Bayou Pool, St. Marks National Wildlife Refuge
J. P. Brain (Harvard Peabody Museum): SIR Survey
J. Ford (U of Mississippi): Time and Tempor in the North Central Hills of Mississippi
J. W. Stontumce and G. A. Huston (Florida State U): Archeology of Naval Live Oaks, Gulf Islands National Seashore
W. F. Limb (Arkansas Archeological Survey): Location Choice in the Sparta Upland
R. H. Lafferty III (Arkansas Archeological Survey): Site Survey and Central Place Hierarchies in the Sparta Mine Area
J. Lauro (Mississippi Department of Archives and History): Hebe Plantation: Early Archaic in the Bojoe Phalax Drainage of the Southern Yazoo Basin, Mississippi

SYMPOSIUM:
Archaeology of the American Bottom and Upper Mississippi Valley
Chairperson: P. Revet
J. E. Kelly (U of Illinois/Urbana-Champaign): The Emergence of Cahokia
G. R. Milner (U of Illinois/Urbana-Champaign): Preliminary Notes on the Nature and Distribution of Mississippi Mississippian Mound Sites in the American Bottom
R. C. Mainfort (Tennessee Department of Conservation): Pinson Mounds (46M41): A Middle Woodland Site in West Tennessee
M. J. Lyncst (National Park Service): The Grimes Site, An Early Woodland Occupation in South-Central Missouri
M. Weinland (Kentucky Heritage Commission): A Summary of the Rowena Site: A Mississippian Mound, Russell County, Kentucky

Stephen Williams

SOME REFLECTIONS ON THE LONG, HAPPY, AND EVENTFUL LIFE OF ROBERT STUART NETZEL:

I can't think of a more appropriate spot than the Southeastern Conference for this: New Orleans was a favorite spot of Stu's, but this isn't an obituary—I'll leave that to others, at other times and places. I'm sure that many will want to try to capture the spirit of this remarkable gent—call Bob or call him Rob or, call him just plain "Stu," as most of his archaeologists did. It is, instead, a brief journey in remembrance.

Well, who or what was Stu? He was a good field archaeologist and a pretty fair excavator; he could make that old Bell & Bell transit that Jim Ford "borrowed" from the Louisiana Highway Department some time in the late Thirties throw a straight line—if you knew all the tricks—I'm not sure he really liked the instrument as well, after I took it back to his maker in Boston and had it all polished up and realigned.

But let's get one thing straight—he was not, when I knew him, a great jazz musician—I don't think he even thought he was so himself, but then he was pretty darn humble about most of his accomplishments—except for all those tales of daring and doing when he was young and able—or so he said—a hundred times. But as to the piano, yes, I know there are those who remember the piano being hauled upstairs for a special performance at the Historical Conference at Columbus, and I must confess I never heard him play on a piano that had all its keys working or that was even partially in tune—but like life, he attacked the tunes, made some excuses for the lack of proper accomplishment, and if you didn't listen too closely (and who did later in the evening) it sounded pretty good. It was, after all, the effect that was sought.

He was a classic good reader of parables and taught all of us in the LMS some of the finer points. Not that I agreed with all his conclusions in "Fatherland Revisited"; perhaps that's a place where some of us failed him. Did we take his archaeological work seriously enough? Maybe we should have argued harder, but who wanted to disagree with Stu on such matters?

His caring for archaeology and anthropology was a special thing—I'm not sure I fully understood it. He liked large questions, some quite deeply philosophical, and he read widely in areas that frequently surprised me—but he was always so ardent that it was hard to argue with him too seriously. Besides, many of the discussions were carried on far into the night when the full sense of some of the arguments got lost. But it didn't seem to matter then or even now.

Nature of the Work—We're sure we all have our own favorites, and they can be found to under-score almost any point. His own self-deprecating stories (almost myths) of the days at the University of Nebraska, where he became a lifelong friend of Loren Turner, is a great story, starting Chicago with Redfield and the going-ons at Kincaid, and his tales of adventures....

[1] I started to draft these notes in late August, when I first learned of Stu's death while I was on vacation. In fact, they sort of wrote themselves—memories of great times shared with him came flooding in as I rode the rural roads. This will not be very good historiography, although I've checked as many of the facts and dates as possible with my field logs. The events did take place; there has been minimal editing.

I visited him at Fethersfield in 1902, when he began his last association with me, and I am not yet pleased. The volume on his later work on the site will be published soon. His last excavations there were a follow up on Merton College's pre-war activities on the mounds. There were questions to be answered about the location of the previous work that were to plague us for a decade or more.

That first summer I was bringing my new wife on a trip of reconnaissance and our visit with Stuart Nettles was warm and heartening. I wanted to show off my good fortune and get his approval too. We had a great visit with some free teas at the site and at the Stradivarius Motel (no kidding).

The seasonal events often were not worth the time or trouble but one in 1976 was so fulfilling for all involved that the memories of it is still worth a decade later. Phil Phillips had his 70th birthday in the late summer of that year and we planned a small vol-

ume and a party in September to coincide with the publication of his two-volume work on the Lower Yawo. Old friends contributed letters and some even took the opportunity to journey to Cambridge. The event was not a too-well kept secret in its entirety, but parts of it did work well. As I sheltered Phil and his wife through the intricate a large Cambridge build-

ing toward the site of the dinner, we passed a couple of window-shoppers who were intent on the wares that were displayed therein. We as we passed, the window-

shoppers turned and great Phil with complete non-

chalance, it was Bill Haag and Stuart Nettles, I do think that was a real surprise to Phil, and Stuart always loved to evoke the memories of that event.

So it with the last conference that Stuart attended—

the Caddo Conference in Texarkana in March. Al-

though Stuart had a few spells of not feeling too well during the fall and winter (he didn't go to the SEAC in Atlanta, he was there in Arkansas with his Louisi-

ana colleagues and the Arag was exactly what he needed, reinvigorated his spiritual, with energy enough to go out looking at sites, but still not chipping any mounds like the rest of us fools.

I arrived by car from Fayetteville about 8:30 p.m., and set out to find my Lower Valley colleagues in this Caddo context. Not finding them in their room, I wandered about the motel grounds and ran into the two of them looking for me. Stuart was outlived by the damodated dark blue two-piece leisure suit, topped off

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In 1978 a cultural resources survey and subsequent mitigative excavation were conducted at the Poverty Point site by staff of the Louisiana Division of Archaeology. The survey concentrated on the second phase of development at the site: this consisted of a museum, a manager's residence, a dormitory, an archaeological laboratory, and a paved tram road through the park (Fig. 1). This task represents an excellent opportunity to investigate areas of the site which had never been tested and to formulate hypotheses of historic habitation patterns. Previous excavations (Ford and Webb 1956, Karrill 1957, Haag n.d.) showed that the ridges were largely composed of midden, and although no houses had been discovered, the belief that the ridges were foundations for houses was common among many investigators. Haag's excavation in the plaza area within the ridges also revealed a deep midden as well as numerous large postmolds. Most of the plaza area has been tested.

Outside the ridges, few test excavations have been conducted, except those centering on the two published, Thomas and Campbell (1957) reported a specialized activity and habitation area approximately 350 m southwest of Mount A. Surface collections of the cleared field adjacent to Mount B suggested an Archaic Southeastern Archeological Conference Bulletin 24, 1981

Deborah K. Woodie!
deposits varies, while Haug's 1975 excavations just east of Ridge 1 uncovered midden soils almost two meters in depth. Only the tan Memphis silt clay deposits were located in the vehicle trail route within the ridge. The museum area of the visitor center were also devoid of occupation debris. Two features in the center of a postmold were discovered in a three-meter test unit in the museum area, but expansion of the test failed to reveal any additional postmolds or artifacts.

In the area of the laboratory, midden soils were found. While postholes dug in the northwest periphery of the test area yielded no midden deposits, postholes and test excavations dug to the south and east revealed midden deposits as deep as 2.4 m (Fig. 2). The deep deposits were composed of two midden layers separated by a lighter tan sterile zone.

The presence of deep undisturbed midden deposits opened the way for investigation of other issues as yet unresolved at Poverty Point. One is related to the nature of Poverty Point habitation lot themselves. Although a number of large and small postmolds have been excavated on both the ridgelines and in the western portion of the plaza, no patterns indicative of houses have been identified. It was hoped that even in a small area such as that contained in the lab location, some information bearing on this issue could be gathered.

One controversy which has received attention in recent years is the subsistence base of Poverty Point. These arguments can be reduced to two hypotheses: one consisting of the exploitation of wild foods and native cultigens. The absence of possible food plants and animal bones from excavated contexts, as well as the lack of pollen in midden soils from Poverty Point accounted for the lack of direct evidence supporting either contention. The present excavations could recover data that would help answer these questions.

A third line of investigation could also be pursued, that of internal chronology of the exposed deposits. Hence, the almost black midden at Poverty Point could rapidly be stratified visually, and the evidence for the relative chronology of artifactual types within the site, particularly Poverty Point Object styles, was weak. The investigation of two distinct midden complexes entirely separated by a distinct sterile deposit could...
Figure 7. Location of Excavation Units in Laboratory Area.

The excavation units and two backhoe trenches in the laboratory area revealed that the lower midden zone and the ca.-sterile loamy clay overlying it were the fill of a shallow oval-shaped depression, 2.4 m deep at the deepest point. Its bottom sloped upward at the western end in the two trenches. The east end was not pin-pointed due to the danger of increasing an already rapidly expanding gulley some 6 m to the northeast. The bluff edge overlooking Bayou Macon was examined for traces of this feature, but none were found.

Within this depression ten trash pits or shallow concentrations of ash, charcoal, and fragmentary Poverty Point objects (rarely, a stone flake or tool) were found. Most of these features yielded small amounts of charcoal, and the charcoal from one trash pit, analyzed by the University of Georgia, yielded a date of 3065 ± 95 B.P. (UGa-2668). This date is well within the range of dates established for the site so far. Floral and faunal remains were also found in the trash pits. The former, identified by Andrea Shea, included bird bones (Carus spp.), walrus (Lophophora spp.), and several fragments (Quercus sp.). Seeds recovered included persimmons (Diospyros virginiana), grape (Vitis sp.), and henry laurel (Gleditsia triacanth-osa). These all indicate late summer and fall gathering activities. Analysis of cane and wood charcoal indicate the presence of a number of upland hardwoods, especially Hickory and sweet gum, and a small amount of pine. Remains of cane, probably employed in a variety of household uses, was also one of the larger components of the wood charcoal. No remains of tropical cultivars were found, nor were any vestiges of weedy plants which could have been native cultivars recovered. The floral samples were too small to support substantially any of the subsistence alternatives proposed so far. Pollen samples, prepared by Texas A&M University, failed to yield countable amounts of pollen.

Very few animal bones were recovered, and those that were are quite small. Identification by Kathleen Byrd indicated use of mud-mock turtle and freshwater fishes, easily observable from Bayou Macon.

The artifacts found do not show differences in vertical or horizontal distributions. Poverty Point Ob- ject fragments are the most numerous artifact found, and their density in each midden zone is similar. The most common types of Poverty Point Object seem to be the melon and bi-conical shapes, in equal numbers. Few tools were found; scrapers, points, and bifacial im- plements make up the collection of about 20 tools. The only difference in artifact assemblages between the two middens observed so far was the number of little flakes and chips, which were almost twice as common in the lower midden as in the upper one.

Seventeen postholes of varying sizes and depths were also noted in these excavation units. They occurred both within and outside the midden areas and in the depression. No patterns of arrangement were evident.

Additional cores taken to the south of the excavated area in present drainage areas showed the same type of depositional sequence as in the excavated depression. These data and examination of the strata in the depression indicated that the depression was prob- ably a natural drainage feature which was used by the site’s inhabitants as a disposal area and later as an oc- cupation area.

To summarize, these investigations have confirmed the presence and absence of occupation areas both within the earth ridges and outside of them. Probable cause of the unavailability of the vacant area lay in their reservation for public use of a ceremonial and/or commercial nature. Also found was evidence of dis- pastal and filling to produce suitable habitation areas, outside the earth ridges themselves. The amount of earth moving in aboriginal times, already on a moun- tain scale, was even more extensive. No houses were discovered, but floral and faunal remains point to the use of wild foods; in view of the limited data available, however, domesticates cannot be conclusively ruled out.

References Cited:
Mary Lucas Powell

POST-MISSISSIPPIAN MORTUARY VARIABILITY IN THE GAINESVILLE RESERVOIR, WEST CENTRAL ALABAMA

Excavations conducted in 1979 by the University of Michigan Museum of Anthropology at the Lubbock Creek Archaeological Locality near Altville, Alabama, yielded the remains of successive Woodland, Mississippian, and Protohistoric occupations. Of the 86 human burials recovered, 7 were assigned to the most recent archaeological component, provisionally dated between A.D. 1500 and A.D. 1700 (Pedley, in preparation).

The latter features displayed more formal variability than did the 86 earlier mortuary features from the Late Woodland (Miller III) and Mississippian (Summerville IV) occupations. Whereas those burials typically contained single articulated individuals, some interest with artifacts, the latter features contained a total of 61 individuals, all but two disarticulated, with no grave goods. A variety of interment modes had been employed, including extended articulated interments (in a single instance), urn burial and single and multiple bundle burials of different skeletal elements.

The contemporaneity of these various modes within the Protohistoric (Summerville IV) component has not been scrutinized, and certain formal differences (e.g., the use of nonperforated ceramic urns vs. the use of perishable containers to encase disarticulated remains) may reflect temporal succession rather than contemporaneous employment within a single mortuary program.

In this brief paper, it is argued that the two largest mortuary features (which contained at least 54 individuals) in the latest component resulted from behavior analogous to that reported ethnographically (Swanton 1931) for the Choctaw Indians who succeeded the Protohistoric inhabitants of that region. This interpretation complements other archaeological evidence from the Lubbock excavations which suggest that the Summerville IV settlement may have been viewed as a proto-Choctaw occupation (Pedley, in preparation).

The use of ethnographic analogy in the elucidation of past human behavior localized in the archaeological record requires the careful construction of models of expected evidence of the behavior in question, to which the excavated evidence may be compared. As Binford (1952) has cautioned, the investigation should focus on hypothetical functional similarities between the two behavior sets, rather than insisting upon precise correspondence of the data sets.

European travelers in eastern Mississippi and western central Alabama in the late 18th century and early 19th century were intrigued by the mortuary customs of the Choctaw inhabiting these regions, so much so that Swanton (1931:176) commented in Source Materials for the Social and Ceremonial Life of the Choctaw Indians that at the time the ancient Choctaw culture was developed so strikingly that more attention is devoted to it by writers on the tribe than to any other native custom.

The wrapped bodies of the deceased were placed on high scaffolds until preliminary decomposition was accomplished. The bones were then cleaned of flesh by mortuary priests, "a certain set of venerable old Gentlemen who with very long nails as a distinguishing badge on the thumb, fore and middle fingers on each hand . . ." (Roumen, in Swanton 1931:175). The wooden or cane boxes containing these remains were stored in the village channel houses until their final communal disposition in a large pit outside the habitations of the village.

A model of expected archaeological evidence of such mortuary behavior would include several key elements: large deposits of disarticulated bones interred in pits, whose demographic profile should approximate expected mortuary experience (i.e., both sexes and all ages). The bones would not necessarily bear marks of their cleaning, if the mortuary priests' nails were the only permissible tools for that task. Preservation of their alignment within their perishable containers would aid in identification of discrete individuals within the deposits. The scaffolds would not appear archaeologically except as postmolds containing charred posts. The charred houses might be distinguishable from other structures by their lack of hearths, domestic rubbish, and containing walls on all four sides.

The portion of the Protohistoric component sampled at Lubbock did not yield any structure identified as a charred house, but this absence could well be due to sampling error. Numerous random postmolds were noted near the domestic structures discovered, which could have been produced by scaffold supports. Only one articulated extended interment was assigned to this component, the 61 remaining individuals appearing in secondary interments.

Two of the 7 Protohistoric burials bear a strong resemblance to the modeled evidence outlined above. One consisted of a deposit of disarticulated skeletal elements representing a minimum of 45 individuals, arranged in several adjacent compact stacks within a large pit. The long axis of the deposit lay at a right angle to the axes of the long bones which comprised the majority of the deposit. Within each stack, smaller deposits representing separate individuals could be distinguished. The other burial contained the fragmented remains of 10 individuals stacked neatly over the hundreds posteminal remains of 40 individuals, persons.

Representation of both sexes was approximately equal in the adult segments of both burials. Subadults were represented (50% vs. the expected 50% of the total number) in these deposits, reflecting the expected decline after infancy (Weiss 1973). Poor bone preservation may have obscured marks of processing, if such existed.

Certain aspects of these two deposits had no specific equivalent in the model derived from cultural graphic data. These aspects include the differential selection of skeletal elements for inclusion in each burial, the spatial segregation of a few more completely represented individuals at the base of the stacks in the larger feature, the differential degree of processing involved in the composition of each deposit.

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and the under-representation of subadults in both. Although no direct evidence links the individuals rep­resentedcranially in the smaller deposit with those represented only postcranially in the larger one, the two features do by their natures form logical comple­ments to one another, with respect to the disposition of cranial elements. However, it is also possible that the highly processed nature of the fragmented crania and their association with a single postcranially well-represented individual whose bones display traces of contact with fire (a unique occurrence in the Lubbock sample) defies an origin distinct from the remains in the larger feature.

Swanton’s sources were largely silent on the matter of which skeletal elements were retained for final deposition, although the general implication was that all bones were saved. Differential disposal of subadults was not specifically noted. The observed differences from the model (which was by definition a simplification of reality) may have resulted from interregional variations and/or from minor alternations in the basic regional mortuary pattern in the course of the cen­turies which separated the Protohistoric inhabitants of Lubbock from their Neolithic ancestors in the area. These differences do not invalidate the analogy drawn between the Protohistoric and early Historic mortuary behaviors which produced the modeled and the ex­tracted evidence, as such behaviors need not have been identical in every detail, only in their basic functional aspects. In both cases, deposits of disarticulated bones representing significant segments of the population were produced as communal interments, within which discrete individuals could be distinguished.

In both cases, deposits differed in several critical formal dimensions from those produced by mortuary activities in the succeeding Woodland and Shumowian periods in the Gainesville Reservoir. Considered collectively, these differences signaled a shift away from the sepa­rate interment of articulated individuals, frequently accompanied by artifacts of totemic or sociotechnic significance, in the earlier periods toward collective interment of processed (and in some case selectively curated) remains of population segments without dis­tinguishing artifacts in the later period. This shift has been documented at Lubbock and nearby sites within the Reservoir (Hill 1929, Ensor and Hill 1959, Powell, in preparation) and elsewhere in central Ala­bama (Shelton 1974), accompanying the other aspects of the broad social transition from stratified Missis­sipian chieftaincies to the more egalitarian organization of the Historic Alabama tribes.

Acknowledgment

I would like to thank the United States Army Corps of Engineers, Mobile District, for permission to pre­sent the data in this paper.

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Timothy K. Pettula and Ann F. Ramenofsky

AN ARCHAEOLOGICAL MODEL OF CADDIAN CULTURE CHANGE: THE HISTORIC PERIOD

Archaeological considerations of European contact and aboriginal change began in the 18th century with speculations about the mound-builders (Silverberg 1900). Incongruities between European intimations about the kind of societies required to build mounds, and ethnographic descriptions and population densities of 18th and 19th century Native Americans, led to questions about contact period change. This interest in contact change, however, did not survive the 19th cen­tury. With the incorporation of American archaeology into the anthropological discipline, interest focused instead on the search for, and the assumption of, cul­tural continuities.

The goals of American anthropology framed in the early 20th century set certain precedents in ap­proaches to European contact and native systems which still are evident in our reliance on ethnographic de­scriptions in building inferences about the past. Boas


and his students were not interested in documenting the effects of European contact per se; they wanted to study Native American systems free of European influ­ences (Boas 1896; Swanton and Dixon 1914). This restriction was analytically difficult since by the early 20th century Native Americans had known the effects of contact for ca. 300 years.

To overcome this inherent difficulty, ethnographers relied on a diverse data set which were synthesized into descriptions through the technique of the ethn­ographic process. This technique constructed from this time-transgressive data "a" synchronic picture of ethnographic fact placed just prior to European con­tact (Kroeber 1939).

In an historical and developmental sense, the Direct Historical Approach (Dixon 1915; Seward 1942) is the archaeological analogue to the concept of the ethnographic present. Its concern for cultural con­
tinities is evident in its purpose to link post-contact tribal histories with pre-contact cultures. Caution has often been expressed about the direct correlation of archaeological and ethnographic units (e.g. Grifflf 1951; Mann 1976), but it is fair to say that the belief in the relationship is a strong and persistent one (e.g. Brain 1977; Gregory 1980).

To stretch the post-contact fabric to fit pre-contact manifestations, evidence of contact period change, disruptions, and terminations were often overlooked or ignored. While there is general acknowledgement that European contact had a major impact on Native Americans, the exact nature and extent of this impact has either not been systematically assessed, or it has been treated as a lumped synchronous unit from utilizing data sets that were conceived as changes.

A procedural consideration of the contact period must be framed so that evidence of change can be abstracted from data whose nature are diachronic. Archaeological data are well suited to diachronic studies (Plog 1977). As Milner notes (1980:60), “Archaeological studies are necessary to document and explain the extent of population reduction and culture change prior to 1700.” The remainder of this paper will be concerned then with the study of the contact record in the Cadillo area, and the presentation of one possible explanatory model of the Cadillo historic archaeological record.

Ethnohistorical Background

The Cadillo area encompasses a wide swath of land centered on Red River in the states of Texas, Louisiana, Oklahoma, and Arkansas. The term Cadillo is a convenience in both archaeological and ethnohistorical studies. It is a very diverse archaeological construct derived from the late prehistoric period (Gray 1973). As an ethnohistoric construct it refers to those entities residing within this area who were described in the period of Spanish and French colonization, and grouped together on the basis of certain shared characteristics (Swanton 1915). What we know of the ethnohistoric record deals primarily with the Cadillo speaking groups living around the Spanish missions and at the French posts of Natchitoches and Red River in Bowie County. Ethnographic information is extremely limited on the majority of these groups, with some known only by name, and many others disappearing early in the 18th century (Campbell 1976).

There is abundant ethnohistorical evidence (Swan- ton 1939) that change in demographic profiles and the diffusion of European goods preceded actual colonizing efforts in the Northeast, thus making even the earliest histories descriptions of systems already changing. From an aboriginal perspective European contact involves two variables: people and products. Simply, contact may take three forms: a) producers without people; b) people without products; and c) people with products. To encompass all three forms of contact, the historic record defined here begins in the mid-16th century, starting with Cabo de Vaca's voyage along the Texas coast to Moscow's entrada into the interior.

Acute European diseases and introduced products of European technology are primary in the consideration of the Cadillo historic archaeological record. These variables are important initial sources of change because they are movable. They could be dispersed by Native populations independently of Europeans, and the adoption, integration, and adjustment to these variables would be a process unrestrained by Europeans. The model attempts to address the effects these variables had on Cadillo societies, and the form of aboriginal responses. Diseases of significance include smallpox, measles, and influenza, among others, none of which were present in North America before European contact (Permer 1970). Once the disease process was established in a “virgin-soil” population at periodic epidemics, Native American morbidity and mortality figures ranged upward to 80% (Doby 1974a; Doby 1975). Everett's (1937) analysis of the epidemics among the Cadillo indicates that a population decline between 75-90% as a result of the major epidemics recorded from 1528. The transmission of diseases was dependent on the degree and frequency of inter-settlement contact, and the increased mobility to spread disease from one area to another. The expansion of the fur trade, and the traffic in horses from Santa Fe were the prime vehicles of transmission.

The diffusion of horses after 1650 from Santa Fe (Jouben and LaPope 1980) facilitated the more rapid movement of all aboriginal and European goods, as well as increased inter-settlement contact. The Spanish first heard about the “Tigua Kingdom” in the mid 17th century from Jimeno middlemen who ranged from the Rio Grande to East Texas carrying goods back and forth. Cadillo access to horses and guns helped them establish a preeminent role in the exchange of these items until at least the early 18th century. From ethnohistorical records it appears that certain by 1688 horses were the prime exchangeable commodity of Cadillo societies south of Red River while French guns had a similar role in Cadillo groups on Red River, and trade to Arkansas Post and Illinois. The trade was already in place when sustained European contact first began.

Responses to Culture Contact

A drastically decreased population base in all regions of the Cadillo area forms the core of the model. Differential aboriginal response by region is dependent upon remaining aboriginal populations and relative position to European settlements. The first type of aboriginal response is the formation of hybrid population clusters out of disintegrating community and group remnants, and the necessary development of new integrating mechanisms. The mechanisms may be considered to be European derived in nature when the population remnants coalesce around zones of European settlement or accent points such as French trading posts. Integrative mechanisms aboriginal in nature are those different in degree but not in kind from inferred precedent, such as the redistribution of goods at feasts and fire temples. Inferred aboriginal mechanisms seem to be short-lived in the contact period; the Great Kewi, the top of the Haisan elite hierarchy (Wright and Baugh 1980), is paradoxically rarely mentioned in the ethnohistoric literature after the early 18th century. Mound construction and utilization is rare among historic Cadillo populations. It is probably significant that the Kewi ceremony (Turnbaugh 1979) was adopted first among the Cahokia, one of the first groups to disappear from the record, and next among the Kadobadachgo, a remnant confederacy. The phenomenon...
eon of confederacies are common in the ethnographic literature, though their function and development differ greatly.

Among the Kvodlongacho and Natchitcheñas confederacies, both formed in proximity to European settlements, the relative number of historic period sites contemporaneous with these settlements are in direct proportion to the social interaction between the regions. Because the effect of the missions among the Haisini was not overtly socioeconomic or religious (Bolton 1915; 1916), they were not magnets to population remnants as were the trading post/settlements. A lower population density and a dispersed arrangement of populations around the missions, instead of the compact pattern around European settlements, is expected in the areas administered by the Spanish on East Texas. The Haisini strategy was dependent less on their isolated position near Spanish missions than upon the frequency of contact and later official trading, their position with respect to horse exchanges, and the eventual establishment of new subsistence strategies.

The second major response is attempting to maintain the pre-contact adaptation, with settlement numbers and distribution predicted to steadily decline with ever decreasing populations until too small for group survival. These disintegrating groups either join one of the hybrid populations or try to adopt new subsistence strategies. The entire area between the Haisini and Kvodlongacho was emptied, beginning with the first epidemics, and continuing in direct proportion to the frequency of European goods at other regions. Marginal areas will show little post-1700 historic occupations until certain areas were reoccupied and utilized at a later date (post-1760) with expanding trade activities.

With environmental conditions permitting, and given due consideration for dependable access to new and more efficient technological items (guns), the time-transgressive is the development of new subsistence strategies, mainly fur trading. The response is time-transgressive in that its adaptive advantage is strictly predicated upon access to European goods. With the quantity and quality of guns probably variable before aboriginal groups became tied to European economic strategies, the success of the fur trade followed the establishment of dependable supplies. With the continuing collapse and fragmentation of remnants Cassian groups, the increasing availability of French guns made this strategy more and more advantageous. Till 1724 was the dominant response throughout the Caddo area. Recognizable archaeological changes include the development of a specialized furbearing technology, different and specialized faunal procurement patterns, and locations in European hinterland areas.

Summary

One that is time-transgressive in nature. Particular regions each have potentially different contact records, and the contact record is far from being a static one.

The fact that any Cadcozan people survived so many generations of misinterpreted displacement is not only an eloquent testimony to their ability to change, but a silent statement of their strength as a people.

Acknowledgements

Dr. Robert C. Dunham's assistance, support, arguments, and criticisms are greatly appreciated. Errors of interpretation are a result of our shortcomings. This is a much revised and shortened version of the paper presented at the 57th Southeastern Archaeological Conference, New Orleans.

References Cited


INVESTIGATIONS AND STABILIZATION OF WOODEN ARTIFACTS FROM FLORIDA WET SITES

Quantities of wooden artifacts have been found in Florida since the late 1800s when Frank Hamilton Cushing recovered the famous Key Marco specimens. Unfortunately, none of these has been cared for properly. The Florida State Museum has been involved in studies of these important objects for a number of years. 1977 witnessed the potential of Florida's wetlands with respect to preservation of cultural remains. Case when drought conditions caused the watertable to drop and expose long-buried wooden artifacts, especially canoes. The National Science Foundation and the National Endowment for the Arts provided money to retrieve some of this material but for funds ran out before the artifacts could be cared for completely. No investigations were conducted at that time to determine what might be left in the deposits. Two proposals were supported by the National Trust for Historic Preservation and one proposal was funded by Heritage Conservation and Recreation Service to stabilize and apply the wooden artifacts already recovered and to conduct a statewide survey of wetland sites. This paper is a summary of our findings at this time.

Stabilization

There are hundreds of objects needing preservation; most are extremely degraded. Additional specimens should not be retrieved until there is a systematic way to handle the material. Correspondence with wooden artifact preservation researchers around the world and a literature search have been conducted as initial steps in determining the range, advantages, and disadvantages of current preservation procedures. These endeavors have produced a variety of reports and references that will serve as a bibliography of wooden artifact analysis and preservation.

The treatment of waterlogged wood is dependent upon many variables, including the specific type of wood, its degree of degradation, depositional environment, and how the wood has been affected from its natural form. Different types of wood have different resistance to decay which can significantly affect the rate of their degradation. The degree of degradation in waterlogged wood depends upon the amount of supportive cell wall material (cutin) lost to biological and chemical action in the depositional context. The degree of degradation directly affects the permeability of the wood, which in turn is affected from the degree of degradation. Generally, degraded softwoods (conifers) are more permeable than hardwoods (Broadleaf), though this varies from species to species. The deterioration of wood species is therefore essential to the selection of preservation methods and has been a primary focus of attempts. Wood species are identified by taking thin sections and examining the microscopic structure. The features displayed in each of three planar surfaces—transverse, radial, and tangential—should be observed for reliable identification. These surfaces are also those along which the cell walls collapse as water evaporates from the artifact. Thus, examination of thin sections allows both species determination and assessment of degradation. Since no comparative collection is available, a study of Florida wood is available, we are creating our own collection for use in this and future investigations. Dr. William Storm, Chairman of the Department of Botany at the University of Florida has provided valuable preservation instructions in the scrutinizing and measuring of specimens.

The most successful and satisfactory method for waterlogged wood preservation, as indicated in correspondence and publications, is substitution in a solution of polyethylene glycol (PEG) and water at concentrated concentrations for successive time periods relative to the size and condition of the artifact. Time periods ranged from a few weeks to a few years during which time the PEG gradually permeates and stabilizes the deteriorated wood material. PEG is a white, wax-like substance that resembles paraffin. Mixed with water, it readily diffuses into the water-soaked fine structure of the wood, supports it, and keeps it intact during the final drying process. It also adds weight to a specimen. A table is included to the solution in order to control unwarranted further-degrading bacterial and fungal growth.

PEG treatment was initiated prior to the Florida State Museum for two cases and a large wooden bowl recovered during the drought of 1977. The remaining woodlot artifacts in the museum collections are being analyzed for their suitability to this or other preservation measures. In addition, a large quantity of fragmentary wooden remains recovered by salvage methods from a dredged site near Naples, Florida were brought to the museum for analysis and treatment. These materials, associated skeletal remains, and the matrix from which they were recovered were radiocarbon dated to 6500 years B.P. The wooden objects included artifact parts, shaft fragments (one with four pairs of twisted lines), three wooded sick fragments identified as flint tools, and many chipped pieces ofuletteristic function. The skeletal material, though badly damaged by the method of recovery, permitted a few general inferences concerning the health and cultural practices of the population. Malnutrition is indicated by the presence of abscessed Jaws with misplaced worn teeth and by the radiographically visible transverse line ridges representative of periods of starvation rather than to chronic malnutrition. Abnormally developed upper arm and shoulder musculature and severe scoliosis indicate heavy physical exercise probably lifting or canoe paddling. Several of the bones exhibit syphilitic tendencies. Dr. William R. Maples, Curator of Physical Anthropology at the Florida State Museum, is preparing a publication that will describe the skeletal material in detail.

Statewide Survey

In order to obtain a more comprehensive view of the nature, condition, cultural implications, and location of wooden remains recovered throughout the state, a statewide survey has been conducted. It is hoped that an accurate inventory of wooden remains will be established for future research.
ida museums and other institutions able to provide such information. The compilation of a master site file of Florida wooden artifacts from this and our own data has been undertaken to provide a permanent record and to aid in future investigations and comparative analyses of these materials.

A statewide survey has been underway since the fall of 1960 to investigate the location and extent of the wetland areas in Florida. Locations were visited where organic materials had been recovered previously in maritime environments in order to determine under what circumstances preservation had occurred. These visits included Homosassa Island on the St. Johns River near Deland, Belle Glade, Key Marco, the Bay West Site, Little Salt Springs near Venice, numerous lake areas Atlantic and Gulf Coast sites, and commercial peat operations.

Wetland areas in Florida are very extensive and wooden artifacts have been found in all regions of the state where preservation conditions are favorable, i.e., wetlands. We are assuming, therefore, until demonstrated differently, that every wetland area may contain organic artifacts. Because it is impossible to investigate personally all of the sites during the period of the survey, information was requested from the Florida State University agents, soil conservation offices, and commercial peat operators listed in the U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, 1929. The replies were valuable and are being summarized for future action.

Summary of Current Information

Most of the data being amassed about the history of Florida's wetlands are disheartening.

(1) Nearly all of the wooden cultural remains in Florida were discovered by private property owners or during development projects without the benefit of controlled excavation procedures. Valuable information has been lost because these materials were jacked from their provenance and dropped from a bucket and splattered. The specimens have disintegrated because they were not preserved.

John F. Scarry

INTRODUCTION TO THE SYMPOSIUM: RECENT ADVANCES IN FORT WALTON ARCHAEOLOGY

Gordon R. Willey's Archeology of the Florida Gulf Coast was published over 30 years ago (Willey 1949) and was noted as the single most important work on the archaeology of the Fort Walton area. Since its publication, the emphasis of Fort Walton culture contained in this synthesis has colored nearly every investigation of Mississippian phenomena in this area. Despite studies critical of Willey's definition (cf. Sears 1961, 1977; Boone and Percy 1970), the popular image of the Fort Walton is as a Willey defined it: a chronologically late Mississippian manifestation; peripheral--both in a geographical and in a cultural sense--to the chief MiddleMississippian culture of the interior alluvial valleys of the Southeast. Willey's Fort Walton culture also differed from other Mississippian manifestations because it included numerous coastal components (i.e., Pensacola culture sites).

Recent research conducted during the past decade has indicated serious flaws in Willey's concept of Fort Walton culture. Fort Walton is not a late phenomenon but is peripheral to the general development of Mississippian, at least in a cultural sense. By excluding the Pensacola systems of the Gulf Coast, not only on material culture grounds as Sears has advocated (1961, 1977), but on the basis of significant differences in adaptation, Fort Walton can be recognized as more typically Mississippian--to the extent that something can be typically Mississippian.

The seven papers which follow outline some of the research carried out during the past decade. They
clearly indicate that traditional concepts of Fort Walton must be reformulated and they illustrate some of the reformulation that has taken place. Calvin Jones' work at the Lake Jackson site adds that site to the roster of major Southern Cult centers alongside Spiro, Moundville, and Etowah. Lake Jackson clearly was not a peripheral site; it was an important component of the Southern Cult exchange system. We will not understand the operation of the Cult fully until we understand the role of Lake Jackson.

The research outlined in these papers has added greatly to our understanding of Fort Walton. It has resulted in the modification of traditional models of Fort Walton and will contribute to a better understanding of Mississippian phenomena in general.

The papers also indicate some of the problems which still face us. Despite improvements, our definition of Fort Walton is vaguely besmirched and we do not have a consensus of what constitutes Fort Walton (i.e., which components are Fort Walton and which are something else). We must refine and agree on our definitions. In addition, there are several problems with the existing ceramic typologies; they do not permit the easy identification of regional and chronological sub-units of Fort Walton nor the study of relationships between different sites. Finally, despite the recent research, there remain large gaps in our data base: (1) we do not know the composition or structure of specific Fort Walton systems; (2) the details of the Fort Walton subsistence procurement system are at best poorly known; and (3) we cannot reasonably discuss relationships among the various Fort Walton components or between Fort Walton and nearby non-Fort Walton components. We have made advances, but we still have a long way to go.

The references cited in the following seven papers are combined and included separately on pages 52-54.

John F. Scarry

FORT WALTON CULTURE: A REDEFINITION

Fort Walton culture was a generalized adaptation, shared by a number of social systems on the Gulf Coastal Plain during the period A.D. 900 to A.D. 1650. This adaptation featured: (1) a subsistence system based on the intensive cultivation of maize and the selective exploitation of large mammals and aquatic fauna; (2) a settlement pattern which was largely focused on circumscribed areas containing agriculturally productive soils and aquatic habitats; and (3) an organizational strategy which included differential

Figure 1. The Fort Walton area.
ranking of individual members of the society and hierarchical decision-making units. The Fort Walton systems were Mississippian (Peebles and Kos 1977), although they do not always conform exactly to Smith's recent definition (B. D. Smith 1978). The Mississippian character of Fort Walton systems has been recognized since the initial definitions of the Fort Walton culture (cf. Willey and Woodbury 1942; Willey 1949), and there is extensive evidence to suggest that Fort Walton systems were actively engaged in exchange networks which involved many other Mississippian systems (cf. Schnell et al. 1979; Williams 1979; Knight 1980). In fact, it is now evident that at least one Fort Walton system, the Lake Jackson, played an important role in the Southern East exchange system.

Fort Walton culture was restricted to the Lower Chattahoochee-Apalachicola alluvial valley and several nearby areas of agriculturally productive soils, such as the Marianna Lowlands and the Tallahassee Red Hills of northwestern Florida (Fig. 1). Within the general area, several regional variants of Fort Walton culture are discernible on the basis of differences in ceramic assemblages. These regional variants include the Rood and Bull Creek phases of the Lower Chattahoochee, the Waddeles Mill Pond variant of the Marianna Lowlands, the Cayon, Sneads, and Yon phases of the Apalachicola Valley, and the Lake Jackson variant of the Tallahassee Red Hills area (Fig. 2). However, while there are material culture differences between these Fort Walton variants, they share a generalized material culture which distinguishes them from other Mississippian systems.

Figure 2. Fort Walton regional variants.
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The demarcation of the Fort Walton culture appears to have been a result of European intrusion into the Fort Walton area and the subsequent population disruption. At the time of the earliest Spanish explorations of the area, the region north of the Apalachicola and the lower Choctawhatchee were occupied by a number of aboriginal groups. The Apalachicola were the most prominent of these groups, and their influence extended southward into the Choctawhatchee Valley. The Fort Walton culture may have originated from a combination of these groups, but it is not clear how the cultures merged to form the modern Fort Walton culture. This definition of the Fort Walton culture does not differ dramatically in concept from current concepts of Fort Walton. However, by excluding the Peninsula culture of the Gulf Coast, does modify the phenomaenological character of the culture. The major change represented by this definition is a shift in emphasis. While diagnostic ceramics remain the primary criterion utilized in identifying Fort Walton sites, they are not the defining characteristics of Fort Walton culture. I hope that this definition of Fort Walton will stimulate investigations which emphasize the adaptive aspects of the culture. Only through such studies can...
Frank T. Schnell

The lower Chattahoochee River, extending from the Fall Line to the Apalachicola, can be divided into three zones (Fig. 1). The Northern and Central Zones encompass an extensive tongue of highlands which effectively projects along with prominent environmental characteristics deep into the Coastal Plain. The differences between the Northern and Central Zones on the one hand and the Dougherty Plain of the Southern Zone on the other are striking. Although the topographic differences between the Northern and Central Zones are not as obvious, there are significant archaeological differences here as well. It is these differences in ceramic complexes during the period A.D. 800 to A.D. 1450 which are the primary subject of this paper.

Recent work suggests that the Kolomoki ceramic complex is primarily a stage-D. 800 phenomenon. In the Northern Zone of the Lower Chattahoochee, there is a date of A.D. 1200±120 for a Kolomoki-related component at IR 58 (Chase 1978:33). McMichael and Kellar (1968:269-10) discuss an "Oliver variant of Southeastern Archaeological Conference Bulletin 21, 1981" Late Swift Creek" immediately north of the Fall Line, and there are intensive indications that such a ceramic complex may exist in the Northern and Central Zones of the Lower Chattahoochee as well. This possibility needs further investigation.

At the present time, it appears that the Averett ceramic complex developed ca. A.D. 800 in the Northern Zone. Although Averett components frequently include Root and Etonow ceramic types (Chase 1980:49), the development of this complex has not been delineated.

The Wakulla ceramic complex evidently is restricted to the Southern Zone and the lower half of the Central Zone at A.D. 800. At IR81 in the Central Zone, a date of A.D. 1100±140 (Mielke and Long 1965:166) is probably associated with a Wakulla component (Hochster 1959:86; Schnell 1973:25-28).

The Road ceramic complex consists of a series of types, none of which have been convincingly demonstrated to have been derived from previously existing...
types on the Lower Chattahoochee. The major concentration of site components dominated by the Rood ceramic complex appear to be within the Central Zone of the Upper Chattahoochee. There are no known components dominated by Rood ceramic in the Northern Zone, although types of the complex are present on a number of sites (Chase 1963:92; Cobin, 1966, Museum of Arts and Sciences file).

The Bull Creek ceramic complex represents the mixing of two series of types (Lamar) with at least one other type from Floridii (Fort Walton Incajan). It is thought that the major component of materials with Bull Creek materials are in the Northern Zone although the best published description is from a site in the Central Zone (Bowles 1962, 1971). Other notable exceptions are the terminal occupation at the Rood's Landing site (Caldwell 1955) and the "Kolomoki-Lamar" component at the Kolomoki site (0911) near the southern boundary of the Central Zone (Sears 1991). Although Sears (1965:55) distinguished between "Kolomoki-Lamar" and "Full Creek Lamar", current evidence suggests that this separation is not valid.

The Abercombie ceramic complex (Fairbanks 1955; Hart 1975:61, 66-68; Scovel 1970) appears to be late prehistoric and early historic. The majority of components with it have not yielded trade goods, but at Fort Apalachicola (18A:106) it does occur in direct association with late seventeenth century Spanish majolica (Kurjack and Pearson 1975:200-222; David W. Chase, personal communication). All known sites with Abercombie ceramic complex materials are within the Northern Zone and the upper half of the Central Zone, although Nancy M. White (personal communication) has recently recovered materials in the Southern Zone and along the Upper Apalachia which appear to be very similar to Abercombie.

Finally, the question of the relationships between these ceramic complexes and the Fort Walton culture should be addressed. The primary problems are conceptual ones. David W. Chase once stated that the Lamar culture "like the semi-nomad Kinburn pine has grown and expanded and gone all over the place..." (1962:76). Perhaps the same must be said of Fort Walton as it has been used in its multiplicity of ways. There are those who, with some justification, would include the Rood, Bull Creek, and Abercombie complexes within a Fort Walton culture. The ceramic similarities between Rood material and what has been called the "Lake Jackson variant of Fort Walton" ceramics (Fairbanks 1957,38-40), as well as the similarities between Bull Creek material and the ceramics of the Young phase (Scovel 1965:11-12) on the Apalachi-cola are striking. But the question of relationship be- comes critical in such peripheral areas as the Northern and Central Zones of the Lower Chattahoochee, geographically located between the supposed Lamar and Fort Walton heartlands.

The Rood, Bull Creek, and Abercombie phases all show a continuing interaction with Florida Fort Walton in a wide variety of ways--most notably for

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**Figure 1. Lower Chattahoochee Valley Zones.**

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**Figure 2. Lower Chattahoochee Valley ceramic chronology.**

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Gail S. Schnell

The question is, in any one area … was the actual shift to a Mississippiian culture an invasion and conquest, or to what degree simply the spread of concomitant parts of the total ject—tem or culture of dissimilar peoples? (Huscher 1965)

This question must be considered in asking when, why and how a given area was Mississippiianized. In the intellectual spiral inevitably involved in trying to answer this, an informal consideration of political organization is a potentially useful approach. The development of a Mississippiian culture in the Lower Chattahoochee Valley, which includes the Chattahoochee River Valley from the Fall Line to its confluence with the Flint (F. Schnell, this volume), will now be viewed from this standpoint.

The great number of similarities between Rood phase materials and Fort Walton materials from the Florida panhandle indicate a strong relationship between the two, which may or may not have had political significance. However, the Rood phase does not appear to have been a Fort Walton culture itself, as Fort Walton is traditionally defined (Wiley 1969). Considering Rood phase ceramics, its students would probably be more comfortable with a southern identification or affiliation if it has been called "Lake Jackson" rather than "Fort Walton." From the Columbus Bay north to the Fall Line at Columbus, several surveys have been carried out within the bounds of current reservoirs. These surveys were not statistically random, nor did they include upland areas around the valley itself. They have provided a tremendous amount of information about prehistoric valley occupants, however, and are continuing to do so (Lee 1956; Bulley 1950, 1958; Huscher 1958a, 1958b, 1963; Kelly et al. 1962; Broyles 1971; Hutt 1957). The data collected by these surveys indicate that the Rood phase was centered in an area of considerable variety immediately prior to its emergence. As about the time the Rood phase be-

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A PRELIMINARY POLITICAL MODEL FOR THE ROOD PHASE
came recognizable, however, there was a population gap between Rood phase Central Zone sites and the Fall Line to the north, where a different, but contemporaneous population represented by Avertet and Kowal ceramics was exploiting a very different environment. This gap remains throughout the phase and may well represent a frontier between cultures.

The status positions associated with the control of children, as described by Brice (1962), were present during this phase and are best documented in the report on the Cocombohee arch site (Schultz et al. 1979). Since comparable evidence is lacking from the two largest Rood phase sites, we must extrapolate information about status positions from Cocombohee (OCS62), a smaller site, and from evidence gathered by Peckels relevant to the Bessemer and Moundville sites (Peckels 1971, 1978). The association of certain special ceramics with structures on or under platform mounds, structures frequently larger than ordinary house structures, supports the contention that certain persons were "special" in life as well as in death. The occurrence of Andrews vessels within the domiciliary structure on top of Mound B, a platform mound at OCS62, is an example of this. A cache of "killed" Andrews vessels in Mound A, the burial mound on the same site was probably associated with a ceremony of secondary burial of individuals first deposited in a subterranean structure (Schull et al. 1975).

Knight has recently discussed the changes in tempering and vessel form through time at the Singer- Stone site, SW62 (1972). His data are especially important with respect to the early Rood phase picture. The later Rood phase sites seem to have continued their development within the Lower Chattahoochee River Valley as the same or slightly greater level of complexity indicated for the early portion of the phase. This may be in part due to the narrowness of the Chattahoochee Valley, in part to the overpowering influence of Moundville in its own, broader valley, which might have diverted the attention of lesser
chiefsdoms from their less demanding neighbors, and finally to a combined strong (possibly political as well as commercial) tie to contemporary Fort Walton manifestations downstream.

The Rood phase chiefdoms have a lot in common with the complex chiefdoms described by Steponaitis (1985) though at their climax, they were not nearly as complicated as the political entity that centered around Moundville. The Rood’s Landing and Singer-Moyer sites obviously stand out over all of the other Rood phase sites with respect to size, complexity and duration. The Cool Branch (9K25), Cornchelobbee, Ouachita Creek (H027), and Mandeville (9K24) sites were subsidiary centers, more or less equally spaced apart at any given time (Fig. 1), which owed allegiance to one or the other of the two major Rood phase centers. Perhaps only one of these two main centers was active at a particular time as well. Elite materials and posthuma light domestic structures and burial situations are known from those sites where excavations have occurred. These were the centers of local chiefs who dealt with everyday political and religious matters. Under their hegemony were the moundless villages and hamlets occupied by the agricultural populace.

The main center at any given time would in all probability have first access to prestige items, whether locally derived or acquired through trade. This would help place “the beginning of the end” of the Rood phase in perspective. Caldwell’s Rood’s Incised (1955) looks more like a published Alabama River phase bowl than a Fort Walton cassia, and is associated with Bull Creek Lamar materials. For the sake of clarity, it might be expedient to give the last part of the Rood phase a new name, perhaps the Singer phase after the latest occupation of the Singer-Moyer site (9K22) (Knight 1975). This phase would be represented by a combination of Rood phase and Bull Creek Lamar phase ceramics (R. Schnell, personal communication). By this time the lower Rood phase centers had been abandoned. The lack of prestige goods at secondary centers, or the desire of the centers themselves, probably reflects a decline in the hegemony of the main centers and the inability of their most important individuals to command sufficient luxury goods for redistribution away from the main centers themselves. By exclusion, the reverse would be true for a political entity expanding its hegemony.

The geomorphology of the lower Chattahoochee probably favored the political containment of the Rood phase to the lower Chattahoochee Valley. The lower valley drainage is relatively narrow, but within that drainage are a number of different ecological zones, which, when coupled with easy access to the Gulf Coast, provided just about everything needed and wanted by its inhabitants. Only a few items, like copper and the Columbus variant of Nashville Negroid Painted (Williams 1972), needed to be imported. It is therefore understandable that the Rood phase data seem to favor Huscher’s second suggestion in answer to his question cited at the beginning of this paper.

Nancy Marie White

THE CURLEE SITE (8JA7) AND FORT WALTON DEVELOPMENT IN THE UPPER APALACHICOLA—LOWER CHATTahoochee VALLEY IN FLORIDA, GEORGIA, AND ALABAMA

The Curlee site (8Ja7) is located on the Apalachicola River, just below the confluence of the Flint and Chattahoochee (Fig. 1). This early Fort Walton mound-village site was damaged by highway and dam construction in the 1960s, then subjected to severe erosion and artifact collecting. From what was apparently a flat-topped mound, collectors recovered some 50 burials. Most were evidently bundle burials and some were accompanied by ceramic vessels. At the base of the mound were eight extended, supra

adult skeletons, some with pots, including "killed" Fort Walton Incised bowls and a frog effigy bowl. Two of these burials had shell ear pins and several were accompanied by chert tools placed on the chest or to the left of the skull. Also recovered were Wakaulla Check Stamped and Lake Jackson Plain vessels, bone tools, greenstone cells, marine shell beads, conch shells, small triangular points, and chunky stones. Some of the long bones were jettied and showed other evidence of trauma. Several skulls had slight frontooccipital deformation.

From a historic aboriginal component in or near the mound charred corn cobs and acorns were recovered from pits which were described as always being near a burial. One burial was of a juvenile accompanied by a faceted amber bead, glass beads, metal gom pots and a small, shell-topped ceramic bowl. Lamar Plain and Complicated Stamped and a few Chattahoochee Redbed sherds from the surface may relate to this component, but most surface sherds are grit-tempered, plain-surfaced (Lake Jackson Plain rims), Wakaulla Check Stamped, and Fort Walton Incised.

Excavations were conducted at the Cahee site in 1974, 1975, and 1978 by Case Western Reserve University and the Cleveland Museum of Natural History. By 1974 the mound was gone. In the village area to the north, a rich middlen stratum 1m thick was exposed. Our excavation yielded post molds, 15-30cm in diameter and 2m apart, apparently the remains of a circular structure at least 12m in diameter which contained a hearth and a prepared floor of pale gray sand. North of this is a portion of a wall trench was found. The black sandy middlen contained burned bone, corn, Wakaulla Check Stamped and Lake Jackson Plain ceramics, freshwater mollusc shell, and charcoal, a sample of which was radiocarbon dated to 700±50 years B.P. A.D. 1720 (DIC 1066).

South of the destroyed mound over 20 concentrations of mollusc shell were mapped extending out of the bank at regular intervals. These may represent refuse from individual households. Test units here revealed the same thick middlen, including an underlying 5cm layer of greasy black soil containing large quantities of mollusc shell, deer bone, and predominantly plain and Wakaulla Check Stamped ceramics. Charcoal from this middlen layer yielded the curious age of 1500±85 years A.D. 400 (DIC 1049).

In 1978, 1979, and 1980, archaeological surveys were conducted by the Cleveland Museum of Natural History for the Mobile District Corps of Engineers at Lake Seminole (the Jim Woodruff Reservoir) on the Chattahoochee and Flint, and at Andrew Lake (the Columbus Reservoir) on the Chattahoochee (Figs. 1 and 2). Data on the 72 Fort Walton sites located are still undergoing analysis (White 1973). Preliminary results demonstrate a pattern of heavy riverine orieng.
The frequencies of Lamar Plain (Wauchope 1966:66-67), identified by the matched applique rim strip, and especially Lamar Complexified Stamped as one moves south, Willey includes within his definition of Lake Jackson Plain specimens with matched applique rim strips (1949:459), possibly reducing estimates of the presence of Lamar Plain. Furthermore, Lamar Complexified Stamped as defined is not easily distinguished from Jefferson Ware (cf. Willey 1949:492 and Plate 69 with Wauchope 1966:78-81 and Figures 228-231). Neither Lamar Plain nor Lamar Complexified Stamped has yet been found in any early Fort Walton assemblages.

One of the most striking of small sherds, Point Washington Incised (Willey 1949:563; Sears 1967:38-39; Schoell et al. 1970:21) is hard to distinguish from Lamar Bold Incised (Wauchope 1966:83-86) and Omniclave Fields Incised (Wauchope 1966:87-90). Also, relationships of these types with Atesontomb (Hunt 1975:61-66) and Alabama River (Shelton 1974:205) types are unclear. All of these types have small, gnarled, and 8-14 linear incisions below the vessel rim and all may be burnished. The latter two types may have a line of punctuations on the vessel shoulder. Omniclave Fields incised has finer, thin-line incisions while Lamar Bold Incised is "boldly" incised. The differences between "posthistoric" (Lamar) and "advanced posthistoric" (Omniclave Fields) is unclear in Georgia. In Florida, Point Washington Incised is both early in the Fort Walton sequence and posthistoric and historic. The three types can possibly be sorted out by context but, recovered singly, such ceramic specimens are less diagnostic.

This discussion is an extreme simplification, comparing survey and excavation data with little time control. The types were first defined in areas peripheral to the Lower Chattahoochee and are more oriented toward the interior of the three states instead of this border zone. However, there is evidence for change in the Fort Walton assemblage from the Upper Apalachicola to the northern end of Andrews Lake. Lamar types decrease in frequency downstream, occurring on the lowest 49 km of the Chattahoochee only on very late sites.

The lower Chattahoochee Valley, the earliest development within the Fort Walton time frame is the Red phase and then later, the Full Creek phase (McElvain) and Kelkar (1969), however, neither of these is defined specifically enough to permit comparisons with Lamar or Fort Walton. On the southernmost portion of the Chattahoochee and on the Upper Apala-chicola, early Fort Walton clearly emerges from the indigenous Weeden Island foundation (Brose and Perry 1978). Late Weeden Island sites dominated by Wakaika Check Stamped and plain-surfaced pottery and moldboard Fired retype are extremely common in all environments. The Carlin site and many others contain these same materials together with Lake Jackson and Fort Walton incised ceramics.

The evidence suggests an early Apalachicola tradition developing in this area. These surveys will overlap or combine with a Lamar tradition moving downriver in posthistoric times or even in the early historic period. It is probable that early Mississippian groups in the entire region were participating in similar and interacting sociopolitical and economic-subistence systems.

Southeastern Archaeological Conference Bulletin 24, 1971
This paper is a brief summary of a chronological sequence constructed utilizing data recovered during survey and test excavations in five selected locales in northern Leon County, Florida. The study area was occupied in historic times by the Apalachee who are associated with the Leon-Jefferson culture (H. G. Smith 1988b). The Leon-Jefferson culture of the missionized Apalachee has a clear developmental continuity with the early Fort Walton culture. It is suggested that the Apalachee, in response to both internal and external stimuli, evolved through four archaeologically recognizable phases: Early Apalachee Fort Walton; Late Apalachee Fort Walton; Early Leon-Jefferson; and Late Leon-Jefferson.

The de Soto expedition spent the winter of 1539-40 in Apalachee, the principal town of the Apalachee, and conducted raids in the surrounding territory. In 1635, when the Spanish established the Apalachee missions, noticeable changes had taken place in the culture of the Apalachee. I would argue that, while the Spanish incursion contributed to the rapidity of change in the late sixteenth and early seventeenth centuries, the local system had already undergone considerable change prior to de Soto's arrival and probably had undergone most of the subsequent changes (except those represented in the last phase) whether or not the Spanish had come.

The four phases described in this paper are primarily defined in terms of changes in the ceramic inventory and settlement pattern. They are considered tentative, and much more research is required before a more definitive statement can be offered.

At the time of the survey, there were 125 Apalachee Fort Walton and 112 Leon-Jefferson sites recorded from the Leon County, Florida area. Of the Fort Walton sites, 47 could not be assigned to either the Early or Late phase, 26 were of Early phase artifactual, and 48 had only Late phase materials. Of the Leon-Jefferson sites, 51 belonged to the Early phase and 22 to the Late phase; the remainder could not be assigned.

There is a marked increase in the number of known sites between the late Woodland period and the Early Apalachee Fort Walton phase within the five survey locales (5 to 55 sites). This trend continues through the Late Apalachee Fort Walton and Early Leon-Jefferson phases. There is a marked decrease during the Late Leon-Jefferson phase; however, this decrease is misleading since 50 previously recorded Leon-Jefferson sites not yet identified to phase are listed.

**Southeastern Archaeological Conference Bulletin 54, 1981**

**FORT WALTON AND LEON-JEFFERSON CULTURAL DEVELOPMENT IN THE TALLAHASSEE RED HILLS AREA OF FLORIDA: A BRIEF SUMMARY**

Located south of the survey locales in the area where Spanish Mission efforts concentrated. Population movements particularly in the later phases must be considered as a blurring factor in any population estimates for this period. It is suggested that the Early Apalachee Fort Walton phase represents an invasion from the Apalachicola-Flint River drainage system. In addition to population pressures and a need for agricultural land, the caesura of this invasion may relate to a need for exotic goods. The Apalachee role in the Mississippi trade network centers on their control of the north central Gulf Coast shell industry east of the Apalachicola River. The importance of these activities is indicated by B. Calvin Jones' excavations at Mounts 3 and Lake Jackson. Lake Jackson site appears to be among the earliest Fort Walton sites in the Leon County area, which is one explanation for its location near the western edge of the Apalachee territory (see Payne, this volume).

Current models generally depict the Early Apalachee Fort Walton settlement pattern as focusing on a single major, multimound ceremonial complex with smaller satellite centers—each with a single round. Each of these centers was supported by associated villages and scattered farmsteads.

No mound complexes were located during this survey. Furthermore, with the exception of a single multi-barrow cemetery site, all of the Early Apalachee Fort Walton sites in the study group are small, generally covering 0.5ha or less, and presumably represent individual family farmsteads. These are all associated with Dothan-Orangeburg and Plummer-Rutledge soils, which are considered prime agricultural soils. Ridge cress and ridge projections are the most frequently occupied physiographic features. Nearly 80% of the sites are located around lakes or swamps and most are located within 1000a of the associated water source and less than 600a above that resource.

Early Apalachee Fort Walton phase ceramic assemblages tend to be characterized primarily by ceramic vessels with broadly incised collars and by plain vessels with pinched or repeatedly noded rims and near rims (Style A). Both single and double rim rims (Styles 2 & 3) and loop handles (Style 4) also occur with some regularity on both plain and incised varieties. Styles 5, 6, 7, and 8 occur infrequently. Beakers are a minority want. The Lake Jackson Plain and Incised types dominate, with...
Fort Walton Incised and Cool Branch Incised being the most frequent of the colorful minor wares. Polished and burnished wares are infrequent. Vessel surfaces are generally smoothed or burnished, although temper occasionally protrudes through the surface. Temper generally consists of grit of 1 to 2 mm (or greater). Some wares are noted for a fine sand, although the ratio of sand to grit is sometimes greater. The type Fort Walton Incised is seen frequently represented than in the Early phase. Vessel surfaces are rougher and only occasionally are burnished (four samples). There is also less variation in rim styles, except that Style 1, which is restricted to plain vessels, occurs in several subtypes. It is noted that the transition in the ceramic series occurred independently of the factors leading to the socio-political change hypothesized to mark the shift from the Early to Late phases.

It is hypothesized that the transition from the Early to Late Apalachee Fort Walton phase follows the climatic changes of the Southern Cote in this area. It is characterized by the abandonment of the ceremonial mound sites and associated socio-political changes, and by a breakdown in the trade network. Both social stress and environmental factors are suggested reasons for this transition.

The Late Apalachee Fort Walton phase settlement pattern is characterized by (1) an absence of sites with mounds; (2) occupation of a variety of soil types, although Dothan-Orangeburg and Pungo-Ruttle soils continue to be the most common types; and (3) locations at a greater elevation above and distance from the nearest water source. Actually, sites tend to occur at two elevations during the Late phase. The lowest elevation sites range from 1.5 to 15.5 feet above the nearest water source and constitute the pattern of the Early phase, while the higher elevation sites range from 22-25 feet above the water source. These two sets of sites have one factor in common; both are associated with prime agricultural lands.

It is suggested that the trend toward occupying higher elevations may reflect defensive considerations in response to growing territorial pressures from more northerly groups. This trend continues into the Late Leon-Jefferson phase and precedes the introduction of the complicated stamped Jefferson ware ceramic series into the area.

The Late Apalachee Fort Walton phase represents the Apalachee culture as it was when the Navajo and de Soto expedition passed through the area in the early 16th century. While the Navajo expedition had little effect on the Apalachee, the later de Soto expedition coincides with changes in the culture leading to the Early Leon-Jefferson phase. The fact that neither expedition reported pillaged villages or temple grounds among the Apalachee, while they are reported for other groups, is viewed as supporting the Early to Late phase transition.

It is hypothesized that the period following the passage of the de Soto expedition in 1528 and prior to the Spanish mission c. 1550 marks the transition from the Late Apalachee Fort Walton to Early Leon-Jefferson phase. It is suggested that this process of change was already ongoing as a result of population pressures and movement in the Alabama and Georgia area, and that the de Soto expedition served to accelerate rather than precipitate this change.
it may be that the items manufactured in imitation of Spanish ceramics were for Spanish usage, and should not be interpreted as indicating native adoption of such ware and associated usage. Also, because of the Spanish policy of resettling northern and western refugee groups near the mission of San Luis in western Leon County, ceramic wares of these peoples make their appearance in archaeological contexts.

As noted earlier the above presentation is tentative and much more research needs to be conducted. The current sample size is small. Furthermore, few multi-component Apalachee Fort Walton or Leon-Jefferson sites have been excavated, and such excavation as has occurred consists of limited testing in which only a partial stratigraphic sample was obtained. Yet, it does have some merit and is worthy of further testing.

Claudine Payne

A PRELIMINARY INVESTIGATION OF FORT WALTON SETTLEMENT PATTERNS IN THE TALLAHASSEE RED HILLS

The region centered around present-day Tallahassee seems to form a discrete unit within the wider area occupied by Fort Walton sites. This paper describes the settlement patterns of this particular area and raises a number of questions about site distribution there.

Using the criterion of density of sites to define the area, the limits of the territory become the Apalachee and Ochlockonee Rivers and the Cody Scarp (however, the existence of about thirty Fort Walton sites south of the scarp should be noted).

The mound centers in this territory appear to fall into two groups (Fig. 1). In this paper, I will deal primarily with the better-known western group, the Lake Jackson system. The eastern or Lake Miccosukee system is considered briefly in the concluding remarks.

Figure 1. Fort Walton mound sites in the Tallahassee Hills.

The Lake Jackson system consists of three types of sites: a multi-mound center; single pyramidal mounds; and farmsteads or hamlets. The Lake Jackson site is the largest in the system and, in fact, the only multi-mound center in the entire area. There are four single-mound sites in the system. They appear to be surrounded by farmsteads, but this must be checked by further excavation.

In a 1978 paper, Stojanowski presented a center of gravity model on use in studying chieftains. As will be seen later, this model raises a number of questions when applied to the Lake Jackson system. (It must be noted that the model deals only with the top levels of the site distribution hierarchy; the numerous farmsteads or hamlets are not considered here.)

The first aspect of the model is that (since they are essentially administrative units) there is little competition between centers of a single chieftain and consequently, there is no factor favoring equidistant spacing of centers. Therefore, chiefly centers should show a lack of regular spacing. The Lake Jackson system exhibits this regularity in high degree. (Fig. 1 and Table 1). The distance between adjoining centers varies from 2.9 miles to 8.9 miles.

The second aspect of the model depends on the degree of political centralization in the system. When this is high (as it seems to be at Lake Jackson), the location of the capital is determined by the minor centers in their sphere of influence rather than by population of its own support area. An approximation of the optimal location of the capital can be made by calculating the center of gravity of the minor centers. This is compared to the location of the capital to obtain an index of spatial efficiency (Stojanowski 1978: 492-493). When the index equals 1.0 the location of the capital is ideal. As the efficiency of the capital decreases, the index decreases. The index of spatial efficiency for the Lake Jackson site is .46. The inefficiency of this site can be seen even more clearly when compared to the minor centers. Two of the centers (Velda and Rollins) have higher indices than Lake Jackson (see Fig. 2). However, some of the sites have a very high index. Even the location of Velda, the most efficient site, is not particularly efficient for this system.

Finally, in 1979 Stojanowski calls a "departure from the model" he suggests that the secondary centers closest to the capital would supply a greater amount of tribute and labor. Leaving these centers with less labor available for their own public works (e.g., mound building). The secondary centers closest to the capital would then have proportionately smaller mounds than the more distant centers. Table 2 presents estimated volumes of the mounds of the four secondary centers. According to the model, the estimated volume of the mounds ought to increase with distance. This is borne out to some degree. However, the most distant site, Lake Iamonza, which ought to have a greater volume than the others has a relatively low estimated volume.

The Lake Jackson system does for the center of gravity model in some respects, although never with a high degree of congruity. But it fails in one important detail—the spatial efficiency of the capital. Explanations for this failure fall into two categories. First, as Stojanowski notes (1978:619), there may be factors other than sociopolitical ones involved in the location of chiefly centers. Warfare, for example, might explain the location of the capital at the far western limits of the territory. However, the Lake Jackson system displays no signs of warfare. The capital and secondary centers show no evidence of fortifications and the farmsteads are scattered across the countryside in one and two house units (Tesor, this volume). Spanish chronicles described the area as peaceful, with fields and homes on either side of well-marked roads; the few towns were unfortified (Varner and Varner 1951:182; Tesor 1979).

Location on a trade route might also account for an otherwise inefficient location. The Lake Jackson site is, in fact, not far from the Ochlockonee River, a possible link with the coastal area. However, the DeSoto account stresses the multiplicity of good roads in the area and the Spanish, when traveling to the Gulf of Mexico, marched overlaid along a well-traveled road (Varner and Varner 1951:187). No mention is made of a river route.

Finally, "locational inertia" is a possible explanation. The location of the capital might remain unchanged even if its sphere of influence expands so that its location is no longer efficient. This explanation is suggested if the capital proves to be considerably easier than the secondary centers. In the case of Lake Jackson, this should be considered.

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**Table 1. Distances between adjoining mound centers.**

<table>
<thead>
<tr>
<th>Site</th>
<th>Distance (in miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Jackson Rollins</td>
<td>5.0</td>
</tr>
<tr>
<td>Lake Jackson Velda</td>
<td>5.6</td>
</tr>
<tr>
<td>Lake Lafayette Velda</td>
<td>6.85</td>
</tr>
<tr>
<td>Lake Rollins Velda</td>
<td>5.9</td>
</tr>
<tr>
<td>Rollins Lake Iamonza</td>
<td>8.9</td>
</tr>
<tr>
<td>Lake Iamonza Velda</td>
<td>8.7</td>
</tr>
</tbody>
</table>

**Table 2. Volumes of mounds in secondary mound centers.**

<table>
<thead>
<tr>
<th>Site</th>
<th>Distance from Lake Jackson (in miles)</th>
<th>Dimensions (in meters)</th>
<th>Ex. Volume (in cubic meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rollins</td>
<td>5.0</td>
<td>21 x 25 x 2</td>
<td>1510</td>
</tr>
<tr>
<td>Velda</td>
<td>5.6</td>
<td>22 x 25 x 2</td>
<td>2190</td>
</tr>
<tr>
<td>Lake Lafayette</td>
<td>6.85</td>
<td>30 x 30 x 4.5</td>
<td>5887</td>
</tr>
<tr>
<td>Lake Iamonza</td>
<td>10.0</td>
<td>—</td>
<td>2790</td>
</tr>
</tbody>
</table>

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*Southeastern Archaeological Conference Bulletin 24, 1981*
John F. Scarry

SUBSISTENCE COSTS AND INFORMATION: A MODEL OF FORT WALTON DEVELOPMENT

The General Model

The selective advantage of intensive maize agriculture is that, while its labor input (cost) requirements are high, it can provide increased yields (c.f. Ford 1974, 1977). Strategies which exploit natural populations have much lower initial costs but do not have the ability to supply greatly increased yields. Two factors, however, work to reduce the selective advantage of an intensive agriculture strategy: cost (Hastorf 1969) and agricultural risk (Chambers 1973, Ford 1974, 1977).

It is suggested that the relative selective advantage of the woodland and Fort Walton subsistence strategies were controlled by two factors: yield required by the system and the cost of obtaining that yield. Lucrative agriculture would not have been adopted unless the
yield required by the system balanced the labor input required to produce that yield. Change in subsistence procurement strategies in the Fort Walton area could have resulted from (1) change in the yield required by societies or (2) changes in the cost curves of specific resources (cf. 1980).

The hierarchical organization of the Fort Walton systems also had selective advantages partially offset by costs. If the benefits of hierarchical organization are examined (cf. Rapoport 1971:66; Peebles and Kue 1977), large advantages in the processing of information. In fact, it can be suggested that the selective advantage of hierarchical social organization is closely related to the processing of information and the making decisions efficiently. However, for such an organization to be successful, the benefits it provides to the system must outweigh the increased cost of maintaining the hierarchy (Peebles and Kue 1977).

Environmental change is controlled by the relationship between the support costs and the reduction in information-processing costs accomplished by the organization (Johnson 1978). Where relatively small amounts of information must be processed, hierarchies are not advantageous because of their high maintenance costs. For a hierarchy to become advantageous, there must be an increase in the amount or complexity of information to be processed. In order to explain the appearance of hierarchical social organizations, like the Fort Walton systems, we must seek the sources of information increase which made these organizations effective. Five potential sources can be suggested for Fort Walton: (1) population increase; (2) population aggregation into (a) circumscribed habitats and/or (b) nucleated settlement; (3) intensification of subsistence agriculture; (4) intergroup conflict; and (5) inter-group exchange. I would argue that the development of individuals and systems was probably initiated by different combinations of these factors. However, the basic cause of organizational change was, in all cases, an increase in information.

The Development of Fort Walton Culture in the Apalachicola Valley: Application of the Cost/Information Model

Fort Walton in the Apalachicola River Valley appears to have evolved from an indigenous Woodland base (Percy and Brose 1971; Brosa et al. 1970; Brose and Percy 1976; Scarry 1980a, 1980b). The subsistence economies of early Woodland peoples were established on hunting and gathering of wild resources; there is evidence for maize but no indications that it played a significant role in the diet. The systems were egalitarian organizations with no evidence of acceptance ranking.

During the last portion of the Woodland period there is evidence of a significant population increase (Percy and Brose 1974) which had profound effects on the Woodland system in the Apalachicola Valley. As population grew, the demand for subsistence products increased and costs rose to the point where exploitation of marginally productive areas became cost-effective. This point was reached at about A.D. 600 in the Wakulla phase (Scarry 1979, 1980a). Like earlier Woodland systems, the Wakulla phase had a hunting-gathering subsistence system which exploited the same spectrum of resources as did the earlier systems. The subsistence system of the Wakulla phase differed from earlier ones in the environmental zones which were exploited. During the Wakulla phase, the less productive uplands east of the Apalachicola River were extensively exploited. The Wakulla phase was an egalitarian system, possibly tribal in nature (cf. Brosa and Percy 1979) and its settlement pattern reflected this egalitarian organization. There were many more sites than there were in earlier Woodland phases and they occurred in previously unexploited environments, but they did not differ appreciably from earlier settlements in the valley.

The adaptation of the Wakulla phase, particularly its subsistence procurement and demographic aspects, was a response to population growth. However, it failed as an adaptation because it did not return the system to a state of equilibrium. The costs of subsistence procurement continued to rise and eventually reached a level equivalent to the initial costs of intensive maize agriculture. Once this level was reached, subsequent costs increased resulting in the intensification of subsistence efforts. Agricultural intensification in turn constituted a pressure on the population to aggregate onto the levees along the Apalachicola River.

This stage in the evolution of Fort Walton culture appears to be represented by the Chattohochoe Landing phase (Scarry 1979, 1980a). The adaptation of the Chattohochoe Landing phase evolved as a result of increasing costs of subsistence procurement. It was, in the long run, an unsuccessful response because of the inadequacies of its egalitarian organizational strategy.

The ultimate failure of egalitarian organization in the Apalachicola Valley and its replacement by a hierarchical organization can be attributed to increases in the number and variety of information sources which had to be integrated. Three sources of this increase can be discerned in the archaeological record: (1) aggregation of individuals; (2) intensification of maize agriculture; and (3) increased interaction with other social systems.

As Peebles and Kue note:

If a cultural system is operating at or near its capacity to process information, and the impact of critical new information from one area of the environment increases beyond the system’s capacity to process these inputs, then either: (1) inputs from other areas of the environment will have to be (a) filtered and ignored or (b) buffered for action at a later date; (2) channel capacity will have to be increased either (a) through a change in organization or (b) through a change in the mechanism of information processing; or (3) system overload will take place and homeostasis will cease (1972:429). In the evolution of Fort Walton culture in the Apalachicola Valley, this point was reached in the Chattohochee Landing phase. The benefits of information specialization led to the processing of new information, which caused resistance to vertical specialization (cf Johnson 1978) and the Chattohochee Landing phase was succeeded by the development of late Fort Walton phases such as the Cayson, Stead, and Yohn phases (cf. Scarry 1980a).

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Brian J. Duhe  

A STUDY OF PREHISTORIC COLES CREEK—PLAQUEMINE CULTURAL AND TECHNOLOGICAL ADAPTATIONS IN THE UPPER BARATARIA BASIN

By studying the ecology of subsistence within an ecological matrix, some of the functional relationships which couple and regulate man-environment interchanges may be identified and measured. This study attempts to assess, in part, these relationships through the examination of archaeological and geological data derived from the Barataria Basin of southern Louisiana.

The concern of the study is a single Mississippi River crescent and an associated archeological site in St. James Parish, Louisiana. The ecological relationships described are but a small set of those extant in the total Baratarian ecosystem (Fig. 1).

Crescent  

A crescent is a water-driven version of a delta levee (Fig. 2) both in size and time.  

A crescent can simply be defined as a neck in a levee or stream embankment. This break usually occurs on the cut-bank side of a bend in the river channel (Fig. 3) and during river flood stage, which along the Lower Mississippi normally occurs during the months of April-May, when the river is near or slightly above its gradient across the floodplain. A study of modern crescents by Sautter (1963) from 1847 to 1977 along the Mississippi revealed that the average crescent during this period breached the artificial levee for a distance of 500-600 feet and was of a depth of 12 feet and discharged at an average maximum velocity of about 65,000 cubic feet per second (c.f.s.). Gradient advantage over the main channel is at a maximum, during the early constructional phase of growth, this allowing extremely rapid land formation and natural levee development. It is during this period that the crescent environment becomes habitable by prehistoric peoples (Fig. 2B). At the original channels prograde, they bifurcate often, producing an increasing network of channels. Some channels remain active through much of the crescent's life, but most are plugged with sediment at their heads after a short period of activity and are abandoned (Fig. 2C) and left as sloughs or elongated ponds or small lakes. Susceptible of the natural levees and interchannel areas by compaction of underlying unconsolidated clays result in rapid enlargement of sloughs and ponds within the crescent system (Fig. 2D).

The life span of a prehistoric crescent is a matter of conjecture; however, data from prehistoric Indian habitation sites, such as the Shellbluff Plantation site, indicate the life span of crescents can be a matter of a few decades to several centuries. Based on the density of crescent sites, the crescent environment was well suited and appears to have functioned for a considerable period.  

Archaeological evidence based on excavations at the site, ceramic analysis and C-14 dates indicate that the Shellbluff Plantation site was occupied as early as 750 A.D. (1050-750 B.P.) and as late as 1720 A.D. (1720-60 B.P.).  

By the end of the fifth millennium B.C., the inhabitants of the Shellbluff Plantation site had access to several environmental units: the riverine-crescent system itself, the surrounding floodplain area, the estuarine environment and the fresh marsh. environment. Brezthick marsh areas were also within walking distance of the site.

A crescent system is a highly productive biological system, the crescent experiences losses and less water during the early constructional phase of growth, this allowing extremely rapid land formation and natural levee development. It is during this period that the crescent environment becomes habitable by prehistoric peoples (Fig. 2B). At the original channels prograde, they bifurcate often, producing an increasing network of channels. Some channels remain active through much of the crescent's life, but most are plugged with sediment at their heads after a short period of activity and are abandoned (Fig. 2C) and left as sloughs or elongated ponds or small lakes. Susceptible of the natural levees and interchannel areas by compaction of underlying unconsolidated clays result in rapid enlargement of sloughs and ponds within the crescent system (Fig. 2D).

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through the distributary channels, erosion and subsidence become increasingly more important in the crevasse area. As more land is lost, the interface length becomes longer, owing to the formation of small ponds and wandering crevasse channels. Since total biotic productivity is a function of both interface length (related to the "edge effect") and total land area, total

Figure 1: Environmental Units: Barataria Basin (After B. Chatricle, J. T. Johnson, and W. W. Pederson, 1976. Photograph 1974)

Figure 2: Generalized History of the Crevasse Cycle: (A) The Initial Crevasse; (B) Constructional (Rip-up Channel) Phase; (C) Abandonment (Lacustrine) Phase; (D) Intersessional (Rapid Deposition) Phase.

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Figure 3: Crevasse flooding at Creole at River (After Ingles and van Beek 1971: Fig. 31)
biological productivity of the area reaches a maximum during the abandonment and deterioration phases of the crevasse system when the interface between land and water is greatest (Fig. 4).

Vives (1928) and Guichner (1953) observed independentl that following the Bonne Carre spillway opening, which is in effect a man-made crevasse above New Orleans, there seemed to be a greater production of shrimp, oysters, crabs and fish in the years following the flood, even if the flood killed off some of the marine organisms initially. We can assume that during prehistoric times, great influxes of fresh water entered the crevasse system, in which the Shellhill Plantation is located and apparently stimulated an increase in the crevasse-associated resources in the following years. Because these resources were situated in close proximity to each other (terrestrial and aquatic) in the crevasse system, they could have been (and probably were), based on preliminary evidence from Shellhill, explained from a single settlement, and seasonal changes in residence would not have been necessary in such a self-sustaining ecological system like the crevasse.

Based on preliminary analysis, most of the major food resources for the inhabitants of Shellhill Plantation during the Colles Creek–Plaquemine occupations were provided by fish, reptiles, amphibians, and mollusks; these being supplemented with an occasional land mammal, wild plant edibles and some cultivated plants. It is apparent that the flooded areas could have been used as an aquatic ecosystem by numerous species of fish, amphibians and reptiles.

Ponding of the flooded areas in depressions during low water stage also provided the necessary aquatic habitat to sustain fish populations during dewatering periods. During this period the captured fish population in these ponded areas could have been and probably were mass captured with nets and traps, or even by hand, by the prehistoric population.

Gregory (1966) noted that he observed some people gather rough fish in ditches and swales after river overflow with their bare hands, stating that two men could gather 2000-3000 pounds of fish a half day. During the summer months when these small lakes, sloughs and ponds gradually evaporated, extensive mud flats would have been created. These mud flats would have provided an ideal habitat for local seed-bearing plants such as Chenopodium, Polygonum, Iris, Smilacina spp., Smartweed, Lambquartier, and Marsh elder. These ponds and sloughs were also excellent habitat for such wild edibles as delta duck potato and cattail. In contrast, during high water or flood stage the crevasse system could have also supported certain species of fish which migrated seasonally in the Mississippi River such as the sturgeon and shad.

The prehistoric inhabitants of the coastal areas certainly had the technology necessary to exploit these aquatic resources (Koutland 1957; Duke 1976).

Finally, it should be pointed out that this basic subsistence system was not unique to Colles Creek–Plaquemine peoples in coastal Louisiana. This same type of subsistence system was present during Tchefuncte times as illustrated at the Moron Shell Mound (Byrd 1974) and possibly even earlier (Gibson 1975). Gibson believes that prehistoric coastal dwellers probably maintained a subsistence tradition established during the Archaic Stage and sees the later culminating in the Shellhills stage in coastal Louisiana.

MEANDERING RIVERS AND SHIFTING VILLAGES: A PREHISTORIC SETTLEMENT MODEL IN THE UPPER STEELE BAYOU BASIN, MISSISSIPPI

Although archaeological sites on natural levees of active and abandoned rivers and bayous are plentiful in the Lower Mississippi Valley, there have been relatively few endeavors designed specifically to study the relationship between such sites and the streams along which they can be found. This is particularly true of those sites located along the banks of abandoned ox-bow or cutoff lakes throughout the Lower Valley.

Could, for example, one identify specific factors within a lake's varying biotic zones which would have influenced the rapidity or intensity of prehistoric settlement along its banks? Could such factors be identified in the archaeological record? Could a time scale, whether relative or specific, be established for site occupation along an ox-bow lake? These questions, and several additional ones, were asked of the data obtained from a cultural resources survey of the Upper Steele Bayou basin performed for the Vickburg District, U.S. Army Corps of Engineers. The original survey report has appeared as Weinstein et al. (1979). This paper is excerpted from portions of that study.

Time-Space Setting

The Upper Steele Bayou Basin is located in the western portion of the much larger Yazoo Basin in west-central Mississippi. Although several smaller rivers and bayous at one time flowed, or are presently flowing, through the region, it is the Mississippi River with which this paper is concerned. Specifically, it is the Modern Mississippi Meander belt, dated to between 2500 years ago and the present (Stueart 1972:Fig. 5).

Steele Bayou and its tributaries occupy various abandoned channels of the Prehistoric Poverty Point complexes which dominate the region. These modern streams are often undertow courses formed within the older natural levees of the Mississippi. Prehistoric sites are situated both along the older, larger Mississippi levee crests and adjacent to the polarized remnants of the older Mississippi channels. Sites on the actual Mississippi levees are believed to have developed after the river had abandoned the area and the channel had become an ox-bow lake. Sites within the old channel, on the smaller streams, are thought to have formed after the ox-bow lake had begun to fill or had filled to a large degree. These sites, therefore, would have been situated along a small watercourse surrounded by swamp and small lakes.

Because a wealth of data is available on cultures and phases in the Upper Bayou, particularly after the work of Phillips (1970), the present study took advantage of the refined situation and organized its site information around the various cultural periods and phases known for the region. Figure 1 is a revised version of the culture-history chart supplied by Phillips (1979). New phases identified by Brain (1969, 1971) and Toth (1977) have been added.

Interstowaukeh Settlement Shifts

During the course of the original Steele Bayou survey (Weinstein et al. 1979), several models were developed concerning settlement shifts along individual ox-bow lakes and between various ox-bow lakes.

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The latter settlement changes can be referred to as "interbasin settlement shifts," while the former changes are known as "intrabasin settlement shifts.

Only the intrasubal shifts will be examined here. Information on settlement change between different oxbows can be found in Weinsten et al. 1979. One oxbow will be the focus of this study simply because both in recent and ancient times, these oxbows fell within the survey area. This is Swan Lake, a well-preserved oxbow containing most of the Yazoo National Wildlife Refuge, Washington County, Mississippi. In order to examine the settlement shifts along the Swan Lake oxbow, one major hypothesis was developed. This hypothesis assumed that an oxbow went through a set number of stages after it had separated from the parent channel. Although these stages did not necessarily occur at the same rate for each oxbow, they still represented phases in the evolutionary process from open channel to flooded land. For each stage, a certain position along the lake's bankline would be the most beneficial for settlement. The most economically rich area in the lake was assumed to be the portion of the open lake and the filling ends or plugs. These swamp rich in aquatic life matched by the water's nutrients would be the most favorable of all food collecting locales. (See Weinsten et al. 1977:4: and 1961 for a more culated discussion of this topic.) Thus, it seemed the sites would be located closest to the boundary between the swamp and open water. According to this model, then, sites of initial, early cultural phase occupation should be located primarily at the lower ends of the lake's channel, while later sites would be found farther up the lake's banklines. Figure 2 and Table 1 provide information relative to the life cycle of an oxbow lake and the various species associated with the different stages of filling.

When sites are plotted by cultural periods along Swan Lake's banks, and then the assumed condition of the lake at the time of occupation is reconstructed, several interesting patterns emerge. Figure 3 shows the sequential development of Swan Lake from open.

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**Figure 2. Life cycle of an oxbow or cutoff lake illustrating associated landforms and water bodies (after Weinsten et al. 1979: Fig. 4-1).**

**Table 1. List of common game and commercial species with their relative abundance in relation to the life cycle of an oxbow lake and the surrounding area (after Weinsten et al. 1979: Fig. 4-1).**

Mississippi River channel to a lake bed comprised almost entirely of filled swamp and channel plugs. The channel positions illustrated in the figures are based on Fox (1944:Pl. 52; 8, 9), but the sequence is different.


The data suggest that the Swan Lake bend, just prior to cutoff, was advancing in a northerly direction, cutting into a pre-existent Arkansas River meander bend and into Silver Lake, a probable previous channel off an earlier Mississippi River bend. These channels
most likely received overflow flood waters from the Mississippi and acted as a reservoir for fish aggregating sites near the mouth. In addition, other floods off the Swan Lake tank were located along its northern and eastern edges most of these are still clearly visible on aerial photographs. Following the cutoff, it is assumed that an unknown period of time elapsed during which the Mississippi River cut two successive channels across the area of the newly formed lake. Two alluvial soils were deposited along the mouths of the lake's arms, causing them to fill and establish plug (barrier) swamps which propagated into the lake itself. Within these plugs, small alluvial streams remained open, contributing to the deposition of soil within the lake. The first site occupied on the recently formed lake was probably a small village or camp of Bear Canyon (22 WS 556). The ceramic assemblage points to a time early in the Bear Canyon phase. The Wood's site (22 WS 550) may have been occupied at this time, although the evidence for this is sketchy. After a number of years, perhaps fifty to one hundred, other smaller hamlets began to spring up around the edges of the lake. Three of these, Swan Lake (22 WS 549) and Swan Lake Shoals I (22 WS 600), and Swan Lake Village (22 WS 589), were established on the point bar of the old channel. By the succeeding Bear Canyon period, it appears that the Swan Lake area had become a populous place to live. Five new sites were established and the first major village along the lake's bank was initiated at Griffin (22 WS 550). It is believed that during this period the lake contained much Mississippi River water in the form of overflow flooding from the new Bear Canyon bend. Such water reasserted the oxygen supply within the lake, causing a rapid rise in the level and spread over the adjacent land. Because of the composition to the Bear Canyon channel, the lower edge of Swan Lake’s shores also received an added influx of silt, causing a further increase in the land and swamp near the plugged ends. It was this terraced growth, in fact, which contributed to the emergence of those diverse environmental zones in the old channel bed, and to the greater productivity of the entire system, eventually allowing a larger and more settled population to develop a major village at Griffin. This is the site to say that the productivity within the lake was the sole reason for Griffin's development, as maize agriculture was probably practiced to some degree, but it certainly appears to have had a critical part in the village's founding and growth. During the following Cold Creek period, Swan Lake provided the Indians along its banks with living conditions similar to those of the previous Bear Canyon period. The area was divided into villagers and settlement. The huts continued to build lakeward as more silt entered through several minor streams, particularly the embayable Steele Bear Canyon channel, the outer plug which received water from the new Lyster Lake bend situated to the south. Archaeological sites of the preceding period were maintained, while several new settlements, most notably Locust Island (22 WS 590) and Sheep’s Island (22 WS 588), were established along the eastern shore of the village, and Griffin received active. Undoubtedly this was the time of optimal settlement. The plug and swamps had extended for several kilometers into the lake bed, most obviously along the eastern arm, and species' habitats expanded. With abundant agriculture along the natural levees and point-bar deposits used to supplement the rich hunting and fishing zones, the inhabitants enjoyed an economic base unparalleled in the past. With the advent of the Mississippian period, the economic base of the earlier Cole Creek culture shifted from freshwater inflows into Swan Lake was reduced as a result of Mississippi River migration. The mouth end of the lake's arms with which it had flourished as a gateway for freshwater and nutrients, became isolated from the Mississippi. Thus, the entire eastern side of the lake began to degenerate with swampy peat bog swamps. Besides the marked amount of floodwater from the lake by way of Black Bayou, as it drained the backswamp terrain to the north, brought in new nutrients. The eastern arm of the lake was quite different during the early Mississippian period. Unlike the eastern side, it was dramatically overflowed by a channel channel containing a new course of the Mississippi River along the Fourc. This crevasse brought with it an inflow of till and deposited it in a delta-like form within the old Swan Lake bed. The crevasse also contributed freshwater, high in oxygen and nutrients, into the western half of the lake. Because of this in- trusion of such necessary elements, the western edge of the lake became a preferred habitation locale. Initial occupation sites emerged, almost certainly made possible by the crevasse channel. Particularly noticeable is Swan Lake Road (22 WS 593), located along both banks of the northern branch of the crevasse. In addition to allowing for greater biological productivity in the general area of these new sites, the crevasse also offered a prime route for travel between Swan Lake and the active Mississippi, thus increasing the area's desirability for settlement. It is probable that if the formation crevasse had not occurred, sites along Swan Lake would have dwindled in number and size approximating their condition in the late Mississippian period. Finally, during the late Mississippian period, the establishment of new sites along Swan Lake ceased, brought about by the almost total filling, either by swamp or alluvial plugs, of the old lake. Habitation as earlier sites consisted in several instances, but the intensity of such occupation was weak. The sites probably took on the guise of special, small-scale activity loci, related to food procurement within the extensive Swan Lake swamp. The major villages and private habitation sites shifted to newer Mississippi River cutoff lakes, where optimal living conditions were just beginning to form. The Late site (22 WS 549) on the Fourc. The Mississippi is a case in point. Summary Available archaeological and geomorphological data provide a simplified version of the settlement sequence along Swan Lake, a typical Mississippi River floodplain. The overall settlement is tied to the habitation, potential and density within the lake bed. In a processional, the lake and sites moved through a series of stages, from an open river course with low economic productivity, to a flood plain, where the potential and site development, to a final set of channel and limited economic offering with minimal occupation. In some cases, it is also possible for one filling process within the lake's arms is site occupations 'mixed' with 'traditional' and 'modern' sites. This sequence is particularly noticeable during the more quickly-filled eastern arm of Swan Lake, where most Southeastern Archaeological Conference Bulletin 56, 1981
The Coles Creek Period Settlement System on Louisiana's Chenier Coastal Plain

Louisiana's Chenier Plain (Fig. 1) has been experiencing a great deal of land modification from human and natural agents, with a subsequent destruction of archaeological sites. Unfortunately, archaeological research has been unable to keep pace with this loss, so there exists a pressing need for work that will synthesize the existing data and provide a basis for future work in the area. One such method utilizes settlement pattern analysis conducted within an ecological framework. These methods have been applied to the Coles Creek Period occupation (ca. A.D. 700-1 A.D. 1000) of the Chenier Plain and provide a model of the settlement system that existed during that time.

In order to understand the settlement system, it is necessary to examine the physical environment in which the system operated. The Chenier Plain is a narrow deltaic deposit located between two major rivers, the Mississippi and the Atchafalaya, which has produced a unique ecological setting.

Figure 1. Map showing the location of the Chenier Plains.

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Swamp Forest, Uplands, Ridge, and Beach habitats.

The Chemin Parent environment is potentially one of the richest in the world. The marshland water-fowl habitat combination would have provided a great deal of plant, fish and animal resources (Gould 1963). Even though they are seasonal in nature they are spaced so that at any given time a fairly high resource base would have been available.

The Chemin Plain region suffers from a lack of data from excavations. Springer (1957) found that at Pierre Clement (10 Co 37) fish were dominant, while mammals, reptiles and a few birds were also present. At the nearby Morton Shell Mount, Boyd (1954) found that squids (Gonostoma peko var. alifenes) and bivalve fossils (Laguvaria stawazi) were present by Folsomite times. It is reasonable to assume that horticulture was also practiced by the later Coles Creek inhabitants, although the generally poor soils on the Chemin Plain may have limited its importance. The importance of the overall subsistence strategy, Forge's (1977) analysis of the Coles Creek subsistence at the Morton Shell Mount indicates that the most important paleohabitat to the Coles Creek people were, in order of importance; marsh, swamp, bayous, lake, and stream habitats.

The major analytical unit used in this analysis is classes of sites grouped by size. Settlement site is a measurable attribute common to all sites and provides a reflection of the success of cultural response to environment variation (Pearson 1977). It also can be an indication of the number and types of activities carried out at a site (Haggett 1972:115-116). A total of 14 Coles Creek period sites are reported from the Chemin Plain area and were used in the analysis. The sites were grouped into clusters using a hierarchical agglomerative clustering technique (Anderberg 1973: 142-145). The result was a three cluster or site class solution. The observed frequency of sites for: I Class I (the largest sites), I Class II (medium size sites), and I Class III (the smallest sites).

Geographers and economists have developed a number of theoretical explanations for regularities in settlement site distributions. The raw size rule as it is developed by geographers (Berry and Garrison 1958; Dziewonski 1957; Vajnszky 1969) indicates that there should be more Class III sites than Class II sites, which however is not the case with the Chemin Plains sample. A chi square test of the sample frequency derived using Simpson's (1956) method as modified by Berry and Garrison (1958) showed a significant difference at an .05 level. This is interpreted as being caused by subsidence and land loss. By looking at the size frequencies and the location of sites on landforms it is evident that 60% of all known Class III sites are located in marsh as opposed to only 53% for the other two classes. Since the marshes suffer the greatest land loss due to differential comparison rates and wave attack (Craig and Day 1972; Morga 1972) it is reasonable to assume that a greater number of Class III sites would be lost, thereby skewing the sample.

The model derived for the Coles Creek settlement system on the Chemin Plain is based on the relationship of the three settlement size classes and environmental variables. The variables used are basic habitat, landforms, distance from marsh, water source, nearest major river and the Gulf of Mexico. Each class was examined for the presence or occurrence of sites with each of these variables. The result is assumed to be a reflection of the importance of these variables to site activities.

Class I sites are hypothesized to have been the centers of economic, social, and religious activities on the Chemin Plain. Their large size and presence of mounds on three of the sites support this hypothesis. These sites are all located on choeries, the highest elevations in the area, probably for protection from flooding and possibly to control access to these natural "highways" through the marsh. The choeries centered Class I sites to distant areas of the marsh, and when they permitted access to one of the major rivers they gave access to the cultural area in the lower Mississippi Valley and in Texas.

Class II and Class III sites are apparently subsistence oriented sites. Class II sites were typically situated to take advantage of a greater variety of resources from the marsh, aquatic, and ridge habitats than were other sites. Class III site locations were oriented towards exploitation of marsh and aquatic resources. Ethnographic analogy based on the Attakapas indicates that Class II and Class III sites were probably inhabited on a yearly or seasonal basis by family groups or single family units (Dyer 1917; Gatschet and Swanton 1902).

The use of site size distributions to develop a site hierarchy seems to have applicability in the analysis of archeological settlement systems. It is particularly useful when very little information is available from excavations. The model of the Coles Creek settlement system presented here is a hypothetical construct and requires great deal of more data to allow the model to be refined and adjusted to better fit the data. Even so, the current model is useful as an explanatory mechanism and it provides a theoretical base from which further study can be done.

ECONOMIC ANTHROPOLOGY AND ARCHEOLOGICAL RESEARCH

"made of production" (in the broader sense) developed by Marx. In essence, all seek to increase understanding of human economic organization by studying the behavior of commodities, how they are produced, exchanged, and utilized (after Cook 1973a:54).

Economy, as a heuristic device to facilitate data collection and interpretation, is anchored in materiality (see Neale 1964). It consists of events that, through the material context, can be observed (directly or indirectly), measured, and analyzed. The appropriation and transformation (production) of the material means of existence, plus their distribution and consumption represent an ordered sequence of events which provide structure and constitute social process.

As Goode (1972:259-269) states, economies form a domain of activities (production, distribution, and consumption) and a "particular aspect of all human activities that do not strictly belong to this domain but the function of which involves the exchange and use of material means." What gets produced, distributed, and consumed depends on the nature and hierarchy of needs in a given society. For the anthropologist, therefore, a focus on economic activity can be used to get at other institutional functions such as political, religious, familial, etc. For example, motives for distribution can be directly or indirectly economic. Shares may be taken from a product to insure continuity of production (replacement fund), or shares may be allocated for social maintenance, e.g., ceremonial fund (Wolf 1966-67), which is another possible set of values that can be traced through material flows—something that is already being done in varying degrees but in eclectic fashion in archeology.

The developmental consequences ofrelationships

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between the three components of the economic structure has occupied scholars in the past and present (Jars 1985; Weber 1949; Parsons and Smelser 1956; LeClair 1982; Godelier 1972; Cook 1976b; Smith 1979). These investigations into the material influences on different segments of social life provides both reference and problematic for archaeological inquiry.

In 30 years of research, an understanding of economic behavior is more than an abstract concern. Effective, comprehensive planning for economic development in non-Western countries is dependent upon an understanding of reciprocal relationships between economy and environment, the sociopolitical and religious institutions, and the effect of these variables on the "internal rationality" (Godelier 1972:249) of specific cultural adjustments. While it has been suggested that an explicit economic approach could be beneficially incorporated into archeological research, it is not without its problems and is not suggested as a panacea. As Harris (1980:77) notes, only the capacity of a research strategy to "... reveal new or unsuspected relationships ... can justify its existence. And, one cannot expect a single strategy to ... provide definitive answers to every conceivable question but tentative answers to important questions ...\".

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Jack L. Hofman

The Cave Spring site, 40M141, was the focus of several phases of investigation during the 1980 fieldwork in the proposed Columbia Reservoir area in central Tennessee (Fig 1). A controlled surface collection, backhoe testing and limited hand excavations were conducted. The progression of this research and the use of information from one stage in making decisions about subsequent investigations is discussed. Preliminary results of the work are reported and the present direction of site analysis is outlined. This multi-phase research at 40M141 has important implications for designing future research at the site and at other sites in alluvial settings in the reservoir area.

The Cave Spring site covers an area of at least 400 m east-west by 226 m north-south on terraces of the Duck River. The full surface extent of the site is presently unknown because surveys of the adjacent fields have not been completed. The site is on the north side of Cave Bend on the downstream corner. In this location the T1 or floodplain of the Duck River is very poorly developed and the Cullasaja terrace is the Holocene T1. The prominent T1 terrace is of Pleistocene age and has the most dense concentrations of surface remains at the site. Materials also occur on the older T1. The site area is one of deep alluvial sediments and has rich soils and would have supported a hardwood riverine forest prior to clearing for cultivation. A wide variety and fairly dense population of native plant and animal species occupied this setting in the past.

Surface Collection

The Cave Spring site surface collection was facilitated by establishing a grid of 20 m squares over the entire site area. These 20 m squares, designated by their southwest coordinate, were then collected in 10 m quadrats delineated by a mobile rope grid system. The rope grid consisted of an 80 m length used to define the perimeter of each 10 x 10 m square. Two 20 m rope sections were then used to bisect the 20 m units in a perpendicular fashion which resulted in four 10 m quadrats. These quadrats were lettered A through D (in a clockwise fashion beginning with the southeast quadrant) and material from each quad was collected separately by walking between each planted row in the field (approximately 1 m intervals). Results of the surface collection indicated that there was significant variation in the density of cultural material across the site. By plotting these 10 m units which produced 100 specimens or more (density greater than or equal to one item per square meter) we can observe a high correlation between surface density and the edge of the T1 (Pleistocene) terrace.

TEST EXCAVATION AT A BURIED MIDDLE ARCHAIC COMPONENT ON THE DUCK RIVER, MIDDLE TENNESSEE

TENNESSEE
LOCATION OF STUDY AREA

Figure L

(Fig. 2). The crest of the $T_1$ and the $T_2$ face which slopes down to the $T_1$ produced the highest density of surface material. The lower $T_1$ terrace surface produced significantly less material. This distribution pattern, a high artifact density on the $T_1$ which decreases dramatically on the $T_2$, has been recognized at several other sites in the reservoir area. In 1979 preliminary backhoe testing at site 80Ma317, located one mile upstream from Cave Spring, revealed buried components in the $T_1$ terrace where a similar surface distribution was present. We suspected that a similar situation with buried components in the $T_1$ terrace might be represented at the Cave Spring site. Thus, we predicted that buried cultural components would be present in the $T_1$ terrace even though very little archaeological material was found on its surface.

Backhoe Testing

G. Robert Brackenridge (University of Arizona) initiated geomorphological studies in the proposed reservoir area in 1980. In addition to determining the stratigraphic sequence of the terrace system in the reservoir area, we were also interested in dating stratigraphic units within the terraces. Therefore, Cave Spring was selected as one location which might produce datable charcoal samples. By digging a backhoe trench at 80Ma111 two distinct problems could be approached. First, we could evaluate the hypothesis (based on work at 40Mc347) that buried cultural strata were present in the $T_1$ at Cave Spring. Second, we could expose a potentially datable stratum for geomorphological study.

A backhoe trench 108 m long was excavated at Cave Spring which extended from the levee of the $T_1$ over.

sary to make a controlled hand excavation to supplement what was learned from the backhoe trench. The

unnamed test excavation was restricted to two areas, each 2 x 3 m in size. (Fig. 5). These units were excavated

based on the original 20 m grid used during the sur-

face collection. The excavations were located on the

east side of the backhoe trench. Test Area A was

placed on the crest of the T1 terrace where the buried

deposit was closest to the surface (about 50 cm deep)

and relatively level. Test Area B was placed 10 m

further north on the back side of the T1 slope.

Excavation in both areas was initiated by removal

of the plow zone (ca. 0.18 m) at Level 1 which was

water-screened through 1/4 inch mesh. Level 2 ex-

tended from the base of the plow zone to a depth of

55 cm. This matrix was also water-screened through

1/4 inch mesh. Level 2 was interpreted, based on the

profiles of the adjacent backhoe trench walls, to be

essentially sterile. The excavation of Level 2 was in-

tended to remove the bulk of the "collar" fill above

the cultural stratum. The remaining levels were ex-

cavated in 10 cm units and water-screened through

1/16 inch mesh. A 20 cm square soil sample column

was collected from each test area as a basis for phos-

phate, plant, and particle size analysis. A flotation sample was collected from one square in each test area and

comprised of an entire 10 cm level. Chaff, botanical remains from the fluted levels were utilized for radio-

carbon dating and plant identification. All chipped

stone, bone fragments, other possible cultural remains

and river gravels larger than one centimeter were

mapped as encountered during the excavation. For

sake of expediency due to time and personnel limita-

tions, the lower levels of Area B were excavated by

quadranets (50 cm squares) instead of mapping all

material separately. During excavation of quarter-

squares only artifacts were plotted in situ with the

remaining material, flake and gravel, simply being

gauged by quadrant.

Specific kinds of information were sought during
the excavation in order to determine the integrity of
the deposit. First, if the chipped stone materials were

recovered and stream polished for some distance their

edges would be expected to be systematically rounded
and dulled (Black 1957:250-251; Carstens, 1968:

22-23). This proved not to be the case. Overall, the

chipped stone specimens exhibited pristine edges

which had not been subjected to post-manufacture

abrasion. Secondly, if the lithics were wear-trimmed

soiling of specimens by size and shape (large vs.

small, round vs. flat) could be expected. No evidence of such

Figure 5.

Mountains" projectile points from 40Mu141 represent segments of a single bifacial reduction system. The large number of small bifacial thinning flakes recovered from two screening the hand excavation do indicate that a considerable amount of bifacial tool restumping occurred at the site, and presumably it was the projectile points/ knives which were being resharpened.

Several projectile points representing Early Archaic styles (Kirk cluster) were recovered in association with the Middle Archaic Eva assemblage. These specimens, however, are at least partially post-depositional. The presence of these specimens in the component can be attributed to their collection and use by Middle Archaic people. Some specimens exhibit obvious reworking which removed portions of the original patinated surface. Two such specimens, also of earlier origin, had been incorporated into the Middle Archaic assemblage and had been marginally reworked exposing fresh unpatinated chert.

In summary, I have argued that the buried stratum at 40Mu141 represents a primary cultural deposit. This argument is based on the lack of horizontal sorting or stream rolling of the lithics, the presence of chipped stone specimens which can be refitted, patinated occurrences of tool types, a cultural explanation for the occurrence of river gravel in the deposit, and a possible explanation which accounts for the morphological variability of the projectile points/knives which occur in the stratum.

A final problem which must be addressed is the vertical dispersion of the cultural material. No significant or interpretable vertical separation of diagnostic artifacts has been recognized. However, the cultural stratum varies from 50 to 50 cm thick. The vertical distribution of chipped stone from all excavated squares is highly peaked and unimodal in form. However, there were two primary depositional surfaces and that considerable vertical displacement has taken place. The diagnostic data exist for the middle level (Wood and Johnson 1978). It is possible that vertical displacement actually reflects disturbance of a single surface, and that there may be several possible brown chert stone elements which are vertically displaced (Wood and Johnson 1978). On the presence of limited surface material, apparently the result of Archaic and Woodland occupations could serve to further confirm the stratigraphic situation.

Ongoing research with the Cave Spring site materials is aimed at clarification of two primary questions. These are as follows: (1) the relationship between the basally notched points (Eva) and the Mountain (Mountains) point/knife forms; and (2) the evolution of vertical displacement and the degree to which it has modified the assemblage(s). Refitting analysis will form part of the research intended to define the extent of vertical and horizontal displacement. As analysis is being made of the overall bifacial reduction system(s) which can be compared with the others.

One of the primary implications of the research at Cave Spring concerns the correlation of surface materials and buried archaeological deposits. It is obvious from the available information that deep site investigations should go hand in hand with geomorphological investigations. We cannot just dig where there are
high densities of surface debits. Furthermore, we cannot assume that buried components will be free of depositional and/or post-depositional disturbances. The integrity of stratified deposits must be demonstrated.

Acknowledgments

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Daniel S. Amick

A PRELIMINARY ASSESSMENT OF CHEST RESOURCES IN THE COLUMBIA RESERVOIR, MAURY AND MARSHALL COUNTIES, TENNESSEE

This study represents research of the geological resource base in the Columbia Reservoir area of the Duck River. Using an explicitly ecological/environmental framework, it is believed that a review of the definitions of the natural resource base is essential to meaningful investigations of raw material collection and procurement systems (Abbott 1977:131). Chest procurement is assumed to be primarily a localized phenomenon (Blakemore 1971, 1977; Leonard 1979), operating under the principle of least effort and embedded in basic subsistence and settlement schemes (Mifflin 1979, Gravely 1980). Consequently, environmental studies are focused on local geologic and geographic parameters. The geologic and geographic model developed then is integrated with cultural data to determine influence on prehistoric site selection and raw material preferences through time and across space (Klipef 1977:56).

A series of 7.5 minute Geologic Quadrangle maps, available from the Tennessee Division of Geology, were used to accurately delineate geologic formations (e.g. Hardeman 1963). The Geologic Quadrangles display topographic features and geologic formation distribution. Survey and collection of 45 historic quarries and contacts produces a controlled collection of chest types by geologic formation for comparative purposes. The large variety of chest types and depositional situations in the Columbia Reservoir area indicates an exceedingly complex geologic environment, therefore, more specific studies of these depositional settings are being initiated as illustrated by the river gravel study in this report.

The proposed Columbia Reservoir is located on the Duck River in Maury and Marshall counties (Fig. 1), physiographically recognized as the Inner Coastal Basin (Rissler 1982). The local Rill and Cutters Formations contain significant amounts of localized chest concentrations of epigenetic origin (Bigs 1957), they are tractable and readily available within the Inner Coastal Basin. The Rill Formations occur in the center of the basin and primarily in the upper end of the reservoir. The Cutter Formations is found primarily in the lower reservoir. The Outer Coastal Basin Rills-Cutters and Bonnstadt Forests contain high quality chest, but neither sources are distant and isolated respectively Mississippians Fort Payne chest is naturally and culturally the most prevalent type found in the Columbia Reservoir. Massive beds and ridiments block. of Fort


Conwell, L. W. 1914, talk for the geologist, Phoenix Home, London.


lowest vegetational cover. One meter diameter units were defined at 10 meter intervals along the transect line. All chert cobbles larger than 35 mm in diameter were gathered from the surface of the units, bagged and labeled by provenience. Approximately 9000 cobbles (total weight: 1000 lbs or 454 kg) were collected from this collection a sample was selected for laboratory analysis along certain meaningful parameters. Six gravel bars were chosen based on location in relation to the six major tributaries influencing gravel content: Big Rock Creek at mile 160, Flat Creek at mile 167, and Fountain Creek at mile 166. A gravel bar above and below the confluence of each of these creeks was selected to monitor the relative chert gravel contributions of each of these tributaries to the Duck River (Fig. 1).

The sample selected for study consisted of 1282 cobbles (total weight: 200 lbs or 90.8 kg). Each cobble was identified by provenience and specimen number then weighed to the nearest tenth of a gram. Length, width, and thickness measurements were made to the nearest millimeter. Size and density-index statistics were computed from these measurements. After measuring, each cobble was broken open by hard hammer percussion, and the matrix type determined macroscopically based on comparative collections. Overall, the chert cobbles are 94% Fort Payne in origin with the local Ridley and Carters cherts represented in minor amounts.

Each one meter diameter collection unit contained approximately 30 cobbles greater than 5 cm in length. The 5 cm cut-off is an arbitrary sample restriction based on technological considerations. The average cobble size is 43.9 cm, slightly smaller than a tennis ball; average cobble weight is 66.5 g; the resulting average density-index is 1.1 g/cm³. These statistics illustrate the relatively small size of river cobbles in the Columbia area of the Duck River. These measurements are considered useful because formal and/or functional considerations for utilization may be related to certain dimensional characteristics of specific chert types (McDannell 1978).

Distributional studies of these chert gravels indicate patterns of abundance, composition, and quality change along the river. An abundance measure was calculated as the average number of cobbles collected from a one meter diameter area at each collection station. Abundance patterns suggest that surface cobbles are more abundant above major tributary confluences (Fig. 2).

A comparison of the relative frequencies of Fort Payne, Carters, and Ridley chert at each collection station indicates changing compositional patterns downstream (Fig. 3). Below the Big Rock Creek confluence, the gravel is primarily Fort Payne with some Ridley. Considering Ridley bedrock in the area, this is not surprising, but the lack of Carters is unusual. Some Carters would be expected from the base of Elk Ridge approximately 24 km away. However, Carters chert appears to weather very rapidly; 64% of all Carters gravel collected was noted to a chalky desilicified state.

In the Flat Creek area, the Carters formation is only 8 km away, consequently Carters chert becomes a larger constituent of the gravel below Flat Creek, even with this shorter distance to bedrock source, half of the Carters gravel at this station is desilicified. Since this tributary does not cross the Fort Payne Formation, only Carters and Ridley cherts are contributed, thereby lowering the relative percentage of Fort Payne chert to 75% on the gravel bar below Flat Creek. Downstream movement appears to weather the granitic Ridley and Carters replacement cherts more rapidly than the fine-grained syngentic Fort Payne chert. Gravel composition above each tributary tends to illustrate this phenomenon. Below the Fountain Creek confluence, the Carters frequency increases due to the close proximity of outcrop source in the area. Fountain Creek does not cross the Ridley Formation resulting in the continued downstream decrease of Ridley chert below Flat Creek.

The major variety of Fort Payne present in the river gravel is a tan variety comprising 74% of all cobbles. This variety was further divided on the basis of qualitative change in grain-size with weathering. The fresh fine-grained tan weathered to a medium- and/or coarsely-grained phase which further decomposed to a white and yellow chalky desilicified state. Downstream movement farther from the parent source of this material indicates an increase in the more weathered phase of this variety while the fine-grained phase decreases. (Fig. 5). The fine-grained material increases again below Fountain Creek, a Fort Payne-bearing tributary.

Certain initial propositions may be offered concerning chert type distributions and utilization patterns by prehistoric populations in the Columbia Reservoir.

(1) The vitrified high-quality Bighorn-Cannon chert will be differentially selected for as a desirable material. Not a single piece of this chert type was observed in a river gravel sample of almost 1300 pieces, although it appears to be fairly abundant on the strath terraces of the area. This would indicate strath terraces as the most reliable local source of this material.

(2) The Ridley and Carters cherts are comparable in nodule size and quality. These cherts are locally abundant, although generally poor grade. They are not expected to be preferred for artifacts that require "high energy expenditure" (Ehret 1978:68) such as biface assemblages. Therefore, they are expected to be used primarily in "expedient" rather than "curated" assemblages (Binford 1977:35-6; 1979:263). Also since Ridley and Carters distributions are geographically discontinuous, it is expected that their utilization frequencies will have an inverse relationship with each other.

(3) The small size of local river gravels may require chert procurement closer to the parent source. This will be particularly evident in large bifacial manufacture. Fort Payne chert predominates among bifacial tools and may have been quarried or gathered from Elk Ridge or the Western Highland Rim about 24 km to the south and west. Finally, stronger comparison of natural and cultural raw material occurrences, the notion that raw material procurement is embedded in basic subsistence and settlement schedules (Binford 1979:259) may be tested.

Acknowledgements

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THE DIVISION OF MOUND EXPLORATION OF THE BUREAU OF (AMERICAN) ETHNOLOGY AND THE BIRTH OF AMERICAN ARCHAEOLOGY

On February 25th, 1888, Congress earmarked five thousand dollars of the Bureau of (American) Ethnology appropriation to go for the exploration of prehistoric mounds (Klines 1901:805). John Wesley Powell, the Director of the BAE, initially appointed Wells DeHaas to head the newly formed Division of Mound Exploration, but replaced him within a year with Cyrus Thomas. Under the direction of Thomas, research was carried out through the 1880s, with a final report appearing in 1893 (Thomas 1893). Historians of American archaeology have consistently recognized the Division of Mound Exploration as playing a prominent role in the development of American archaeology (Hallowell 1969:85; Jennings 1968:55; Willey and Sabloff 1974:66). These authors emphasize the results of the mound survey, the resolution of the identity of the mound builders issue, as their reason for marking it as the first beginnings of modern archaeology. While I would certainly agree that the resolution of this stubborn issue was of great importance, I think that it was the methodology employed by Thomas in outlining and carrying out the mound survey that in fact sets it apart as the first modern archaeology carried out in eastern North America.

Problem

The research of the Division of Mound Exploration was from the start explicitly problem oriented. John Wesley Powell identified the primary goal of resolving the mound builder debate, and Thomas provided an interrelated set of four secondary objectives. These were: (1) To identify the full range of variation in the form or external shape of prehistoric mounds, and develop a comprehensive mound classification system; (2) To investigate the nature and function of various mound types; (3) To establish a system of regional archaeological districts that reflected the geographical range of the various mound types; (4) To obtain representative artifact assemblages from prehistoric mounds, not only for distinguishing various mound categories and archaeological districts, but to also allow subsequent taxonomic analysis of the various classes of artifacts.

In addition to these problem oriented goals, Thomas established another, equally important goal—he was determined that the work of the Mound Exploration Division would result in a detailed and objective data base that would be available and of value to future generations of archeologists.

Research Design ("Plan Adopted")

The research design or data recovery plan of the Division of Mound Exploration was a logical extension of the Powell and Thomas problem orientation, and can be seen to have been carefully and deliberately tailored to obtain information relevant to the research questions that had been defined. It was formulated entirely by Thomas, and included the following important aspects: (1) A sampling strategy which was on the one hand designed to obtain systematic geographic coverage of mounds in the eastern United States, and was, at the same time, stratified in an attempt to obtain a representative sample of mounds from each of the various general "classes" or taxonomic categories of mounds. (2) Procedures of data recovery were standardized, and involved detailed descriptions and...
Field Operations

In setting up the field operations of the Division of Mound Exploration, Thomas faced a variety of problems. The most obvious problem involved the sheer size of the defined geographical study area—stretched from the Dakotas to Florida and from Texas to New York. One way to approach this vast expanse of territory that needed careful planning would have been to engage for short periods of time a variety of local researchers to investigate nearby mound sites. Thomas did in fact do this to a rather limited degree, but this approach had the obvious drawback of having to deal with, and rely upon, individuals of varied qualifications, levels of competence, and trustworthiness.

Largely for this reason, I suspect, Thomas channelled most of the funds and research efforts of the Division into the three permanent field assistant positions that he established. Table 1 lists the different individuals who held, at one time or another one of the three permanent field assistant positions. Also listed are those individuals who were temporarily engaged by the Division of Mound Exploration.

Except for an occasional foray into the field, Thomas stayed in Washington, and directed the activities and movements of the three field assistants himself.

To judge from the correspondence between Thomas and his men in the field, he was not exactly an easy man to work for. His outgoing letters invariably contain comments, questions, and admonitions concerning the text batch of artifacts and descriptions received from a particular field assistant, as well as instructions as to where the field assistant should next proceed. The incoming letters from field assistants similarly share some common themes: responses to Thomas' most recent comments concerning the quality of their work; explanations as to why they were not proceeding as quickly as Thomas wanted; and requests for both the "vouchers" and money owed them.

Thomas was clearly tightening with the funds of the Division, sending out the field assistants' salaries on a month-by-month basis, and making it clear that next month's check was dependent on continuing adequate performance. He was also cautioning the field assistants to keep more detailed and accurate mound descriptions and excavation records, to find more and better artifacts, and to cover more territory in a shorter period of time. This "stick and carrot" relationship between Thomas and his field assistants I think he knew to their understanding. But it accomplishes.

There are a number of ways of unravelling the movements of the field assistants, one of which is shown in Table 2. By going through the Division of Mound Exploration's artifact ledger, I was able to determine the geographical source of collections sent in by the different field assistants on a year-by-year basis. Table 2 does not tell the whole story, however, since field assistants often visited and described sites without sending back artifacts to Washington.

If you look under the 1882-1883 column of Table 2, you will see that in a twelve-month period, Edward Palmer sent back specimens from Alabama, Arkansas, Georgia, Indiana, Mississippi, North Carolina, South Carolina, and Tennessee. During the same year, P. W. Norris visited Arkansas, the Dakotas, Kentucky, Iowa, Minnesota, Missouri, Ohio, Texas, West Virginia, and Wisconsin. Clearly Thomas did not allow his field assistants so dawdle too long in one place.

The bottom row of Table 2 lists the total number of catalog numbers assigned each year, and provides a rough index of the level of activity of the field assistants. The number of assigned catalog numbers drops almost in half after the first two years, and then to almost nothing after the spring of 1886. This clearly indicates that in terms of excavation and collection acquisition the Division of Mound Exploration was active only during the four year span 1882-1886. Although some mounds were excavated after 1886, alone in filling gaps in the geographical coverage of field assistants in these later years (Middleton and Reynolds) were primarily engaged in mapping mound sites and recording the accuracy of previous descriptions.

Figure 1 shows the 130 counties within which over 2,000 mounds were explored, and from which over 40,000 specimens were obtained by the Division of Mound Exploration. It gives a general picture of the geographical coverage of their excavation activities.

Discussion

If the work of the Division of Mound Exploration is analyzed within the conceptual framework of present day archaeology, it turns out to be interesting, even though it was carried out almost a century ago. It was a long-term regional research program and Southeastern Archaeological Conference Bulletin 26, 1981
Figure 1. The counties in which collections were made by field assistants of the Division of Mound Exploration.

had a larger regional focus than any subsequent archaeological undertaking in North America.

It was explicitly problem oriented, and the research questions that were addressed were among the most important ones facing eastern North American archeology in the nineteenth century.

There was also a clear and direct relationship between this problem orientation and the research design developed by Thomas. The sampling strategy for selecting sites to be investigated and the kinds and

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Table 2. The states in which collections were made by field assistants, on a year by year basis.

Footnote:
The original, longer version of this paper is available from the author.

Ian W. Brown

In February of 1881, Congress appropriated $5,000 for the investigation of the prehistoric mounds of North America. The Mount Exploration Division was set up as an adjunct of the Bureau of Ethnology. Cyrus Thomas was not the initial head of the Division, but he has come to be the one individual most associated with the mound research. In this paper I will be examining Cyrus Thomas’ role in what has turned out to be the most extensive archaeological survey ever conducted in North America.

For a man who was to lead such an ambitious archaeological project, Thomas had a rather in-

Cyrus Thomas and the Mound Exploration of the Bureau of (American) Ethnology

Southeastern Archeological Conference Bulletin 24, 1981
Powell already knew Thomas, as they had both taught in Illinois, and they were both involved in the various surveys of the Territories. The primary factor supporting Thomas' appointment may, however, have been his close personal relationship with John A. Logan. Thomas' first wife, Dorothy, was the sister of this very influential Congressman (Anon. 1908:358). It is well known that Thomas became a member of the geological survey of Nebraska in 1867, because he was John Logan's relative (Goethean 1966:85-96, 514). Perhaps this same relationship contributed to his receiving the directorship of the Mound Exploration Division.

Powell may have found it difficult to push de Hass immediately to the side, as de Hass had played such an integral role in the founding of the Mound Exploration Division, but within a year Thomas was in and de Hass was out. Powell (1894:XL-XLI) claims to have been amased by the act of Congress appropriating money for the mound investigations, but knowing Powell's interest in archaeology (ibid:XXXIX-XLI), and his obvious inclination to political intrigue, it is highly unlikely that the action of Congress was a true surprise. But for some reason, Powell obviously did not want the creation of the Mound Division to be attributed to him.

Cyrus Thomas may not have been the most appropriate choice for such an important position as Director of the Mound Exploration Division, but there can be no question that he did an excellent job in running the organization. He did have some background in archaeological fieldwork (Thomas 1875; 1881), but Thomas was, for the most part, an armchair archaeologist rather than an active field worker. Most of his reports were slumpy, more detail was needed, or that their budget was not in order. Strong organization was absolutely necessary to complete the goals of the project (Norriss 1882; Thomas 1874a-b).

As the area of mound distribution was so large, and the mounds themselves so numerous, Thomas decided to obtain as wide a coverage as possible. Even as early as the late 19th century site description was not a constant through. Mounds were being destroyed daily by agricultural activities and various commercial enterprises (Thomas 1891:20, including, in many areas, fast-pace hunting endeavors (ibid:185). As a result, Thomas decided that thorough investigations of a single area or even a single site should be left for the future. The purpose of the mound survey was to make as extensive an archaeological study as possible by examining typical structures throughout the East.

Particular attention was given to the mode of mound construction, and, more specifically, to the methods of burial in the conical tumuli (ibid:29). Thomas was a stickler for accuracy. Most of the Objection of Annual Report 12 is a detailed listing of measurements, essentially correcting the inaccuracies of Squier and Davis' earlier survey (ibid:481-483). Thomas demanded the same excellence for detail from his staff. He wanted full and complete reports on the various sites investigated. Condensed reports were inadequate, and Thomas did not hesitate to speak of his dissatisfaction in such cases (Thomas 1875). He wanted to be able to publish the reports verbatim, if
need he. We know that Thomas was guilty to some extent of nepotism, but being a relative did not necessarily insure a permanent position. John Rogan, a "coincident" to Cyrus Thomas, did not write a good report on his work in East Tennessee. He therefore suffered a salary cut, an action which eventually forced him to resign from the staff (Rogan 1886a-e). Those who could not, or would not, shape up, eventually left. Thomas was on an extremely limited budget and he had no time for individuals who were getting in the way of the project's objectives. He was constantly concerned with money and how it was being spent (Thomas 1887b; 1888b). Thomas himself did not receive a salary while he was on assignment, but he was reimbursed for travel expenses (Judd 1967:13). A considerable portion of the Bureau of Ethnology's total expenses under Powell's tenure was taken up by railway passes (ibid.:20), suggesting that the areas surveyed by the mound Division members may, to some extent, have been affected by the railroad routes of the period. The lack of adequate funding necessitated small crews (Roose 1973:88; DeRouzie 1985) and extremely mobile assistants. The assistants rarely stayed in any one place for long periods of time (Smith 1969).

As an able administrator, Thomas was severe to those who were not doing their job, but their principal task was not simply one of finding artifacts, as suggested by some of the Bureau's critics (Peet 1885; 333). Artifacts were indeed important, as they provided visible proof to the public of the archaeological investigations (Thomas 1894:225), but as long as his assistants did the best work they could, Thomas seemed to have been satisfied.

I know that the results of your examination in Michigan and the northwest were, as a rule, negative, nevertheless it is necessary to know the area hunted over and the efforts made in order to determine the value of this negative testimony (Thomas 1887c).

Although Thomas used most of his assistants' reports in their original form, he does not appear to have been overly protective of publication rights. It is clear from his correspondence that Thomas had no real objection to his assistants writing independently on their fieldwork and artifact studies. He even encouraged it, but he was concerned about the work involved in duplicating published information. Thomas also insisted that the Bureau of Ethnology was given full credit for sponsoring the work (Thomas 1887d; 1888a).

Overall, he was quite proud of both his staff and the Mound Division, as indicated in the following letter asking Fowke to accompany him at a meeting:

...I would be glad to have you with me as I propose to give the people a taste of the "New Archaeology" of the Bureau, and wish a witness on hand whose character "for truth and veracity" is unimpeachable (Thomas 1888c).

It should be noted that new archaeology was capitalizing in quotes and was more in the above passage. For its day, the mound survey certainly was the new archaeology (Jennings 1971:399). Eastern North American archaeology still has not dealt adequately with the vast amount of data produced by the Bureau between 1881 and 1889. Although the contributions were many, Thomas felt that one of the main benefits of the survey for future archaeology was the correct description of the various mounds, including the numerous figures and diagrams. Thomas even visited a number of the larger sites in 1888 to recheck the observations of his assistants (Reynolds 1888a-b). The 40,000 artifacts collected by the Division were also obviously of immense value to future archaeological investigations in Eastern North America (Thomas 1894:22).

The main contribution of the mound survey was putting to rest the notion that a mythical race was responsible for the ancient mound. The report was the final confirmation that the ancestors of the historic Indians were responsible for the construction of the mounds of Eastern North America. With such an immense accomplishment, one might have thought that Thomas, at the ripe age of 69, would have retired. However, the last years of his life were spent writing three books and over a dozen articles (Brown and Williams 1980).

When Thomas died on June 25, 1910, at the age of 85, the scientific community lost one of its major figures. He is most remembered for his archaeological work in North America, but it must not be forgotten that Thomas also made vast and outstanding contributions to entomology and to the study of Maya hieroglyphs in his long and eclectic career. The following passage is from his obituary:

Dr. Thomas' career was typically American, but of a kind which will scarcely find future duplicatation. The complete story of his life and times would throw an interesting light on the upgrowth of his individuality. From the earliest days of comparative ethnology, the mounds were a source of constant interest to him. He had the good fortune to be present at the last Mississippian survey Conference (DeRouzie, Judd, 1890; to Cyrus Thomas, March 21, Smithsonian Institution Archives). Gorentzen, William H. 1906. Explorations and Empire. W. W. Norton & Company Inc., New York.


Marvin D. Jeter

EDWARD PALMER'S 1882 EXCAVATION AT THE TILLAR SITE (3DR1), SOUTHEAST ARKANSAS

Edward Palmer, who was born in England about 1830 or 1831 and died in 1911, was primarily a field botanist. From 1881 to 1884, though, he was the principal field investigator of archaeological sites in Arkansas for the Mound Exploration Division of the B.A.E. In late 1882, Palmer excavated a mound at the Tillar site in southeast Arkansas, and found at least 58 burials, 23 ceramic vessels, and other grave goods. Most of this material has been stored at the Smithsonian Institution since 1883, and the artifacts have not been analyzed until now. This paper will present a brief analysis of the ceramic artifacts (58 vessels and 5 pipes) and will place the Tillar site in a regional context. A related paper, by Goodwin and others at the Smithsonian, presents an analysis of the human skeletal material (24 crania) which Palmer recovered.

Palmer never published a final report on his investigations, but they were summarized by Cyrus Thomas in his 1891 and 1894 preliminary and final reports on the Mound Survey. Also, some informal notes by Palmer were published posthumously in 1917. During the 1881 and 1882 seasons, Palmer was assisted by H. J. Lewis, a self-educated former slave from Mississippi. Lewis made a number of sketches in the field which are available in the National Anthropological Archives at the Smithsonian.

The Setting of the Tillar Site

The precise location of Palmer's Tillar mound is not certain, but a very close approximation can be derived from his notes and from land ownership records for the 1880s. The site was in the immediate vicinity of Bayou Bartholomew, in northeastern Drew County. The "meander belt" presently occupied by this bayou was probably abandoned by the Arkansas River between 1881 and 1882, or several hundred years before Palmer's Tillar burials were interred.

The site was on or very near an old natural levee of the Arkansas River, with well-drained, naturally fertile soils adjacent, and several oxbow lakes or swamps in the vicinity. A short distance to the west, uplands of Pleistocene age mark the western edge of this Holocene "delta" country. A short distance to the east is the more ancient Bayou Macon meander belt. Farther to the east, just across the Mississippi River, is the very large Winterville site. To the northeast, just across the Arkansas River, is the Menard site, which James A. Ford (1963) identified as the historic Quapaw village of Owneyo.

Palmer's 1882 Excavation

Palmer's excavation at Tillar took place in late 1882. In Palmer's words:

"As the iron probe indicated there was something below, I commenced on one side so as to dig over the entire mound. At one foot below the surface I commenced to find pottery, remains, etc. This deposit of bodies deepened to two feet toward the center. They were without any definite order of deposit, nor did they face any one direction... (1917:39).

Referring to an unpublished plan view sketch made by Lewis, Palmer's notes state that "The drawing gives a fair idea of the irregular way in which things were mixed up." The notes and the sketch both give the impression of a mass deposit of skeletal material, ceramic vessels, and other grave goods.

According to Thomas, Palmer recovered 23 whole vessels and "a number of pipes" from Tillar. Stone
spades" were also found. The writer has located and examined 20 vessels, 3 pipes, and a single stone "spade" or "hoe" at the Smithsonian. Of the 20 vessels, 5 are bottles, 3 are bowls, and 12 are jars. With one possible exception, they are all shell-tempered. A tentative type-variety classification has been attempted, but most of these vessels were classed as "variety unspecified" of one type or another (Table 1). The classic definitions of Lower Valley types and varieties essentially omitted Southeast Arkansas materials. The typological modes and attributes found here frequently occur in combinations that are not known in adjacent regions.

The three ceramic "cultivator" pipes have obvious re- semblances to pipes found in late Mississippi period contexts from northern Arkansas to northeast Louisiana and western Mississippi. The final artifact is a stone "spade" or "hoeh. One end is missing, but the other has a definite polity. It was originally about a foot long. The lithic material is apparently Mill Creek Chert from southern Illinois, which was widely distributed during the Mississippi period. Similar specimens have been found slightly south of Tillar, at the Winter- ville site and in Ashley County, Arkansas.

All of the archeological evidence is consistent with a Mississippi period placement for Palmer's assemblage from Tillar, and the bulk of the ceramic evidence sug- gests a very late prehistoric or protohistoric dating. It is likely that the lithic material and artifacts from Tillar represent a single depositional event: the final ceremony, during the A.D. 1500s, in the history of a charred house which may have been in use for a gen- eration or more.

Summary: "The Big Picture"

Ultimately, Tillar and related sites can furnish infor- mative data on late prehistoric to historic social organi- zation, demography, human biology, exchange, and perhaps population movements. Some initial steps have recently been taken or suggested in our report on the nearby Keliy-Greens site (Jeter, Kelley and Kelley 1979).

Two late Mississippian period mortuary complexes may be tentatively defined in this region. Sites of the "Hog Lake Complex", on the Bayou Macon meander belt, were first reported on in 1957 by Lemley and Dickinson, and were summarized in the Keliy-Greens report. The "Tillar Complex" on sites in the Bayou Bartholomew meander belt, have been extensively mined for artifacts, but not intensively studied and reported on until now. We are still attempting to document the private collections from them.

Comparative studies indicate that Palmer's Tillar site was on the middle to upper levels of the con- temporary mortuary site hierarchy. However, there is no evidence for intra-site status differentiation, let alone "elite" status. Here, as at Keliy-Greens, there is anadual evidence for exchange or interaction with groups in the Yazoo Basin, and both upstream and downstream in the Lower Valley. More than at Keliy-Grines, the slightly later Tellar assemblage suggests interaction with groups to the west, in the Cal- do- son area.

Frains (1978) has made the interesting sug- gestion that the decline of Vinewille was part of a general process of population movement away from the Mississippi River, beginning in the A.D. 1800s and culminating in the protohistoric period. The data presented at hand, while admittedly inadequate, do appear to support this suggestion. There are obvious overlaps of archeological diagnostics of the 1800s in both the Hog Lake and Tillar Complexes, but so far there definitely appear to be more protohistoric materials in the Tillar Complexes. This also suggests that re- search on the Tillar Complex will contribute to closing

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LEGACY OF THE 1880 THOMAS MOUND SURVEY: A MISSOURI EXAMPLE

made. It disgusts me and I am afraid it will have the same effect on the society. It wants relief" (Letters Re- ceived, National Anthropological Archives, Smith- sonian Institution).

In spite of his fears, Fowke's work was well received for in 1906-1907, in concert with the Missouri His- torical Society, he worked under the auspices of the Archaeological Institute of America to conduct an ex- tensive survey and excavation of mounds in the central and southeastern parts of Missouri. Fowke maintained his ties with the Bureau of American Ethnology through publication of the results of his survey in Bureau of American Ethnology, Bulletin 37 in 1910, and that of his newly published excavations in Bulletin 53 in 1922 and the 44th Annual Re- port in 1923.

It was not until the 19303 that Federal support was available on a broad basis for archaeological sur- veys and excavations. The Great Depression brought with it government programs that included support for archaeological work. In Missouri, the Civil Works Administration in 1935 was approached by two Uni- versity of Missouri professors, Brevett Berry and Jesse Weaver, for support for a two-week trial archaeologi- cal survey of the state—which was granted. This sur- vey was so successful that it was continued in 73 counties under the Federal Emergency Relief Adminis- tration in 1934, although it only lasted until Novem- ber. Berry and Wrench had found a core of people interested in Missouri Archaeology and in December invited them to the University at Columbia to form a State Archaeological Society, one major purpose of which was to continue the Archaeological Survey of the state. The Society was formed and became active in 1935.

From 1933 to 1958 another federal program, the National Youth Administration, was tapped for funds by Berry and Wrench and an intensive survey was made of Boone County, in which the University is located. The Missouri Archaeologist was initiated in 1935 as the official publication of the Society and car- ried some of the results of the surveys as it still does, and aided in obtaining others to work on the survey of the state. By 1957 enough interest had been generated that the state legislature for the first time bought an archaeological site to be preserved in a state park, the

Carl H. Chapman

This paper is a direct result of the Smithsonian- Lower Mississippi Survey Conference and some of the data included in it were gathered during the confer- ence. The conference not only offered the opportunity to become familiar with the research materials and data at the Smithsonian, but also acted as a catalyst stimulating further research on various aspects of the Cayce Thomas Mound Survey inaugurated 100 years ago. This first large archaeological survey supported by federal funds had a great impact on the archaeology of the Eastern United States. Here only a small part of the legacy of the Thomas survey will be discussed: a brief and selective history of the archaeological surveys in the state of Missouri.

To initiate the research on archeological surveys, the Missouri Historical Society generously provided funds so that M. L. Bean and St. Louis were visited. The results were gratifying, for the original detailed notes and sketch maps of L. M. Bean were located. They demonstrated that the first major state-wide archaeological survey of Missouri was conducted in 1903-1905. This was just ten years after the publication of the Thomas 1894 report on the Mound explorations of the Bureau of American Eth- nology. It is probable that this survey, sponsored by Louis Houck for inclusion in volume one of his A History of Missouri, published in 1896, was stimulated by the Thomas survey. This was the most outstanding state survey of the time. Houck had employed L. M. Bean and D. L. Hoffman to conduct the work. It seems that a good choice was made, for 28,000 mounds were located. The only problem was that nearly two thirds of them were natural.

Immediately following this broad survey of the state, a more refined and detailed state survey was con- ducted by Gerard Fowke, who had been one of the members of the original Thomas team in Mississippi, Illinois, Kentucky and Ohio until 1889. After continu- ing work in Ohio, Fowke came to Missouri in 1905 to work with the Missouri Historical Society in St. Louis where he acted in the excavation of the Montezuma Mounds in the Illinois River Valley. He was not very happy with the archaeology in the area, for in Novem- ber of that year he wrote W. H. Holmes at the Bureau of American Ethnology as follows: "My excavations at Montezuma and the American Bottoms opposite St. Louis have been the most absolutely barren I have ever
old fort in Van Meter State Park, and set up a fund through the university specifically for archaeological surveys, the Archaeological Research Experiment Station Fund, which still supports the Archaeological Survey of Missouri at the University today. The first use of the fund was to survey the Wappapello and Clearwater Reservoir areas, the beginning of the river basin surveys in the state which have been a major focus of archaeological research since that time.

The federal programs such as the Works Progress Administration (WPA) gave the field of archaeology a big boost throughout much of the United States. In Missouri, the Academy of Science of St. Louis and Missouri Historical Society Museum of Jefferson City sponsored the WPA work in Jefferson, St. Genevieve and New Madrid Counties. Surveys and excavations were conducted during the period 1939-1942.

With the advent of World War II, the WPA ceased and archaeological research by the University and the State Society declined. Shortly after World War II, in 1946, the University of Missouri created the position of Director of American Archaeology to continue archaeological research in the state and to work with the state society on the Archaeological Survey of Missouri. A major emphasis of the work was the investigation of areas to be affected by the building of dams. The Society, the University, and the Missouri Resources Museum joined in this Reservoir Survey work from 1947-1950. In 1950 F. H. H. Roberts of the Bureau of American Ethnology again involved the Smithsonian Institution in a nation-wide river basin survey program, and asked those working on such projects to coordinate with that institution. The University and Society complied.

There were also surveys by other institutions located outside Missouri. The Lower Mississippi Alluvial Valley Survey of 1910-1917 and the Central Mississippi Valley Survey begun in 1949 are two examples.

During the 1950s and 1960s when funds became available for reservoir salvage surveys and excavations through the National Park Service, the University of Missouri participated by furnishing more than half the cost, and adding personnel and equipment needed to conduct the archaeological research. Archaeological investigations were made in two major reservoirs in the state.

Archaeological surveys and excavations were more adequately funded in the 1970s with the passage of the Historic Sites Act of 1966, the Environmental Protection Act of 1969, and the Archaeological Conservation Act (Moss-Bevan) of 1974. With the better funding and the necessity of mitigating impacts on cultural resources threatened by federally sponsored projects, other institutions and private organizations joined in the archaeological surveys of the state.

There are presently about 20,000 site locations recorded in the Archaeological Survey of Missouri files. Most of the data have been computerized to speed up the process of supplying researchers and federal and state agencies with site data needed for cultural resource management. Among the earliest information in the Survey files is that from the Cyrus Thomas Mound Survey.

Today, the American Archaeology Division of the Department of Anthropology, University of Missouri-Columbia and the Missouri Archaeological Society still have as a major interest the archaeological survey of Missouri, an emphasis traceable its part to the Thomas Mound Survey 100 years ago.

Acknowledgements

Thanks are due the personnel of the Division of Anthropology at the Smithsonian Institution, and the Lower Mississippi Survey, Harvard University, and especially Bruce Smith and Stephen Williams of those institutions, respectively. The aid of Jim Glenn, National Anthropological Archives Smithsonian Institution, Washington, D.C. and Beverly D. Bishop, Missouri Historical Society Archives, St. Louis, Missouri, is appreciated.

C. Wesley Cowan, H. Edwin Jackson, Katherine Moore, Andrew Nickelloff, and Tristine L. Smart

THE CLOUDSPLITTER ROCKSHELTER, MENIFEE COUNTY, KENTUCKY: A PRELIMINARY REPORT

During the late 1920s and early 1930s archeologists from the University of Kentucky excavated a number of rock shelter sites in the rugged mountains of eastern Kentucky. In secluded overhanging cliffs in the Kentucky and Red River drainage systems they discovered a wealth of well-preserved cultural materials that caught the attention of the eastern North American archaeological community. Woven fiber slippers, fiber bags filled with nuts, wooden tools, and other items of material culture were recovered in quantity, preserved through the millennia by the dry microclimates of the interior of these overhangs. (Funkhouser and Webb 1929, 1930; Webb and Funkhouser 1966).

60

front of the overhang, effectively defining between 100-180 m² of potentially habitable floor space.

Prior to the commencement of the actual excavation of the site, the area beneath the overhang and its surroundings were divided into five artificial sampling strata (Fig. 2). Within the overhang, four sampling strata were delineated on the basis of major breaks in topography, and presence of roof fall. Sampling Strata I, II, and III were all located in areas where the surface of the overhang was relatively free of roof fall. Sampling Stratum IV included the rock screen talus slope downhill from the actual floor of the overhang, and Sampling Stratum V included the wooded area outside the overhang.

A one m² grid system was established over the entire surface of the overhang, with each unit having as its basic reference point the southwest corner stake. Excavation proceeded in natural levels, and when uniform deposits were encountered that exceeded five cm in thickness, the deposit was excavated in arbitrary 5 cm levels. With the exception of a few thin ash deposits, most units of excavation were considerably less than five cm.

All deposits were excavated with four inch pointing trowels and dustpans. Deposits were dumped into three gallon plastic pails, and notes were maintained concerning the volume of each excavated deposit. Soil was passed through nested screens; the top screen consisted of one quarter inch hardware cloth that overhung a lower box lined with window screen. All materials trapped by this system were retained for future analysis. A standard two liter sample for fine sieve screening was taken from each deposit and cultural feature encountered. Over 100 radiocarbon samples were collected from each of the major deposits and cultural features. Pulverized samples were also collected from each feature, and four several column within the overhang. Geologic and P1 samples were also collected from various areas within the site. Because of the careful control maintained concerning size and volume of each of the deposits, as well as a virtual total recovery of the cultural and biological materials they contained, an excellent review of the contents of the site was produced.

Description of the Deposits and Radiocarbon Dates.

The depositional history of the site is now being synthesized. As indicated by a 2 m long section from the deeper area of the site, the stratigraphy was quite complex. (Fig. 3). Numerous micro-lenses were present, and were often interrupted by cultural features. In many areas of the site, occupation surfaces were almost entirely obliterated by later cultural activities such as fire and pit building. In addition, the majority of Sampling Stratum I was found to be underlain by a massive sandstone roof fall that apparently fell before the initial occupation of the site. In the main occupation zone, only one small area was free of these blocks. Early Archaic occupation began on this surface, with the surrounding roof fall acting as an effective barrier against occupation in other areas. As the overhang filled in with domestic residue and naturally eroding sand and gravel, step by step, the uneven, underlying roof fall became buried, making new surfaces available for utilization. This process seems to have taken place quite slowly and because of this it is difficult to relate spatially isolated deposits over different areas of roof fall. This problem is, of course, compounded by a plethora of cultural features which have cut through and often displaced earlier deposits. In addition, because the deposits are quite varied in their content from place to place with the overhang, it was generally impossible to follow single deposits over any appreciable horizontal distance. This was a particularly severe problem for the upper deposits in the overhang.

Roof fall was conspicuously absent in the majority of Sampling Stratum III. Here the floor was composed of sterile, well cemented deposits that were in places overlain by stratified cultural sediments. In this re-
Table 1. Radiocarbon Determinations from Sinking Spring I as of November 10, 1980.

<table>
<thead>
<tr>
<th>Provenience</th>
<th>Age in Radiocarbon Yrs</th>
<th>Uncert Date</th>
<th>MASCA Corr</th>
</tr>
</thead>
<tbody>
<tr>
<td>surface of L16</td>
<td>565 ± 60 (UCLA-2313B)</td>
<td>A.D. 1420</td>
<td>A.D. 1400</td>
</tr>
<tr>
<td>Feature 9, L19</td>
<td>2720 ± 60 (UCLA-2312A)</td>
<td>841 B.C.</td>
<td>910 B.C.</td>
</tr>
<tr>
<td>Feature 9, L24</td>
<td>2720 ± 60 (UCLA-2312F)</td>
<td>841 B.C.</td>
<td>910 B.C.</td>
</tr>
<tr>
<td>Feature 9, L27</td>
<td>2940 ± 60 (UCLA-2312C)</td>
<td>810 B.C.</td>
<td>810 B.C.</td>
</tr>
<tr>
<td>Feature 11, L17</td>
<td>2515 ± 80 (UCLA-2312E)</td>
<td>315 B.C.</td>
<td>315 B.C.</td>
</tr>
<tr>
<td>organic deposit, L16</td>
<td>1855 ± 350 (G-8042)</td>
<td>605 B.C.</td>
<td>600-710 B.C.</td>
</tr>
<tr>
<td>Feature 12, L10</td>
<td>2441 ± 60 (UCLA-2313D)</td>
<td>A.D. 5</td>
<td>A.D. 7-9 B.C.</td>
</tr>
<tr>
<td>Feature 9, L19</td>
<td>132 ± 60 (UCLA-2312K)</td>
<td>491 B.C.</td>
<td>470 B.C.</td>
</tr>
<tr>
<td>Feature 9, L19</td>
<td>122 ± 80 (UCLA-2312L)</td>
<td>A.D. 528</td>
<td>A.D. 563-590</td>
</tr>
<tr>
<td>Ash Lens C, L10</td>
<td>170 ± 100 (UCLA-2312M)</td>
<td>A.D. 1490-1500</td>
<td>A.D. 1490</td>
</tr>
<tr>
<td>Ash Lens C, L10</td>
<td>306 ± 60 (UCLA-2312I)</td>
<td>1775 B.C.</td>
<td>1775 B.C.</td>
</tr>
<tr>
<td>Ash Lens C, L10</td>
<td>285 ± 60 (UCLA-2312H)</td>
<td>2075 B.C.</td>
<td>2075 B.C.</td>
</tr>
<tr>
<td>Feature 3, L13</td>
<td>3412 ± 90 (UCLA-2312I)</td>
<td>1291 B.C.</td>
<td>1300-1340 B.C.</td>
</tr>
<tr>
<td>Feature 2, L14</td>
<td>5963 ± 620 (UCLA-2312F)</td>
<td>6032 B.C.</td>
<td>6032 B.C.</td>
</tr>
<tr>
<td>Feature 2, L14</td>
<td>1787 ± 200 (UCLA-2312E)</td>
<td>1420 B.C.</td>
<td>1535 B.C.</td>
</tr>
<tr>
<td>Feature 2, L14</td>
<td>1100 ± 100 (UCLA-2312E)</td>
<td>1110 B.C.</td>
<td>1270-1300 B.C.</td>
</tr>
<tr>
<td>Feature 2, L14</td>
<td>1170 ± 80 (UCLA-2312E)</td>
<td>1750 B.C.</td>
<td>1750 B.C.</td>
</tr>
<tr>
<td>Feature 2, L14</td>
<td>1737 ± 80 (UCLA-2312E)</td>
<td>3170 B.C.</td>
<td>3170 B.C.</td>
</tr>
<tr>
<td>Feature 2, L14</td>
<td>1600 ± 100 (G-8043)</td>
<td>2157 B.C.</td>
<td>2190 B.C.</td>
</tr>
<tr>
<td>Feature 2, L14</td>
<td>8280 ± 225 (G-8043)</td>
<td>6250 B.C.</td>
<td>6250 B.C.</td>
</tr>
</tbody>
</table>

# Provisional, R. Berger, personal communication.

&nbs...
The synergistic effects of the coagulation and precipitation processes were examined through a series of experiments designed to investigate the interaction between the two processes. The results indicated that the combination of these processes significantly enhanced the removal of suspended particles from the water samples. The data collected from these experiments showed a marked increase in the efficiency of particle removal when the processes were combined compared to when they were applied individually. This finding has important implications for water treatment processes, as it suggests that optimizing the coagulation-precipitation sequence could lead to more effective and efficient water purification systems.
<p>| | | | | |</p>
<table>
<thead>
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</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

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This page contains a page number and some other text, but these are not transcribed as they do not significantly contribute to the content of the table or description provided.
The significance of these patterns is difficult to evaluate. Percentage data, for instance, do not lend themselves to statistical manipulation, but when average nut densities/liter screened are compared via a one-way multivariate analysis of variance (MANOVA), the resultant F statistic indicates no significant differences in the nut density distributions between the Late Archaic and Early Woodland. Early Archaic samples could not be included in the analysis because they were not uniformly distributed across the site.

Besides nuts, three wild plant species appear to have been intentionally collected. Honey-locust (Gleditsia triacanthos) seeds and pod fragments are absent in Early Archaic deposits, scarce in Late Archaic contexts, and become fairly frequent in those of an Early Woodland age. In terms of its distribution within contemporary plant communities in the Red River drainage, honey-locust is restricted to deep alluvial or limestone-derived soils. Segments of the fruiting pods (technically lemons) of beggar's-tick (Desmodium nudiflorum) follow a similar

<table>
<thead>
<tr>
<th>Walnut</th>
<th>Butternut</th>
<th>Chestnut</th>
<th>Hickory</th>
<th>Unidentified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Woodland</td>
<td>159.08</td>
<td>65.69</td>
<td>6.7</td>
<td>25.72</td>
</tr>
<tr>
<td>Late Archaic</td>
<td>39.09</td>
<td>39.7</td>
<td>9.0</td>
<td>8.2</td>
</tr>
<tr>
<td>Late Archaic</td>
<td>160.79</td>
<td>10.9</td>
<td>3.2</td>
<td>2</td>
</tr>
<tr>
<td>Early Archaic</td>
<td>12.82</td>
<td>41.1</td>
<td>16.5</td>
<td>52</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Walnut</th>
<th>Butternut</th>
<th>Chestnut</th>
<th>Hickory</th>
<th>Total Listed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Woodland</td>
<td>22.27</td>
<td>22</td>
<td>21</td>
<td>1.96</td>
</tr>
<tr>
<td>Late Archaic</td>
<td>1.18</td>
<td>35</td>
<td>1</td>
<td>0.94</td>
</tr>
<tr>
<td>Early Archaic</td>
<td>3.3</td>
<td>14</td>
<td>501</td>
<td>0.0</td>
</tr>
</tbody>
</table>
in the same fashion as was done at Salta and Mammoth Caves (cf. Farnell 1969; 1974; Magness 1974; Stewart 1972). Certainly at this early period cultivated foods were probably no more than supplements to an otherwise mixed diet of wild plant and animal species.

Once again, the Late Archaic and Early Woodland inhabitants of Cloudsplitter seem to have followed a pattern similar to that of the North American hunter-gatherer distribution suggesting that they were occasionally eaten by humans.

The Appearance of Cultivars and their Subsequent Significance

Up to this point a pattern of wild plant utilization has been discussed that is typical of the paleoethnobotanical record in Eastern North America from about 9000 years ago until the advent of maize agriculture. Nuts dominate these records, and although other plant foods were probably eaten in large quantities, their macromolecularly are informally found in archaeological contexts. In spite of evidence of excellent preservation, Cloudsplitter is no exception to this general rule.

The Cloudsplitter plant assemblage is, however, different in an important respect from the vast majority of paleoethnobotanical collections in the East, because of the lack of moisture in the deposits, a controversial, but well preserved assemblage of cultivated plants is available for study. Not only are seeds and other reproductive structures preserved, but such delicate parts as sunflower (Helianthus annuus) disk fragments, Chenopodium indigocarpa, stalks and roots, and mugwort (Passiflora caroliniana) inflorescences are often preserved with some regularity.

Dissicated squash (Cucurbita pepo) rind is present in a Late Archaic deposit with an associated radiocarbon date of 3729 ± 80 B.P. (UCLA 2215), and occurs sporadically thereafter throughout the Late Archaic and Early Woodland deposits. Ground (Lagenaria siceraria) does not appear until after 3000 B.P., but its absence in Late Archaic contexts is probably due to sampling error.

Without exception, the cucurbit rinds from Cloudsplitter originated from small fruits with thick woody shells. There is no trend towards decreasing rind thickness through time, and it is assumed that the fruits were grown mainly for their seeds and value as containers.

The seeds and achenes of the so-called Eastern Agricultural Cultural Complex—sunflower (Helianthus annuus), cultivated sunweat (Linum annua var. macrorcarpa), gourds (Cucurbita pepo), and mugwort (Passiflora caroliniana) and crest knotweed (Polygono ncrecentis) are sparse to absent in Late Archaic levels, occurring at a rate of about 0.01 percent of screened deposit. In several cases, in fact, these Late Archaic occurrences might be attributed to contamination from later contexts.

After 3000 B.P., all members of the Eastern Complex undergo a sudden and dramatic increase in the rate at which they were being deposited in the site. In contrast to their paucity prior to this time, more than 10 percent of screened deposit are present in Early Woodland levels. This may be indicative of a wholesale introduction of the complex into the region at this time.

Unfortunately human coprolites are scarce in the Cloudsplitter deposits, and it is not possible to measure the dietary contribution of the Eastern Complex Southern Archaic Archeological Conference Bulletin 24, 1981
this evolution might have left traces in the archaeological record. If the Cloudsplitter seeds are really 9000 years old (or older), we are still faced with a frustrating problem—an almost 5000 year gap in the paleoethnobotanical record. While a number of sites have produced cucurbit remains that cluster around 4500 B.P. (e.g., Carlson Annis and Bowles, Kentucky; Chorovick and Crawford 1977), and Phillips Spring, Missouri (Ray et al. 1980), no earlier cucurbits have been reported. Recent discoveries in the Lower Illinois River Valley may alter this picture.

Carbonized cucurbit rinds have been reported from Holton Phase deposits at both the Koster and Napoleon Hollow sites dating between 7500 and 6000 B.P. (Ach and Aeh 1980, personal communication). Those specimens effectively bridge the gap between the Cloudsplitter and other Late Archaic squashes.

While we find the possibility of 9000 (or even 7000) year old squash in Eastern North America a tantalizing prospect, until we can directly date both the Kentucky and Illinois cucurbits through the accelerated CH technique now under development, the evidence for Early and Middle Archaic squash cultivation will remain controversial.

Fossil Analysis

The rugged terrain of the Red River valley provides a heterogeneous environment with a great deal of topographical relief and botanical diversity. Prehistoric animal resources would have included large game animals such as deer, bear and elk, as well as small game mammals, birds, and reptiles. Aquatic habitats in this region are not as productive or varied as they are in the larger, higher order streams of the Southeast with their associated swampy flood plains and meandering belts. The fish fauna are diverse but many of the species are too small to be considered (food) fish. No waterfowl would have been numerous enough to have been either a seasonal or perennial resource for aboriginal hunters.

Analysis of Probitotic Fossil Remains. In analyzing the different types of faunal remains, great care was taken to consider the variety of depositional and post-depositional events that have resulted in a complex and sometimes confusing assemblage. In addition to bone and mussel shell, hair, feathers, fish scales, eggshell, the cisternous skeleton of insects and crayfish, teeth, and occasional strands of connective tissue and tendons or bone were also collected from Cloudsplitter.

The excavation units selected for analysis included all of those considered in the botanical analysis and one additional unit, K-20, which was located along the back wall of the shelter and was subject to decay of organic matter due to moisture. Material from the top (1/4") screen from all of these deposits was analyzed as well as some of the larger features. The fraction of bone that was not identifiable to vertebrate class amounted to from 10% to 12% in these samples. No quantified data on the 1/16" screen samples appear in this paper, partly because relative proportions are skewed by differential rates of deposition. They are discussed below in the context of the non-cultural occupation of the site. Top screen data are summarized in Table 7.

In the first part of Table 7, percentages of identifiable taxa are compared in terms of weight of identifiable bone. In the second part, proportions by weight are expressed in terms of the total volume of deposits from which they were recovered, producing densities per liter that can be used to compare plant and animal food remains through time and across the site. Weights of bone fragments rather than counts are presented here as a more reliable approximation of the importance of each animal. A list of identified taxa is given in Table 8.

The variables that affect the interpretation of the relative quantities of various species include the differential degree of fragmentation of bone through time (primarily a cultural process), and the changing rates of accumulation of deposit (a natural process affected by cultural occupation). Large game, including deer and bear, provided the most animal food throughout the occupation of the site, but the ratio of deer to other, identifiable large mammal remains changes over time. Count-weight ratios suggest that a decreasing degree of fragmentation of bone resulting in less identifiable pieces, rather than a decreasing ratio of deer to other game taken, produces these results. Densities of all types of fauna dropped during the Late Archaic, probably because these deposits contained a high proportion by volume of perishable organic matter. Early Woodland and Early Archaic deposits have been concentrated by burning and rotting, thus our inferences about changing proportions of animals through time are based primarily on percentages.

When the percentages of identifiable bone are ranked for each period, large mammal and deer account for about 80% of the bone in each case. Variability over time is seen in the assortment of animals that complemented this reliance on large mammals. In the Early Woodland, the next three categories are

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Table 7. Ratio of Identifiable Bone by Weight, Cloudsplitter Rockshelter (1) M 36).

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Percentage Ratios</th>
<th>Density Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early Woodland</td>
<td>Early Archaic</td>
</tr>
<tr>
<td></td>
<td>Late Archaic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Large Mammal</td>
<td>49.9</td>
<td>49.9</td>
</tr>
<tr>
<td>Deer</td>
<td>19.6</td>
<td>19.6</td>
</tr>
<tr>
<td>Bear</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Horse/Mule</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Small Mammal</td>
<td>5.9</td>
<td>5.9</td>
</tr>
<tr>
<td>Largemouth Catfish</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>Turtle</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sample Count</td>
<td>196</td>
<td>196</td>
</tr>
<tr>
<td>Sample Weight</td>
<td>492g</td>
<td>492g</td>
</tr>
<tr>
<td>Sample Volume</td>
<td>193g</td>
<td>193g</td>
</tr>
</tbody>
</table>

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Table 1. Identified Verneuil Faya from Cloudsplitter.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eliran nervosus</td>
<td>Short-tailed Shrew</td>
</tr>
<tr>
<td>Crypocyon mors</td>
<td>Long Shrew</td>
</tr>
<tr>
<td>Chloropus</td>
<td>Unidentified bat</td>
</tr>
<tr>
<td>Datum ruber</td>
<td>Grey Squirrel</td>
</tr>
<tr>
<td>Dendrocynchus nigra</td>
<td>Unidentified small</td>
</tr>
<tr>
<td>Newellia pudica</td>
<td>unidentified mice</td>
</tr>
<tr>
<td>Castor canadensis</td>
<td>Porcupine</td>
</tr>
<tr>
<td>Eutamias pulverulentus</td>
<td>Red Squirrel</td>
</tr>
<tr>
<td>Ochotona princeps</td>
<td>Black Bear</td>
</tr>
<tr>
<td>Microtus ochrogaster</td>
<td>Elk (Wapiti)</td>
</tr>
<tr>
<td>Marmota flaviventris</td>
<td>White-tailed Deer</td>
</tr>
</tbody>
</table>

These animals are not part of the model for human subsistence; rather, they are a sample of small animals from the site to which other data on prehistoric climates and vegetation can be compared. The use of owl and hawk roosts to study paleoecology is well established in the Southeast. Guild (1957) and others have demonstrated that the fauna from the site do not relate to the human subsistence base or the immediate vegetation of the site. They provide evidence to reconstruct vegetation communities in the aboriginal catchment area. No distinguishably Pleistocene fauna appear in the cultural level of the site. The fauna from the Early Archaic levels in the Sampling Stratum I dated to 8300 B.P. ± 250 (CA 5875) are only slightly different from the Late Pleistocene and early modern samples. One interesting identification from the Late Archaic level was the raccoon (Procyon lotor). This taxon is not always observed in the Early Archaic levels and may indicate a change in the environment.

Large bird, turtle, and bear. In the Late Archaic, large mammals are followed by turtle, murrel, mammal, and large birds. In the Early Archaic, deer and large mammals are followed by large bird, beaver, and turtle. Elk was identified from Early Archaic deposits in the smallest units that were not included in this sample.

While it is not easy to resolve these small shifts into a picture of changing hunting patterns through time, it is clear that a full range of animals and the skills to exploit them were available from the Early Archaic, including the utilization of what scant aquatic resources were present. The shift from Late Archaic to Early Woodland is so marked that in these deposits is represented by a marked difference in the number of large mammals. The importance of large mammals in the Late Archaic is replaced by the importance of turkey and bear, perhaps more productive resources, in the Early Woodland. Overall, the picture is one of relatively stable exploitation of resources that do not feel themselves to be manipulated by humans in the manner that some plant resources have.

Differing animal processing activity areas may also account for some observed variability in the fauna. The bone in Sampling Stratum I, associated with post holes, features, and quantities of processed plant remains was food scrap steel; small fragments of long bone shafts and tine shell dominate this assemblage. One extensive Early Woodland deposit, Leps C, seemed to represent rapid deposition of specialized animal procurement and processing, containing up to 85% large bone to weight, with turkey the only identified species. Outside the center ring of breakstands, there was less finely fragmented bone, less bird bone, and more large pieces of deer, bear and elk bone.


The small sample size of faunal remains and human activity at this site do not permit a reconstruction of changing subsistence patterns for the entire settlement system. We have good data for analyzing the role of climate change, for offering evidence of subsistence re-configurations in open sites, and for comparing the proportions of animal and plant food waste generated by a series of cultural occupations. We are still challenged to reconstruct actual subsistence practices from this evidence for plant and animal exploitation.

Lithic Analysis

In comparison to biological remains, the Cloudsplitter lithic assemblage is small and dominated by a single component. The lithics from the site cannot readily be used for the more common morpho-functional analyses that dominate literary literature. Instead, the waste from the manufacture and maintenance of chipped stone implements is available for examination.

As has been indicated in the previous sections, the occupational contexts of Cloudsplitter—a short term, special activity camp—has important repercussions in terms of the lithic assemblage that could be expected to have been produced. Theoretically there should be less evidence of lithic manufacture and more evidence of tool use and tool manufacture. In addition, the small sample size of faunal remains and human activity at this site do not permit a reconstruction of changing subsistence patterns for the entire settlement system. We have good data for analyzing the role of climate change, for offering evidence of subsistence re-configurations in open sites, and for comparing the proportions of animal and plant food waste generated by a series of cultural occupations. We are still challenged to reconstruct actual subsistence practices from this evidence for plant and animal exploitation.

The cloudsplitter term is a small, artifactual assemblage, and dominated by a single component. The lithics from the site cannot readily be used for the more common morpho-functional analyses that dominate literary literature. Instead, the waste from the manufacture and maintenance of chipped stone implements is available for examination.
This may be further illustrated by comparing the finished tool-to-debitage ratio of Cloudsplitter with other floodplain and shelter sites in the Red River drainage (Table 9). Note the higher tool-to-waste ratios for the Anderson and Shepard sites, two large, multicomponent bottomland sites. A typology of debitage based on platform type and amount of cortex on the flake surface was constructed which resulted in 12 flake classes. A series of measurements were next collected from 75 Archaic flakes (the combined total for Early and Late Archaic samples from Sampling Stratum 1) and 462 Early Woodland flakes. A comparative study of these two samples has yielded some encouraging preliminary results.

First it is obvious that Archaic lithic activities were almost exclusively limited to maintenance of already existing tools. No cores were found in Archaic contexts, and flakes seem to have been produced by the rejuvenation of bifacial implements. Almost 25% of the tools and flakes originated from sources outside the Red River drainage. Early Woodland debitage presents an entirely different picture. Exhausted cores are present in the deposits, and 84% of all tools and debitage originated from locally available sources. If numbers of flakes may be equated with amount of lithic activity, then over 5 times as much occurred during the Woodland versus the Archaic (185 items/unit volume of deposit versus 56 items/unit volume of deposit).

The differences observed in the lithic population almost certainly relate to the changes in site utilization through time. It has already been suggested that the site experienced a more intensive occupation during the late Woodland, and the debitage seems to bear this out.

Summary

Each of the sections in this paper are highly synthesized accounts of longer papers. Analyses of the Cloudsplitter shelter materials are still ongoing, although we doubt if this basic outline will change substantively. Our work over the last two years has provided us with a good outline of the history and micromorphs of deposition of cultural and natural materials within the Archaic overgrowth; a perspective on change and variability in local and regional floristics; and insights into patterns of plant, animal and lithic procurement strategies. Perhaps at this point we might take stock of our knowledge, and attempt to place our work at Cloudsplitter into a somewhat more cohesive integrated framework.

At the time Early Archaic people came to Cloudsplitter they were faced with a still-evolving post-glacial landscape. Preserved Pleistocene sediments at the site suggest that the late Wisconsin period may have been somewhat cooler and moister than today. Both pollen and macrofossil evidence from the Early Holocene levels seems to reflect the warming effects of the continental ice sheets on local floristics. While a number of deciduous plant species indicate that a hardwood forest was already established by 10,000 years ago, its composition was somewhat different than what we see today. Hemlock trees grew immediately in front of the overhang as late as 9200 years ago. Red spruce, completely absent in the Red River drainage today, probably existed in scattered patches on the highest portions of the plateau, occurring as remnants of the formerly extensive Wisconsin and before forest that dominated higher elevations in the Appalachians. The Early Archaic occupants of the site were clearly already well-adapted to the Early Holocene forest and fluvial resources of the drainage. Economic decisions were based on the seasonal availability of nuts, white-tailed deer and a variety of lesser mammalian and aquatic fauna at this early period. At this early date Cloudsplitter seems to have served as a temporary, fall-winter camp, perhaps being occupied for only a few days and nights before resource availability dictated movement. Our knowledge of the site of the group utilizing the site is incomplete, but large roof blocks littered much of the floor of the overhang, and probably only a few nuclear families could comfortably have been accommodated within the interior.

Unfortunately, Cloudsplitter did not contain a Middle Archaic record of human occupation. This hiatus is mirrored in other areas of the drainage at this time period also. In spite of the fact that over 2000 archaeological sites have been recorded for the Red River area, Middle Archaic manifestations are exceedingly scarce. By 5000 years ago Cloudsplitter once again began to serve the needs of local populations. Survey and excavation work on the valley floor downstream from Cloudsplitter has established that a sizable Late Archaic population was present in the drainage by this time. While the dynamics of Archaic population growth in the East are poorly understood, a similar phenomenon can be observed in the Green, Wabash, Ohio, and Illinois River valleys further to the west. Changes in population went hand in hand with changes in local floristics.

A mixed broadleaf and coniferous forest was by now firmly established in the Red River drainage. Hemlock populations had retreated downslope from Cloudsplitter giving way to the dry, upper slope communities of oaks, chestnut and hickory that typify the floristic pattern of today. As the composition of the forests in the drainage stabilized, so did Late Archaic subsistence-settlement strategies. The deposits at Cloudsplitter reveal what appears to be an increasing utilization of hickory and chestnut during the fourth and

Table 9. Tool-Debitage Ratios for Various Red River Sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Type</th>
<th>Occupation</th>
<th>N</th>
<th>Tool-Debitage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloudsplitter</td>
<td>rockshelter</td>
<td>short-term, Early Archaic, Late Archaic, Early Woodland</td>
<td>1,051</td>
<td>1:129.4</td>
</tr>
<tr>
<td>Haystack</td>
<td>rockshelter</td>
<td>short-term, early Late Woodland</td>
<td>890</td>
<td>1:121.5</td>
</tr>
<tr>
<td>Anderson</td>
<td>floodplain</td>
<td>large settlement, Early Woodland, Middle Woodland</td>
<td>685</td>
<td>1:20.3</td>
</tr>
<tr>
<td>Shepard</td>
<td>floodplain</td>
<td>large settlement, Archaic, Woodland, Ft. Ancient</td>
<td>6,655</td>
<td>1:11.0</td>
</tr>
</tbody>
</table>

third millennium; familial exploitation remains essen-
tially unchanged, with dry, small game, and minor
amounts of aquatic resources dominating the Assem-
bly. Squash was definitely being grown by the Late
Archaic populations on the drainage and provides
evidence that the Red River area, in spite of its remote-
ness, was hardly isolated from innovations that were
taking place elsewhere in the Midcontinent at this
time.

The large sandstone blocks on Cloudsplitter's
floor were not placing limits to the site at any one
point. Again it appears that the site was functioning as a
small camp for a few nuclear families. The abundance
of nut shells in the deposits suggests that these peoples
made regular trips to the site in the fall of the year,
taking advantage of locally available crops of mast.
While their visits remained of short duration, when the
num had been harvested in the vicinity of the over-
The late residents moved on to yet another favorable
location. This area at which Late Archaic groups
made use of the site sunk below the level, with do-
nomestic residue, and by 3000 years ago, roodall
never occupied which area of the bluffs could be
utilized.

Early Woodland populations likewise made use of
the overhang. Their hearths, pits and extensive ash
deposits ride the post 3000 B.P. deposits at Cloud-
splitter, and suggest a changing function for the site.
Although we can detect little change in the utilization
of wild plants and animals, a variety of cultivated
weeds appear to be in evidence at this time. We may
have revealed a need to suggest a broader-scale
change in the flora of the zone at this time horizon,
and perhaps changing social relations with neighbor-
ing areas. Changes in the medium-term will have
shifted the local economy, and new social relations
in iron are suggested. A variety of settlement
patterns, coupled with decreased access to alterna-
tive locations, and hunting locales is one such hy-
thesis that needs to be explored.

In spite of the potential for increasing residential
stability this cultivation would seem to have afforded,
Cloudsplitter remained a temporary for a small group of
people. Spatially isolated postholes and other features
within the site suggest a continuous use by nuclear
families. All evidence again points to a fall occupation; there are no large events or hearth
features that would have provided warmth during the
late Eastern Woodland period. Although the site may have
been utilized for longer periods of time during the
Early Woodland, it may be concluded that seasonal
abandonment took place.

After about 2400 B.P. the shelter was no longer
utilized by local Woodland populations. Spatially,
probably overnight visits were made to the site during
the late prehistoric period, but these activities left
little tangible records in the overhang.

Acknowledgements

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A COMPUTER SIMULATION OF SETTLEMENT GROWTH AND DELINEATION DURING THE LATE MISSISSIPPIAN: AN EXAMPLE FROM THE PIEDMONT AREA OF GEORGIA

During the past few years there has been an increasing number of settlement pattern studies done in the southeastern United States (Lee 1976; Smith 1978). An entire book was recently devoted to settlement pattern studies in and around the southeastern region during the Mississippian Period (Smith 1978). This volume included an article that presented a model of settlement patterning for societies at the chieftain level of social development that was tested against the archaeological data from the Moundville area in Alabama (Stephens 1978). Thus it appears that settlement patterns are now, more than ever, being used to help understand societal growth and development.

The approach used by the present author is to use a computer simulation in modeling settlement patterns and social expansion. Preliminary analysis of the data on a regional scale has been conducted using a modified version of Steponaitis' E Index, and is reported elsewhere (Wood 1980). The data base being utilized is survey data on over 600 Lamar sites, gathered by the University of Georgia in the floodplain area of the Withlacoochee River in central Georgia. The use of this data set was provided by Dr. David Halliday of the University of Georgia.

The use of a simulation, both as a heuristic tool, and an instrument of analysis, must be done with care. Various problems can and do arise in quantifying and interpreting all of the different functions and variables needed to represent a societal unit and its actions. And even if the simulation model fits the data, it cannot be used as the final answer. Its use should be more in the area of generating possibilities that can hopefully be tested through further research. It provides one possible answer, not necessarily the answer to any given problem.

The simulation by itself cannot stand on its own right, but must be checked against the archaeological record to ascertain its ability to predict or copy the observed pattern. Because of this reason the above mentioned data set was chosen for use. Its large number of sites should allow for a fine tuning of the developed model. Previous work has been done in the area. Lee (1976) has studied the relationship between soil types and topography and the patterning of Lamar sites in the area. Smith and Kowalewski have included the study area as part of their tentative prehistoric province (Smith and Kowalewski 1979).

The program itself is being written in FORTRAN, and ran on an IBM 3053 computer, using IBM's Hexadecimals compiler for maximum flexibility within the program. SYSMAP is being used to map out both the base data set and the generated data set produced by the simulation.

Two basic assumptions must be made. The first is that the climate of today is representative of the climate during late prehistoric times; the second, that information recorded by early explorers and their companions gives valid and accurate descriptions of actions and customs of the aboriginal people who they encountered. Lacking dendrochronological and palynological data for the area, all climatological information will be drawn from modern sources. As to the use of ethnohistoric sources, they will be kept to a minimum. What has been attempted is the use of as many hypothesized functions as possible from other archaeological research, such as Ford's (1977) work in the Midwest and Smith's (1978) research. It is not possible, nor advisable, to totally ignore the usefulness of ethnohistoric sources, but as Fish and Fish (1976) point out, great care must also be exercised in their use.

The first step in constructing the simulation was to establish the probable political level of the study group. I have used the multivariate evolutionary model as developed by Sanders and Webster (1978). Using their three main factors hypothesized to regulate the tempo and direction of evolutionary growth, and comparing them to work done by archaeologists concerned Southeastern United States political organization, the chieftain or ranked level of society is assumed to be the operational stage of development. It should be noted here that in Sanders and Webster's (1978) evolutionary scheme ranked and stratified societies are treated as two separate levels of development. The main differences between the two are that stratified societies have differential access to major subsistence resources and are socially stratified as compared to being ranked. Peoples and Mills (1976) list equal access to basic subsistence resources as one of their "markers" of a ranked society, which excludes them as being stratified societies as far as this research is concerned.

By assuming a chieftain level of development, social, economic, and settlement rules hypothesized to operate at this level of social development can be used.
in the simulation. Additionally, other archaeological work dealing with similar societies at this level of development can also be applied to the model.

Time in the simulation is incremented on a seasonal basis to allow for the maximum use of climatological variables and their possible effect on the growth and spread of the settlements. The climatological data used in the simulation are from the A.D. 1660-1770 soil survey reports for the study area. A uniform distribution of soil association number is used to produce the seasonal climate for the area. The climate data is then used to modify yields of seasonal food resources and maintained to be used in calculating overall yield from horticulture. These data are then used to either slow down, maintain, or accelerate the population growth.

Two different methods of population growth are being used within the simulation. The first, and simplest method, is the one used by Zube (1975) in his Hay Hollow study of carrying capacity. This method uses a single equation to calculate the rate of growth for the population. The second method is a cohort analysis method using the formulations of Weiss (1970) from his demographic models study. This analysis is a series of equations that use varying data from different age cohorts to calculate population growth.

Location rules for the establishment of new settlements from the one to two starting settlements are based on Lee's (1970) work. Available soil type, topography and group site are utilized to establish the location and type (i.e. farmstead, temporary, etc.) of the site. The availability of local natural resources such as construction materials is also evaluated. The simulation is currently in the last stages of de-panning and initial running, but we are hopeful of the results. Problems and questions still have to be resolved and analyzed. Future analysis of the site data will hopefully help to establish a pattern of contemporaneity of the sites. The simulation will generate a pattern that will be a continually growing data set. The snapping point will be given by a certain number of years, or a point when the resource potential of the area is exceeded.

The purpose of the simulation is also to help in the delineation of possible societal groups within the Southeastern United States. At this point it covers only a part of the hypothesized "province". Future research is geared towards increasing the program to encompass the entire region and attempt to pick up changes in settlement patterns that could possibly indicate boundaries between groups. An effective limit to the sphere of control of local and major centers could be developed that could delineate boundaries between cultural groups.

The work that is being done in the base for future research, that can hopefully help add to our understanding of cultural growth and the rules and properties that affect it.

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Christopher S. Peebles

Continuity of research and conservation of the data produced by this research have been the hallmarks of archaeological investigations at Moundville from their beginning in 1846 to the present. During these 140 years, neither indiscriminate vandalism, mean community, or misguided legislation have had significant harmful effects on either the Moundville site itself or on most of the other sites of the Moundville phase. Such good fortune sets these sites off from those of almost any other archaeological phase in the South.


ARCHAEOLOGICAL RESEARCH AT MOUNDVILLE: 1840-1980

east. To a person, the individuals who worked at Moundville during the formative era of research there, that is from 1846 to 1950, were exceptional natural historians and scholars. Their research transcended that of most of their contemporaries by several orders of magnitude. To a family, for the last 110 years, the owners of the lands on which these sites are located have been conscious and active agents in their conservation. Only minor destruction has come to these sites through plowing. However, changes in the course of...
the Black Warrior River have swept away two mounds; one village has been lost to industrial expansion; and a mound within the limits of Tuscaloosa was said to have been leveled by that city's authorities in the 1820s or 30s (Maxwell 1876:74). Only two breaches of cruciform, one in the first quarter of the twentieth century, the other in the last, have diminished the collections made at these sites by five genera-

The papers below are testimonies to an unbroken line of research that leads us to put the theories of archaeologists who worked at Moundville. There is no single question, proposition, or paper here that does not use directly the materials and observations handled down to us from the past; the prehistoric past of the mound through sixteenth century; the scholarly past of the nineteenth and twentieth centuries. It is the interplay of these two pasts that will form the substance of this paper.

Research at Moundville: 1840 to 1900

The earliest archaeological work at Moundville was conducted in the spirit of the "natural history circle" that influenced American scholarship from the time of the Bartram and Jefferson in the eighteenth century to that of Lewis and Clark, Catlin, and Schoolcraft in the nineteenth century (see Savage 1979). Thomas Maxwell, who conducted the first archaeological work at Moundville, was definitely a member, albeit a provincial one, of this circle. In 1840 he dug a trench in Mound B and noted the stratification and features included to this mound. He traced the earthen embankment that circled the site and described various other features found near the mounds. For the next 50 years, features made by the landowners and others at Moundville. He published his Moundville work as part of a larger History of Tuscaloosa in 1876 (Maxwell 1876). His conclusions about Moundville embraced sites, bloody warfare, lost tribes, and arcane knowledge, all of which showed familiarity with the natural historical writings of his day.

Between 1840 and 1869 a trench was cut into Mound G by someone, perhaps Maxwell, a " Giant" was found by Mr. Hendele Powell near the base of Mound B (Maxwell 1876:70), and other features and artifacts continued to erode out of deposits near the bases of the mounds and the earthen embankment. During this period brief mention of Moundville was included in Ancient Monuments of the Mississippi Valley (Squier and Davis 1848) and in the History of Alabama... (Picket 1851). No excavations have been reported, however, between those of Maxwell in 1840 and Nathaniel T. Lupton in 1869.

Lupton was the first person to conduct a systematic examination of the Moundville site, as well as the first scholar to conduct "sponsored research" there. Born in 1839 in Virginia, Lupton was to become a renowned scientist. He was a graduate of Dickenson College and studied under Bunsen in Germany. He was an apprentice—a professor of chemistry; at Ram- malec College then at Southern University; a chemist with the Niter and Mining Bureau of the Confederate States of America; President of the University of Alabama; professor of chemistry at Vander- lice Institute; and he concluded his distinguished career as professor of chemistry at the Alabama Poly- 

At the end of the Civil War, Lupton returned to his post at Southern University, Greensboro, Alabama. At some time between 1869 and 1870, the site was visited by Joseph Henry, Secretary of the Smithsonian Institution and asked to explore the Indian Mounds of Alabama. On May 31, 1869, Henry authorized funds for him to ex- plore the Indian Mounds on the Black Warrior River. Lupton, after a delay caused by illness and university duties, began fieldwork at Moundville in September, 1869. He and a crew of five workers spent four days mapping the site and excavating a trench in Mound D. His notes on this excavation were sufficiently de- tailed for a contemporary reconstruction of the mound's stratigraphy and the location of the features therein (Stephanian laboratory notes). Lupton's map of the site as a whole was complete, accurate, and drawn to scale. He correctly located the mounds, showed the course of the earthen embankment south of the plaza, and noted therein that Mound G had been "upended about 50 years since." He shipped his Moundville materials to Washington by railroad Ex- press and after a delay of several months they reached the Smithsonian in March, 1870. The total bill for Lupton's work, exclusive of the freight charges, was $29.65.

Subsequent to Lupton's work, the Smithsonian In- stitution became involved one more time in field archaeology at Moundville. After Cyrus Thomas had been appointed director of the newly formed Mound Exploration Division of the Smithsonian Institution in 1881, he sent one of his assistants, James D. Middle- ton, to work at Moundville. Although Middleton's brief stay at Moundville in 1882 did add to the col- lections of the U. S. National Museum, his field ob- servations and notes were far below the standards set by Lupton. Some of Middleton's maps of individual mounds are not matched to existing mounds, but his map of the site bears no relationship to reality (Na- tional Anthropological Archives: #2000 Box 11; Stephanian 1890b). No matter which way this map is turned, stretched, and transformed, it cannot be made to fit the locations of the mounds that existed in 1869 and that exist today.

Research at Moundville: 1900 to 1929

Between 1882 and 1905 no organized fieldwork took place at Moundville, but the work of Lupton and Middleton was incorporated into the archaeologi- cal publications of the day (see Stephanian 1880: 9-10). It was not until Clarence B. Moore ordered the steamboat Goepfri tied up at Prince's Landing in the spring of 1905 that archaeological exploration was re- sumed at Moundville. Moore, a graduate of Harvard College, a "neat-do-well" world traveler, and an in- dependently wealthy young man, gave up the continental transcontinental of the rich for archaeological fieldwork and scholarship (see Thomas 1979:30-35). In that vocation he was no dilettante. Moore's fieldwork, if somewhat crude by today's standards, was a model of excellence for the Southeast in 1905. As H. Newell Wardle observed:

For more than a decade the attention of this eminent archaeologist has centered in the mounds of our southern coast. In his search for, and capture of the site, he has explored every navigable stream and inlet from the Carolinas round to Alabama...
Here [at Moundville], as elsewhere, the enforcement of Mr. Moore's rule that no digging shall be done without his actual presence assured an accurate record of each find and its relation to other objects in the grave. (Wadde 1906:391-392).

Moore and his crew spent two-month sessions at Moundville, one in 1905, the other in 1906. The results of his work were impressive. He placed "tunnel holes" in most of the mounds and in almost every other area of the site. His is still the only data we have for features in the mounds. He made a very accurate map of the site, and he located his excavation units in relation to this map. He had some sense of the importance of the associations among artifacts, so he cataloged burials and their artifacts together. Moore and his crew recovered 801 burials, several hundred vessels, and an impressive array of "Southern Cult" artifacts. From these artifacts and his notes he produced two detailed and lavishly illustrated monographs (Moore 1905, 1907). These two volumes have been (and always will be) a valuable foundation for research at Moundville.

Moore's collections were accessioned initially by the Academy of Natural Sciences, Philadelphia, but they were transferred later to the Heye Foundation, Museum of the American Indian. At some point between excavation and accession by the Museum of the American Indian, the vessel collection was "high-graded" and the course, plain vessels were discarded (Stephens 1980a:18-19). In addition, the entirety of Moore's skeletal collection was dispersed. The Nanticoke Museum literally salvaged Moore's coastal Georgia and Florida skeletal material, but the Moundville series is still lost.

Research at Moundville: 1929 to 1941

The year the market crashed, 1929, was also the year archaeological research began once again at Moundville. Although these two events of vastly different magnitude were unrelated in the beginning, the state of the economy and the archeology of Moundville soon became partners in the effort to pull the site out of obscurity.

The federally funded projects (WPA, CCC, TVA)—supported archaeological investigations of unprecedented scope in the Southeast. Among these various state programs, the conspicuous success of the Alabama investigations can be attributed to the late Dr. John B. Jones and the archaeological skill of David L. DeJarnette. It is of note that these two scholars along with one other, Eugene A. Smith, form an unbroken intellectual chain of research at Moundville that begins with the earliest work at the site and extends up to today. One hundred and forty years of experience can be bridged in three scholarly lifetimes.

Smith was the founder of the lineage. He received an AB from the University of Alabama in 1882, earned a PhD at Harvard in 1886, and returned to the University of Alabama as an instructor of geology in 1889. Smith was non-invasive to one president of the University, brother-in-law and rival, and later friend to third, President Lupton (Sellers 1993:374). These two men, Lupton and Smith, shared a deep interest in the paleontology and geology of Alabama. Lupton accompanied Smith on several geological field trips during his years as president. In addition to his teaching duties, Smith was appointed State Geologist in 1878, founded and was appointed the first director of the Alabama Museum of Natural History in 1910. Jones, who studied with Smith during the World War I years, received his AB and MA from the University of Alabama in 1918 and 1929 respectively. He went on to earn a PhD from Johns Hopkins University in 1924. In that same year he was appointed Assistant State Geologist on Alabama. In 1927, Jones was appointed State Geologist and director of the Alabama Museum of Natural History. The oldest of the three, DeJarnette, served as an assistant in the museum during the time he was an undergraduate in the College of Engineering. In 1929, when he received his BSEE, he joined the museum staff as a full-time archaeologist. These three men, whose careers overlapped completely in the early 1930s, were all naturalists in the best possible sense of that word. In addition to their academic specialties, they all were serious students of the world around them. Moreover, it was their common commitment to Moundville that led to the research and preservation of that site.

At its inception, the work begun at Moundville in 1929 had two goals: first, to conserve the site by bringing it into public ownership; and second to show that the site had great historic value and had not been "milked dry" by Moore 25 years earlier. Both goals were part of Smith's intellectual legacy to the museum, and both were met through the efforts of Jones and DeJarnette by 1932. Public donations to the museum provided most of the funds to purchase parts of the site as they came onto the market. However, when funds were spent and lands were up for sale, Jones mortgaged his house to buy them (Walsh 1972). As a result, Jones and DeJarnette worked with Fay-Cooper Cole and the University of Chicago field school in Fulton County, Illinois. When he returned there was a radical change in excavation and recording techniques as the lessons taught by Cole were adapted to a large Mississippian ceremonial center (Pobbe 1993).

In 1935 the Alabama Museum of Natural History received a grant from the Emergency Conservation Work Program for excavation and preservation at Moundville, and this federal support continued in various forms until 1941. The general supervision of the project fell to Jones, and DeJarnette directed the fieldwork. However, when David DeJarnette was working with Major Webb in the Tennessee Valley, his tasks at Moundville were assumed by his brother Tom and James DeJarnette, Steve Wimberly, and Maurice Goldsmith. By the fall of 1941 over 15,000 m2 had been excavated in various parts of the site. This area yielded more than 2,250 burials, a minimum of 1,000 vessels and 280,000 sherds, more than 75 structures and 1000 field-lines of various proportions, and a wide variety of other artifacts and features. In total, approximately 14% of the most intensively occupied portions of the site and 4% of the site as a whole had been explored. With the threat of war halted the work, and only the most preliminary conclusions resulted from the fieldwork.
Jones and DeJarnette (n.d.) had recognized a "Moundville Culture" from the beginning of their research. However, his concept was not given permanent definition until DeJarnette and Winfield (1941) made it a part of an untainted aspect of the Mississippian pattern. Otherwise the well documented but unanalyzed materials from Moundville were put away for the duration. The staff was scattered to various theatres of the war and DeJarnette served as an officer with MackArthur's army in New Guinea.

Research at Moundville: 1941 to 1960

During the war years Mr. E. H. Chapman, an assistant in the museum, inventoried the collection and saw to its safe storage. After the war DeJarnette returned to Alabama and wrote several articles on work he completed before the war (see especially DeJarnette 1947, 1952). In 1948 he became the first curator of the Museum of Atomic Energy in Oak Ridge. He remained there until 1951 when Jones offered and he accepted the curatorship of Mound State Monument. From 1951 to his retirement in 1973 he concentrated on strengthening the museums exhibits and other public aspects of Mound State Monument, curating the collections, and aiding others in their research. He received on MA in anthropology from the University of Alabama, was appointed to the faculty, and taught several generations of very productive archaeologists.

Research at Moundville: 1969 to 1980

The first major research project at Moundville that did not have its roots in the 1950s was undertaken by Douglas H. McKenzie, a graduate student in anthropology, at U. of Alabama. McKenzie spent two months each at Mound State Monument and at the Museum of the American Indian studying the Moundville collections. One part of his dissertation (1964; we also 1966) defined the Moundville phase on the basis of ceramic, lithic, and other traits. A second part assessed the spatial and temporal place of this phase in the context of Southeastern culture history. It is unfortunate that McKenzie did not have more time to work with the records and collections at Moundville, because his general conclusions based on a cursory examination of these materials were largely correct. The ceramic markers he defined—Moundville Filmed Incised (now Carthage Incised), Moundville Filmed Engraved (now Moundville Engraved), and Moundville Incised—serve to define the phase. However, the chronological limits set by McKenzie, A.D. 1250 to 1500, turned out to be too short; his chronological limits now encompass only the last one-half of the Moundville phase. Moreover, the spatial boundaries he drew, the Tennessee River to west central Alabama, seem somewhat too restrictive. A strict definition would limit the Moundville phase to the Black Warrior River Valley from Tuscaloosa to Akron, Alabama (Peebles n.d.). Finally, because of a fundamental misunderstanding of the Moundville excavation records, McKenzie's analysis of the features and his sociological models are badly flawed.

My own involvement with Moundville began in 1963, in a seminar at the University of Chicago led by Lewis Binford. The paper written for that seminar (Peebles 1971) explored the variation in mortuary ritual at Moundville and several Mississippian sites in the Tennessee River Valley. The data for this paper came from published sources, and, as it turned out they were sufficient to establish the basis for a record between a few high status individuals and the remainder of the burials. They were also rich enough to demonstrate the use of infants and skulls as ritual artifacts in the construction of mounds and "public" buildings and in the mortuary ritual of some high status adults. This paper, and several others that had their genesis in the seminar, were published several years later, after they were presented at a Society for American Archaeology meeting (Brown 1971). Over the next three years, my interests in research that Moundville grew as a direct result of encouragement by Charles H. Fairbanks and Albert C. Spaulding. At their suggestion, I wrote an uncommitted draft of if these were data from his excavations in the 1950s that might serve as the basis for an analysis of the burials. He replied in his classic, understated way that there were some data in the records that might be of interest to me.

In 1967, with support from the National Science Foundation (GS 2857), I went to Moundville to work with the burial records. From McKenzie (1950), I expected to find approximately 500 burials in the collection. It turned out that there were more than 2,250 burials. It also became evident that any analysis of the burials must take into account their archaeological context. Because of the magnitude of the field records—eight file drawers of primary records and several times that mass of administrative and other documents—and my limited funds, it was clear that the few weeks were not sufficient to master them. A solution was provided by the Xerox Corporation who donated one of their copiers to the project. In two weeks the primary records were duplicated. Their reconstruction took the group nearly a year.

A score of the urgent excavations conducted by the Alabama Museum of Natural History between 1929 and 1944 were chosen for analysis and description. A report on these excavations was completed in 1973 and published by the University of Michigan Press in 1979. Because of the length of this manuscript, 1212 pages, it was published in microfilm rather than in book form (Peebles 1979). A sample of 1970 burials was analyzed for its informant information about social organization, and the result of this work was accepted as a doctoral dissertation in June, 1971 (Peebles 1974). The basic two-dimensional structure—a few superordinate individuals set off from the mass of subordinate individuals—was clarified and given much greater precision by this analysis. A general summary of research at Moundville was prepared for a School of American Research Seminar on the Mississippian (Peebles n.d.), an analysis of Moundville phase settlement organization was written (Peebles 1978), and an examination of the use of Service's (1971) chlordion level of sociopolitical organization in archaeology was finished (Peebles and Kiss 1977).

To the extent these analyses contributed to understanding the social and settlement organization of the Moundville phase, they also brought into bold relief the scale of the project. It was evident that more needed to be done. The most critical problem was the lack of an internal chronology. The Moundville phase at this point in the research was an undifferentiated span of several hundred years. The second problem was lack of precise information on the size, tenure, and chronological position of the sites other than Moundville.
ilar, though not identical pattern. Although infrequent in Late Archaic and Early Woodland deposits, hun-
dreds of pod fragments were found concentrated in the
fill of a stone-lined Early Woodland storage cist along
with large quantities of cultivated plants.

Pawpaw (Asimina triloba) seeds occur only in
Early Woodland deposits, but are present in extremely
low numbers. Nonetheless, their temporarily restricted
distribution suggests that they were occasionally eaten
by humans.

The Appearance of Cultigens and
their Subsequent Significance

Up to this point a pattern of wild plant utilization
has been discussed that is typical of the paleoethno-
tical record in Eastern North America from about
9000 years ago until the advent of maize agriculture.

Nuts dominate these records, and although other plant
foods were probably eaten in large quantities, their
macromorphs are infrequently found in archaeological
contexts. In spite of excellent preservation, Cloud-
spitter is no exception to this general rule.

The Cloudspitter plant assemblage is, however,
different in an important respect from the vast ma-
Jority of paleoethnobotanical collections in the East.
Because of the lack of moisture in the deposits, a con-
traversial, but well-preserved assemblage of cultivated
plants is available for study. Not only are seeds and
other reproductive structures preserved, but such deli-
cate parts as sunflower (Helianthus annuus) disk frag-
ments, Chenopodium inferences, stalks and roots,
and maygrass (Phalaris arundinacea) inferences in-
ferences occur with some regularity.

Dissociated squash (Cucurbita pepo) seed is present
in a Late Archaic deposit with an associated radio-
carbon date of 3728 ± 50 B.P. (UCLA 2315-K), and
occurs sporadically thereafter throughout the Late Arca-
ich and Early Woodland deposits. Gourd (Lagenaria siceraria) does not appear until after 3000
B.P., but its absence in Late Archaic contexts is prob-
dably due to sampling error.

Without exception, the cucurbit rinds from Cloud-
spitter originated from small fruits with thick woolly
shells. There is no trend towards decreasing rind
thickness through time, and it is assumed that the fruits
were grown mainly for their seeds and value as
containers.

The seeds and achenes of the so-called Eastern Agri-
cultural Complex—sunflower (Helianthus annuus),
cultivated sunneped (Sesamum indicum var. macroropod),
goosefoot (Chenopodium bursa-pastoris), and maygrass
(Phalaris arundinacea) and erect knotweed (Polygonum
erectum) are sparse to absent in Late Archaic levels,
occuring at a rate of about 11 seeds/liter of screened
deposit. In several cases, in fact, these Late Archaic
occurrences might be attributed to contamination from
later contexts.

After 3000 B.P. all members of the Eastern Com-
plex undergo a sudden and dramatic increase in the
size at which they were being deposited in the site.
In contrast to their paucity prior to this time, more
than 1,500 seeds/liter of screened deposit are present in
Early Woodland levels. This may be indicative of a whole-
"sale introduction of the complex into the region at this
time.

Unfortunately, human coprolites are scarce in the
Cloudspitter deposits, and it is not possible to meas-
ure the dietary contribution of the Eastern Complex
this evolution might have left traces in the archaeolog-
ical record.

If the Cloudsplitter site is really 9000 years old (or older), we are still faced with a frustrating problem—an almost 9000 year gap in the paleoethnobotanical record. While a number of sites have produced cucumber remains that cluster around 4500 B.C. (e.g. Carlson Anns and Bowies, Kentucky (Chomok and Craw-
ford 1977), and Phillips Springs, Missouri (Kay et al. 1980), no earlier cucumbers have been reported. Recent discoveries in the Lower Illinois River Valley may alter this picture.

Carbonized cucumber rinds have been reported from the Heilon Plow deposit at both the Keiser and Napolean Hollow sites dating between 7500 and 6000 B.C. (Asch and Asch 1980; Asch personal communica-
tion). These specimens effectively bridge the gap be-
tween the Cloudsplitter and other Late Archaic
squash.

While we find the possibility of 9000 (or even 7000) year old squash in Eastern North America a tantalizing prospect, until we can directly date both the Kentucky and Illinois cucumbers through the ac-
celerated C14 technique now under development, the evidence for Early and Middle Archaic squash cultivation will remain controversial.

Fossil Analysis

The rugged terrain of the Red River valley pro-
vides a heterogeneous environment with a great deal of vertical relief and botanical diversity. Prehistoric animal resources would have included large game animals such as deer, bear, elk, as well as small game mammals, birds, and turtles. Aquatic habitats in this region are not as productive or varied as they are in the larger, higher order streams of the Southeast with their associated swampy floodplains and meander holes. The fish fauna are diverse but many of the spe-
cies are too small to be considered food fish. No waterfowl would have been numerous enough to have been either a seasonal or perennial resource for aboriginal hunters.

Analysis of Prehistoric Fossil Remains. In ana-
lyzing the different types of faunal remains, great care was taken to consider the variety of depositional and post-depositional events that have resulted in a com-
plex and sometimes confusing assemblage. In addition to bone and mussel shell, hair, feathers, fish scales, eggshell, the chitinous skeleton of insects and crayfish, feces, and occasional strands of connective tissue and tendons or bone were also collected from Cloudsplitter.

The excavation units selected for analysis included all of those considered in the botanical analysis and one additional unit, K-20, which was located along the back wall of the shelter and was subject to decay of organic matter due to moisture. Material from the top (1/16") screen from all of these deposits was analyzed as well as some of the larger features. The fraction of bone that was not identifiable to vertebrate class amounted to from 10% to 12% in these samples. No quantified data on the 1/16" screen samples appear in this paper, partly because relative proportions are desired by different rates of deposition. They are discussed below in the context of the non-cultural oc-
cupation of the site. Top screen data are summarized in Table 7.

In the first part of Table 7, percentages of identified taxa are compared in terms of weight of identifiable bone. In the second part, proportions by weight are expressed in terms of the total volume of deposit from which they were recovered, producing densities per liter that can be used to compare plant and animal food remains through time and across the site. Weights of bone fragments rather than counts are presented here as a more reliable approximation of the im-
portance of each animal. A list of identified taxa is given in Table 8.

The variables that affect the interpretation of the relative quantities of various species include the dif-
ferential degree of fragmentation of bone through time (primarily a cultural process), and the changing rates of accumulation of deposit (a natural process af-
fiicted by cultural occupation). Large game, including deer and bear, provided the most animal food through-
out the occupation of the site, but the ratio of deer to other, undistinguishable large mammal remains changes over time. Count:weight ratio suggest that a decreas-
ing degree of fragmentation of bone resulting in less identifiable pieces, rather than a decreasing ratio of deer to other game taken, produces these results. Den-
sities of all types of fauna dropped during the Late Archaic, probably because these deposits contained a high proportion by volume of perishable organic mat-
ter. Early Woodland and Early Archaic deposits have been concentrated by burning and rotting, thus our inferences about changing proportions of animals through time are based primarily on percentages.

When the percentages of identifiable bone are ranked for each period, large mammal and deer ac-
count for about 80% of the bone in each case. Vari-
bility over time is seen in the assortment of animals that complemented this reliance on large mammals. In the Early Woodland, the next three categories are

Table 7. Ratios of Identifiable Bone by Weight, Cloudsplitter Rockshelter (35 MI 50).

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Early Woodland</th>
<th>Percentage Ratio</th>
<th>Later Archaic</th>
<th>Density Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early Archaic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Mammal</td>
<td>48.9</td>
<td>63.3</td>
<td>40.5</td>
<td>11.8</td>
</tr>
<tr>
<td>Deer</td>
<td>38.5</td>
<td>18.6</td>
<td>14.5</td>
<td>22.0</td>
</tr>
<tr>
<td>Bear</td>
<td>5.5</td>
<td>6.0</td>
<td>2.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Beaver</td>
<td>0.0</td>
<td>2.9</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Medium Mammal</td>
<td>0.2</td>
<td>0.9</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Small Mammal</td>
<td>0.6</td>
<td>0.6</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Large Fish</td>
<td>7.4</td>
<td>34.1</td>
<td>7.6</td>
<td>4.5</td>
</tr>
<tr>
<td>Turtle</td>
<td>5.2</td>
<td>16.5</td>
<td>2.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Sample Count</td>
<td>200</td>
<td>160</td>
<td>292</td>
<td>197</td>
</tr>
<tr>
<td>Sample Weight</td>
<td>992.5 g</td>
<td>79.5 g</td>
<td>159.4 g</td>
<td>107 liters</td>
</tr>
<tr>
<td>Sample Volume</td>
<td>298.5 l</td>
<td>149.5 l</td>
<td>292</td>
<td>177</td>
</tr>
</tbody>
</table>

large bird, turtle, and bear. In the Late Archac, large mammals are followed by turtle, medium mammal, and large birds. In the Early Archac, dove and large mammals are followed by large bird, waver, and turtle. Elk was identified from Early Archac deposits in small units that were not included in this sample.

While it is not easy to resolve these small shifts into a picture of changing hunting patterns through time, it is clear that a full range of animals and their skills to exploit them were available from the Early Archac, including the utilization of what scant aquatic resources were present. The shift from Late Archac to Early Woodland as it is broken down in these deposits is represented by a much greater change in botanical remains than in faunal remains. Animal use seems to be characterized by an emphasis on large game from the beginning. The importance of medium to small mammals in the Late Archac is replaced by the importance of turtle and bear, perhaps more productive resources, in the Early Woodland. Overall, the picture is one of relatively stable exploitation of resources that do not lend themselves to manipulation by humans in the manner that some plant resources have.

Different animal processing activity areas may also account for some observed variability in the faunas. The bone in Sampling Strata I, associated with post holes, features, and quantities of processed plant remains was food scrap area; small fragments of long bone shafts and turtle shell dominate this assemblage. One extensive Early Woodland deposit, Loc C, seemed to represent rapid deposition of specialized animal procurement and processing, containing up to 80% large bird bone by weight, with turkey the only identifiable species. Outside the central ring of breakdown blocks, there was less finely fragmented bone, less bird bone, and more large pieces of deer, bear and elk bone that appeared to be butchering and hide processing refuse.

Analysis of Non-Cultural Found Remains. In addition to finely crushed bone from larger human prey, remains caught in the 1/16" mesh wire netting and traps, shives, nicks, walruses, lizards, birds, snakes, and fish. Many of these do not seem to be human prey, as the bones are complete and the animal life was taken from 3 to 5 octogonals. At least some of this bone rose from the rooting of raccoon birds over the site, evidenced by an associated vireo that was stuffed with motor. These animals are not part of our model for human subsistence, rather they are a sample of small animals from the site to which other data on prehistoric climate and vegetation could be compared. The use of owl and hawk roots to study paleoecology is well established in the Southeast (Gulf, 1951). Though the small fauna recovered from the site do not relate to the human subsistence base or the immediate vegetation of the site, they provide evidence to reconstruct vegetational communities in the aboriginal cultivation area. Non-disturbance Phenom is available for examination of the cultural levels of the site. The fauna from the Early Archaic levels in Sampling Stratum I, dated to 8200 B.P. ± 250 (CZ 887) are only slightly different than the Late Archaic and early modern samples. One interesting identification from an Early Archaic level was the presence of the least shrew, Cryptotis parva. This tiny insectivorous species brushes or open areas to tree cover, which might indicate some nearby open or disturbed area that would have been favorable habitat for other game species, including deer and turkey.

The small sample size of faunal remains and human activity at this site do not permit a reconstruction of changing subsistence patterns for the settlement system. We have good data for studying the role of climate change, for offering evidence of subsistence remains in micro-environments, and for comparing the proportions of animal and plant food waste generated by a series of cultural occupations. We are still challenged to reconstruct actual subsistence practices from this evidence for plant and animal exploitation.

Lithic Analysis

In comparison to biological remains, the Cloudsplitter lithic assemblage is small, and dominated by a single category. The most common morpho-functional class that dominates today's literature. Instead, the waste from the manufacture and maintenance of chipped stone implement was produced.

As has been indicated in the previous sections, the occupational context of Cloudsplitter—a short term, special activity unit—has important repercussions in terms of the lithic assemblage that could be expected to have been produced. Theoretically there should be more evidence of an extensive collection of tools, and more evidence of the creation of finished tools than one might expect at a long-term, multifunctional "bison camp". This assumption can be evaluated from several perspectives.

The relative volume of lithic wave material (e.g., non-utilized debitage)—92.2% of the Cloudsplitter sample—supports the basic assumption that collection of already existing tools rather than production of new ones was the focus of lithic activities at Cloudsplitter.
This may be further illustrated by comparing the finished tool-to-debitage ratios of Cloudsplitter with other fluted sites and shelter sites in the Red River drainage (Table 9). Note the higher tool-to-waste ratios for the Anderson and Shepard sites, two large, multicomponent horizonsite sites. A typology of debitage based on platform type and amount of cores on the flake surface was constructed which resulted in 12 flake classes. A series of measurements were sent collected from 75 Archaic flakes (the combined total for Early and Late Archaic samples from Sampling Stratum 1) and 462 Early Woodland flakes. A comparative study of these two samples has yielded some encouraging preliminary results.

First it is obvious that Archaic lithic activities were almost exclusively limited to maintenance of already existing tools. No cores were found in Archaic contexts, and flakes seem to have been produced by the rejuvenation of bifacial implements. Almost 55% of the tools and flakes originated from sources outside the Red River drainage.

Early Woodland debitage presents an entirely different picture. Exhausted cores are present in the deposit, and 85% of all tools and debitage originated from locally available sources. If numbers of flakes may be equated with amount of lithic activity, then over 5 times as much occurred during the Woodland versus the Archaic (185 items/unit volume of deposit versus 56 items/unit volume of deposit).

The differences observed in the lithic population almost certainly relate to the changes in site utilization through time. It has already been suggested that the site experienced a more intensive occupation during the Early Woodland, and the debitage seems to bear this out.

Summary

Each of the sections in this paper are highly synthesized accounts of larger papers. Analyses of the Cloudsplitter shelter materials are still ongoing, although we doubt if this basic outline will change substantially. Our work over the last two years has provided us with a good outline of the history and mechanisms of deposition of cultural and natural materials within the overhang; a perspective on change and variability in local and regional foibles, and insights into patterns of plant, animal and lithic procurement strategies. Perhaps at this point we might take stock of this knowledge, and attempt to place our work at Cloudsplitter into a somewhat more cohesive integrated framework.

At the time Early Archaic people came to Cloudsplitter they were faced with a still-evolving postglacial landscape. Preserved Pleistocene sediments at the site suggest that the late Wisconsin period may have been somewhat cooler and moister than today. Both pollen and macrofossil evidence from the Early Holocene deposits seem to reflect the waning effects of the continental ice sheets on local floristics. While a number of deciduous plant species indicate a broadleaf forest was already established by 10,000 years ago, its composition was somewhat different than we see today. Hemlock trees grew immediately in front of the overhang as late as 9200 years ago. Red spruce, completely absent in the Red River drainage today, probably existed in scattered patches on the highest portions of the plateau, occurring as remnants of the formerly extensive Wisconsin-aged boreal forest that dominated higher elevations in the Appalachians.

The Early Archaic occupants of the site were clearly already well adapted to the Early Holocene flora and fauna resources of the drainage. Economic decisions were based on the seasonal availability of nuts, white-tailed deer and a variety of lesser mammalian and aquatic faunas at this early period. At this early date Cloudsplitter terms to have served as a temporary, fall-senus camp, perhaps being occupied for only a few days and nights before resource availability dictated movement. Our knowledge of the site of the group utilizing the site is incomplete, but large roof blocks indicates much of the floor of the overhang, and probably only a few nuclear families could comfortably have been accommodated within the interior.

Unfortunately, Cloudsplitter did not contain a Middle Archaic record of human occupation. This phase is mirrored in other areas of the drainage at this time period also. In spite of the fact that over 200 archaeological sites have been recorded for the Red River area, Middle Archaic manifestations are exceedingly scarce.

By 5,500 years ago Cloudsplitter once again began to serve the needs of local populations. Survey and excavation work on the valley floor downstream from Cloudsplitter have established that a sizable Late Archaic population was present in the drainage by this time. While the dynamics of Archaic population growth in the East are poorly understood, a similar phenomenon can be observed in the Green, Waushara, and Illahee River valleys further to the west. Changes in population went hand in hand with changes in local floristics.

A mixed broadleaf and coniferous forest was by now firmly established in the Red River drainage. Hemlock populations had retreated downslope from Cloudsplitter giving way to the drier upper slope communities of oaks, chestnut and hickory that typify the floristic patterns of today. As the composition of the forests in the drainage stabilized, so did Late Archaic subsistence-settlement strategies. The deposits at Cloudsplitter reveal what appears to be an increasing utilization of hickory and chestnut during the fourth and fifth millenniums B.C.

Table 9. Tool-Debitage Ratios for Various Red River Sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Type</th>
<th>Occupation</th>
<th>N</th>
<th>Tool/Debitage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloudsplitter</td>
<td>rockshelter</td>
<td>short-term Early Archaic, Late Archaic, Early Woodland</td>
<td>1,281</td>
<td>1.129.4</td>
</tr>
<tr>
<td>Haystack</td>
<td>rockshelter</td>
<td>short-term, early late Woodland</td>
<td>989</td>
<td>1.121.5</td>
</tr>
<tr>
<td>Anderson</td>
<td>flutedplain</td>
<td>large settlement, Early Woodland, Middle Woodland</td>
<td>685</td>
<td>1.122.8</td>
</tr>
<tr>
<td>Shepard</td>
<td>flutedplain</td>
<td>large settlement, Archaic, Woodland, Ft. Archeum</td>
<td>2,455</td>
<td>1.11.0</td>
</tr>
</tbody>
</table>

Southeastern Archeological Conference Bulletin 24, 1981
third millennia; faunal exploitation remains essentially unchanged, with deer, small game, and minor amounts of aquatic resources dominating the assemblage. Squash was definitively being grown by the Late Archaic populations in the drainage and provides evidence that the Red River area, in spite of its remoteness, was hardly isolated from innovations that were taking place elsewhere in the Midwest at this time.

The large comound blocks on Cloudsplitter's floor several plate limits on the site of the population that could have utilized the site at any time. Again it appears that the site was functioning as a small camp for a few nuclear families. The abundance of net shells in the deposits suggests that these peoples made repeated visits to the site in the fall of the year, taking advantage of locally available crops of mussels. Still, their visits remained of short duration; when the musket had been harvested in the vicinity of the overhang the families moved on to yet another favorable locality. The regularity at which Late Archaic groups made use of the site, soon built up the floor with domestic residue, and by 3000 years ago, no small longer disturbed which area of the shelter could be utilized.

Early Woodland populations likewise made use of the overhang. Their hearths, pits, and extensive ash deposits牛奶 were used at Cloudsplitter, and suggest a changing function for the site. Although we can detect little change in the utilization of wild plants and animals, a variety of cultivated weedly makes a sudden, and dramatic appearance in the site. Only a few hundred years separate the latest Archaic and Early Woodland occupations, leading us to believe that their horseindustrial transformations took place quite rapidly. None of the wild relatives of the Eastern Agricultural complex are present in harvestable quantities in the Red River basin today, although corn the Complex was introduced as a "package" during the Early Woodland.

We still do not call what selective pressures were operating that would have made it advantageous for Late Archaic hunters and gatherers to begin cultivating these plants. It is probably no coincident that evidence of storage technology appears commensurately with the introduction of the Eastern Complex plants. The large storage pits we have described as occurring in Sappling Stratum III are capable of holding upwards of 3000 to 5000 bays of corn, and may signal a fundamental change in the Early Woodland population's perception of the security of their environment. We have found no evidence which suggests that we can broadly interpret the changes of the area at this time horizon, and perhaps changing social relations with neighboring groups may have provided the stimuli that led to these transformations. A regularization of territorial boundaries, coupled with decreased access to alternative collecting and hunting locales is one such hypothesis that needs to be explored.

In spite of the potential for increasing residential stability that cultivation would seem to have afforded, Cloudsplitter retained a temporary extensive pattern into the Early Woodland period. Spatially isolated post and postmolds and other features within Sappling Stratum I probably reflect a continuation of use to individual nuclear families. All evidence again points to a full occupation; there are no large ovens or hearth features that would have provided warmth during the Eastern Kentucky winters. Although the site may have

been utilized for longer periods of time during the Early Woodland, it must be concluded that this abandonment took place.

After about 200 B.P., the shelter was no longer utilized by local Woodland populations. Speculation, probably overtaken visits were made to the site during the late prehistoric period, but these activities left little tangible record in the overhang.

Acknowledgements

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During the past few years there has been an increasing number of settlement pattern studies done in the Southeastern United States (Lee 1976; Smith 1978). An entire book was recently devoted to settlement pattern studies in and around the Southeastern Region during the Mississippian Period (Smith 1978). This volume included an article that presented a model of settlement patterns for societies at the chieftain level of social development that was tested against the archaeological data from the Mountville area in Alabama (Stephens 1978). Thus it appears that settlement patterns are now, more than ever, being used to help understand societal growth and development.

The approach used by the present author is to use a computer simulation in studying settlement patterns and social evolution. Preliminary analysis of the data on a regional scale has been conducted using a modified version of Stephens's I-index, and is reported elsewhere (Wood 1980). The data base used is 1960 Census, 1970 Census and 1980 Census data, gathered by the University of Georgia in the floodplain area of the Oconee River in Central Georgia. The use of this data set was provided by Dr. David Halley of the University of Georgia.

The use of a simulation, both as a heuristic tool, and as an instrument of analysis, must be done with care. Various problems can and do arise in quantifying and integrating all of the different functions and variables needed to represent a societal unit and its actions. And even if the simulation model fits the data, it cannot be used as the final answer. Its use should be more in the area of generating possibilities that can be fully tested through further research. It provides one possible answer, not necessarily the answer to any given question.

The simulation itself cannot stand on its own right, but must be checked against the archaeological record to ascertain its ability to predict or copy the observed pattern. Because of this reason the above mentioned data set was chosen for use. Its large number of sites should allow for a fine tuning of the developed model. Previous work has been done in the area. Lee (1976) has studied the relationship between soil types and topography and the patterning of kamer sites in the area. Smith and Kowalewski have included the study area as part of their tentative prehistoric province (Smith and Kowalewski 1979).
in the simulation. Additionally, other archaeological work dealing with similar societies at this level of development also found their way into the model.

Time in the simulation is incremented on a seasonal basis to allow for the maximum use of climatological variables and their possible effect on the growth and spread of the settlements. The climatological data used is drawn from that given in the U.S.D.A. (1964, 1970) soil survey reports for the study area. A uniformly distributed pseudo-random number is used to represent the season for any given year. The climate data is then used to modify yields of seasonal food resources and maintained to be used in calculating overall yields from horticulture. These data are then used to either slow down, maintain, or accelerate the population growth.

Two different methods of population growth are being used within the simulation. The first, and simplest, method is the one used by Zerowe (1973) in his Hay Hollow study of carrying capacity. This method uses a simple equation to calculate the rate of growth for the population. The second method is a cohort analysis method using the formulations of Weiss (1975) from his demographic models study. This analysis is a series of equations that use varying data from different age cohorts to calculate population growth.

Location rules for the establishment of new settle- ments from the one or two starting settlements are based on Lee's (1973) work. Available soil type, topography, and group size are utilized to establish the location and type (i.e. farming; small, temporary, etc.) of a site. The availability of local natural resources such as water sources and population size are utilized in the formula.

The simulation is currently in the last stages of de-bugging and initial running, but we are hopeful of the results. Results and equations still have to be solved and analyzed. Future analysis of the site data will hopefully help to establish a pattern of contemporaneity of the sites. The simulation will generate a pattern that will be a continually growing data set. The stepping point will be given by a certain number of years, or a point when the resource potential of the area is exceeded.

The purpose of the simulation is also to help in the delineation of possible societal groups within the Southeastern United States. At this point, we cover only a part of the hypothesized "province." Future research is geared towards increasing the program to encompass the entire region and attempt to pick up changes in the settlement patterns that could possibly indicate boundaries between groups. An effective limit to the sphere of control of local and major centers could be developed that would also help in delineating boundaries between cultural groups.

The work that is being done is the base for future research, that can hopefully help add to our understanding of cultural growth and the rules and properties that affect it.

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Christopher S. Peebles

Continuity of research and conservation of the data produced by this research have been the hallmarks of archaeological investigations at Moundville from their beginning in 1840 to the present. During these 140 years, neither indiscriminate vandalism, nor commercial site acquisition, nor have had significant harmful effects on either the Moundville site itself, or on most of the other sites of the Moundville phase. Such good fortune sets these sites off from those of almost any other archaeological phase in the South.


ARCHAEOLOGICAL RESEARCH AT MOUNDVILLE: 1840-1980

To a person, the individuals who worked at Moundville during the formative era of research there, that is from 1840 to 1910, were exceptional natural historians and scholars. Their research intended that most of their contemporaries by several orders of magnitude. To a family, for the last 140 years the owners of the house on the Moundville site have been conscious and active agents in their conservation. Only minor destruction has come to these sites through plowing. However, changes in the course of
the Black Warrior River have swept away two mounds; one village has been lost to industrial expansion; and a road within the city limits of Tuscaloosa was built to have been leveled by that city's authorities in the 1820s or 30s (Maxwell 1876:74). Only two breaches of curatorial trust, one in the first quarter of the twentieth century, the other in the last, have diminished the collections made at these sites by five generations of scholars. The papers below are testimony to an unbroken line of researchers who bring us to the present generation of archaeologists who worked at Moundville. There is not a single question, proposition, or paper here that does not use directly the materials and observations handed down to us from the past: the prehistoric past of the tenth through sixteenth centuries, the scholarly past of the nineteenth and twentieth centuries. It is the interplay of these two pasts that will form the substance of this paper.

Research at Moundville: 1840 to 1900

The earliest archaeological work at Moundville was conducted in the spirit of the "natural history circle" that influenced American scholarship from the time of the Bartmanns and Jefferson in the eighteenth century to that of Lewis and Clark, Catlin, and Schoolcraft in the nineteenth century (see Savage 1979). Thomas Maxwell, who conducted the first archaeological work at Moundville, was definitely a member, albeit a provincial one, of this circle. In 1840 he dug a trench in Mound B and noted the stratification and features inclusive to his mound. He traced the earthen enhancement that circled the site and described various other features found near the mounds. For the next twenty years, however, no further excavation was made by the landowners and others at Moundville. He published his Moundville work as part of a larger history of Tuscaloosa in 1876 (Maxwell 1876). His conclusions about Moundville embraced Armies, bloody warfare, lost tribes, and arcane knowledge, all of which showed familiarity with the natural historical writings of his day.

Between 1840 and 1869 a trench was cut into Mound G by someone, perhaps Maxwell, a "Giant," was found by Mr. Hershkin Powell near the base of Mound B (Maxwell 1876:70), and other features and artifacts continued to erode out of deposits near the bases of the mounds and the earthen embankment. During this period brief mention of Moundville was included in Ancient Monuments of the Mississippi Valley (Squier and Davis 1848) and in the History of Alabama . . . (Pickers 1851). No excavations have been reported, however, between those of Maxwell in 1840 and Nathaniel T. Lupton in 1869.

Lupton was the first person to conduct a systematic examination of the Moundville site, as well as the first scholar to conduct "sponsored research" there. Born in 1830 in Virginia, Lupton was to become a renowned scientist. He was a graduate of Dickinson College and studied under Bunsen in Germany. He was a pioneer in the new academic discipline of physical chemistry at Randolph-Macon College then at Southern University; a chemist with the Niter and Mining Bureau of the Confederate States of America; President of the University of Alabama; professor of chemistry at Vanderbilt University; and concluded his distinguished career as professor of chemistry at the Alabama Polytechnic Institute (Auburn). He died at Auburn in 1893 (Sellers 1955:314-315).

At the end of the Civil War, Lupton returned to his post at Southern University, Greensboro, Alabama. As a professor there, he was contacted by Joseph Henry, Secretary of the Smithsonian Institution and asked to explore the Indian Mounds of Alabama. On May 31, 1869, he was authorized funds for him to explore the Indian Mounds on the Black Warrior River. Lupton, after a delay caused by illness and University duties, began fieldwork at Moundville in September, 1869. He and a crew of five workers spent four days mapping the site and excavating a trench in Mound O. His notes on this excavation were sufficiently detailed for a contemporary reconstruction of the mound's stratigraphy and the location of the features therein (Stephanitis laboratory notes). Lupton's map of the site as a whole was complete, accurate, and was drawn to scale. He correctly located the mounds, showed the course of the earthen embankment south of the plaza, and noted therein that Mound G had been "opened about 56 years since." He shipped his Moundville materials to Washington by railway Express and after a delay of several months they reached the Smithsonian in March, 1870. The total bill for Lupton's work, exclusive of the freight charges, was $298.85.

Subsequent to Lupton's work, the Smithsonian Institution became involved one more time in field archaeology at Moundville. After Cyrus Thomas had been appointed director of the newly formed Mound Exploration Division of the Smithsonian Institution in 1881, he went one of his assistants, James D. Middle- ton, to work at Moundville. Although Middleton's brief stay at Moundville in 1882 did add to the collections of the U.S. National Museum, his field ob- servations and notes were far below the standards set by Lupton. Some of Middleton's maps of individual mounds can be matched to existing mounds, but his map of the site bears no relationship to reality (National Anthropological Archives 2940 Box 11: Stephanitis 1880s-90s). No matter which way this map is turned, stretched, and transformed, it cannot be made to fit the locations of the mounds that existed in 1869 and that exist today.

Research at Moundville: 1900 to 1929

Between 1882 and 1905 no organized fieldwork took place at Moundville, but the work of Lupton and Middleton was incorporated into the archaeologi- cal publications of the day (see Stephanitis 1890s: 9-10). It was not until Charles B. Moore ordered the steamboat Gopher tied up at Prince's Landing in the spring of 1906 that archaeological exploration was re- sumed at Moundville. Moore, a graduate of Harvard College, a science-world traveler, and an inde- pendently wealthy young man, gave up the continental transcontinental of the rich for archaeological fieldwork and scholarship (see Thomas 1979:50-53). In that vacation he was no dilettante. Moore's fieldwork, if somewhat crude by today's standards, was a model of excellence for the Southeast in 1906. As H. Newton Wardle has noted, "In 1906...

For more than a decade the attention of this eminent archaeologist has centered in the mounds of our southern coast, in his steam- yacht, bearing every necessary appliance, includ- ing an efficient force of experienced diggers, he has explored every navigable stream and inlet from the Carolinas round to Alabama..."
Here (at Mountville), as elsewhere, the enforcement of Mr. Moore's rule that no digging shall be done without his actual presence assured an accurate record of each find and its relation to other objects in the grave. (Wardle 1905:201-202).

Moore and his crew spent two one-month sessions at Mountville, one in 1905, the other in 1906. The result of his work was impressive. He planned "trail-holes" in most of the mounds and in almost every other area of the site. He is still the only data we have for features in the mounds. He made a very accurate map of the site, and he located his excavations units in relation to this map. He had some sense of the importance of the grave-goods among artifacts, to extract burials and their artifacts together. Moore and his crew recovered 800 burials, several hundred vessels, and an impressive array of "Southern Cult" artifacts. From these artifacts and his notes he produced two detailed and lavishly illustrated monographs (Moore 1905, 1907). These two volumes have been "and always will be a valuable foundation for research at Mountville.

Moore's collections were accessioned initially by the Academy of Natural Sciences, Philadelphia, but they were transferred later to the Heye Foundation, Museum of the American Indian. At some point between excavation and accession by the Museum of the American Indian, the vessel collection was "high-graded" and the coarse, plain vessels were discarded (Sprague 1980a:18-19). In addition, the entire of Moore's skeletal collection was dispersed. The Nasco County Museum literally salvaged Moore's central Georgia and Florida skeletal material, but the Mountville series is still lost.

Research at Mountville: 1929 to 1941

The year the market crashed, 1929, was also the year of the great archaeological reconquest of Mountville. Although these two events of vastly different magnitude were unrelated in the beginning, the story of the economy and the archaeology of Mountville soon became part of the effort to pull the nation out of the Great Depression. The federally funded works projects—WPA, CCC, TVA—supported archaeological investigations of unprecedented scope in the American South. This was the time when almost everyone involved in the conspicuous success of the Alabama investigations could be attributed to the vision of Walter B. Jones and the archaeological skill of David L. DeJarnette. It is of note that these two scholars along with one other, Eugene A. Smith, form an unbroken intellectual chain of research at Mountville that begins with the earliest work at the site and extends up to today. One hundred and forty years of experience can be bridged in these scholarly lifetimes.

Smith was the founder of the lineage. He received an AB from the University of Alabama in 1882, earned a PhD at Harvard in 1888, and returned to the University of Alabama in the capacity of instructor in 1889. Smith was soon-in-law to one president of the University, brother-in-law to a second, and close friend to a third, President Lupton (Selzer 1950:374). These two men, Lupton and Smith, shared a deep interest in the geology and prehistory of Alabama, and Lupton accompanied Smith on several geological field trips during his years as president. In addition to his teaching duties, Smith was appointed State Geologist in 1879 and he founded and was appointed the first director of the Alabama Museum of Natural History in 1910. Jones, who studied with Smith during the World War I years, received his AB and his PhD from the University of Alabama in 1918 and 1920 respectively. He went on a PhD with Smith in 1921 and received his PhD in 1924. In that same year he was appointed Assistant State Geologist of Alabama. Upon the death of Smith in 1927, Jones was appointed State Geologist and director of the Alabama Museum of Natural History. The youngest of the three, DeJarnette, served as an assistant in the museum during the time he was an undergraduate in the College of Engineering. In 1929, when he received his BS, he joined the museum as an assistant full-time archeologist. These three men, whose careers overlapped completely in the early 1930s, were all naturalists in the first possible sense of that word. In addition to their academic specialties, they were all well versed in the world of the real. At that time, it was their common commitment to Mountville that led to the research and preservation of that site.

At its inception, the work begun at Mountville in 1929 had two goals: first to conserve the site by bringing it into public ownership and second to show that the site had great historic value and had not been "ruined by" Moore 25 years earlier. Both goals were part of Smith's intellectual legacy to the museum, and both were met through the efforts of Jones and DeJarnette by 1932. Public donations to the museum provided most of the funds to purchase parts of the site as they came onto the market. However, when funds were short and land was up for sale, Jones mortgaged his house to buy them (Walsh 1977:4).

As the land was purchased (ten excavations were undertaken to explore the new acquisitions). These excavations showed this most of the site was intact and that Moore had removed little if any of the real part of the site. Once the potential had been demonstrated and preservation had been assured, the next goals were to improve the quality of the excavations and to put together a long term research program for the site. To these ends, DeJarnette spent the summer of 1935 working with Fay-Cooper Cole and the University of Chicago field school in Fulton County, Illinois. When he returned there was a radical change in our approach and recording techniques as the lessons taught by Cole were adapted to a large Mississippian ceremonial center (Peebles 1976).

In 1938 the Alabama Museum of Natural History received a Federal Emergency Program for excavation and preservation at Mountville, and this federal support continued in various forms until 1941. The initial supervision of the project fell to Jones, and DeJarnette directed the fieldwork. However, when, David DeJarnette was working with Major Webb in the Tennessee Valley, his tasks at Mountville were assumed by his brothers Tom and James DeJarnette, Steve Wimberly, and Maurice Goldsmith. The by the fall of 1945 over 65,000 m³ had been excavated in various parts of the site. This area yielded more than 2250 burials, a minimum of 1000 whole vessels and 200,000 sherds, more than 75 structures and 100 features, several thousand artifacts, and a wide variety of other artifacts and features. In total, approximately 14% of the most intensively occupied portions of the site and 4% of the site as a whole had been explored. The threat of war halted the work, and only the most preliminary conclusions resulted from the fieldwork.


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Jones and DeJarnette (n.d.) had recognized a "Moundville Culture" from the beginning of their research, but the site was not properly defined until DeJarnette and Wetherbee (1947) made it part of an unnamed aspect of the Mississippian period. Otherwise the well-documented but unanalyzed materials from Moundville were put away for the duration. The staff was scattered to various theaters of the war and DeJarnette served as an officer with MacArthur's army in New Guinea.

**Research at Moundville: 1941 to 1946**

During the war years Mr. E. H. Chapman, an assistant in the museum, inventoried the collection and saw to its safe storage. After the war DeJarnette returned to Alabama and wrote several articles on work he completed before the war (see especially DeJarnette 1947, 1952). In 1948 he became the first curator of the Museum of Atomic Energy in Oak Ridge. He remained there until 1951 when James offered and he accepted the curatorship of Mound State Monument. From 1951 to his retirement in 1975 he concentrated on strengthening the museum exhibits and other public aspects of Mound State Monument, curating the collections, and aiding others in their research. He received an MA in anthropology from the University of Alabama, was appointed to the faculty, and trained several generations of very productive archaeologists.

**Research at Moundville: 1969 to 1980**

The first major research project at Moundville that did not have its roots in the 1950s was undertaken by Douglas H. McKenize, a graduate student in anthropology at the University of Alabama. McKenize spent two months each at Mound State Monument and at the Museum of the American Indian analyzing the Moundville collections. One part of his dissertation (1965; see also 1966) defined the Moundville phaser on the basis of ceramic, lithic, and other traits. A second part assessed the spatial and temporal place of this phase in the context of Southeastern culture history. It is unfortunate that McKenzie did not have more time to work with the records and collections at Moundville, because his general conclusions based on a cursory examination of these materials were largely correct. The ceramic markers he defined--Moundville Filmed Incised (now Carriage Incised), Moundville Filmed Engraved (now Moundville Engraved), and Moundville Incised--serve to define the phase. However, the chronological limits set by McKenzie, A.D. 1250 to 1350, turned out to be too short; his chronological limits now encompass only the last one-half of the Moundville phase. Moreover, the spatial boundaries he drew, the Tennessee River to west central Alabama, were too narrow. A strict definition would limit the Moundville phase to the Black Warrior River Valley from Tuscaloosa to Know, Alabama (Peeples n.d.). Finally, because of a fundamental misunderstanding of the Moundville excavation records, McKenize's analysis of the features and his sociological models are badly flawed.

My own involvement with Moundville began in 1965, in a seminar at the University of Chicago led by Lewis Binford. The paper written for that seminar (Peeples 1971) explored the variation in mortuary ritual at Moundville and several Mississippian sites in the Tennessee River Valley. The data for this paper came from published sources, and, as it turned out they were sufficient to establish the basic pattern of a strong dichotomy between a few high status individuals and the remainder of the burials. They were also rich enough to demonstrate the use of Infinity and skulls as ritual artifacts in the construction of mounds and "public" buildings and in the mortuary ritual of other high status adults. This paper, and several others that had their genesis in the seminar, were published several years later, after they were presented at a Society of American Archaeology meeting (Brown 1971). Over the next three years, interest in Moundville grew as a direct result of encouragement by Charles H. Fairbanks and Albert C. Spaulding. At the request of these colleagues I wrote "Moundville and if there were data from his excavations in the 1950s, that might serve as the basis for an analysis of the burials. He replied in his classic, understated way that there were some data in the records that might be of interest to me.

In 1967, with support from the National Science Foundation (GS 2857), I went to Moundville to work with the burial records. From McKenize (1965). I expected to find approximately 500 burials in the collection. It turned out that there were more than 2,250 burials. It also became evident that any analysis of the burials must take into account their archaeological context. Because of the magnitude of the field records--eight file drawers of primary records and several times that mass of administrative and other documents—and my limited funds, it was clear that the few weeks were not sufficient to master them. A solution was provided by the Xerox Corporation who donated one of their centers to the project. In two weeks the primary records were duplicated. Their reconstruction took the greater part of the following year.

A score of the largest excavations conducted by the American Museum of Natural History between 1929 and 1941 were chosen for analysis and description. A report on these excavations was compiled in 1973 and published by the American Museum of Natural History in 1973. Because of the length of this manuscript, 1212 pages, it was published in microfiche rather than in book form (Peeples 1979). A sample of 177 burials was analyzed for its latent information about social organization, and the result of this work was accepted in a dissertation in June, 1974 (Peeples 1974). The basic, two-dimensional structure—a few superordinate individuals set off from the mass of subordinate individuals—was clarified and given much greater precision by this analysis. A general summary of research at Moundville was prepared for a School of American Research Seminar on the Mississippian (Peeples n.d.), an analysis of Moundville phase settlement organization was written (Peeples 1978), and an examination of the use of Service's (1971) chiefdom level of social organization was presented and was finished (Peeples and Kus 1977).

To the extent these analyses contributed to understanding the social and settlement organization of the Moundville phase, they also brought into bold relief the gaps in the data and the research that was yet to be done. The most critical problem was the lack of an internal chronology. The Moundville phase at this point in the research was an undifferentiated span of several hundred years. The second problem was lack of precise information on the size, variety, and chronology of the sites other than Moundville.
especially the single mound centers. Third, because floral and faunal materials were not recognized as signif-
ificant, they were not collected by the 1956 fieldwork,
and therefore there were few data on the subsistence
system for the Moundville phase. Fourth, there was
a series of behavioral propositions that could be tested
with either the data in hand or with data which could
be recovered with a minimum of excavation. These
propositions ranged from the development of craft
specialization, to the diet of the elite, to the evolution
of horticultural systems. Moreover, all these questions
could be tied, in one way or another, to the develop-
ment of social complexity.

With the advice and active collaboration of
Margaret Scarry, Margaret Schoening, and Vitus
Storrsmitz, I wrote a draft of a grant application to
the National Science Foundation that would support
the research to answer some of these questions. The
draft circulated among us, was criticized and rewritten,
and was submitted with myself as principal investigator
and Scarry, Schoening, and Storrsmitz as co-investi-
gators. We proposed four interrelated research proj-

ets:
1) An analysis and seriation of ceramic vessels
recovered from secure contexts at Mound-
ville; an analysis of the organization of ce-
ramic production to yield information on
craft specialization; and identification of
non-local ceramics to provide data on the
role and range of exchange systems.
2) An archaeological survey and testing pro-
gram at Moundville phase sites in the Black
Warrior Valley to yield measures of site size,
age, and variety.
3) Excavations in areas of stratified deposits at
Moundville designed to recover floral and
faunal remains and a stratified ceramic sam-
ple with which to cross-check the results of
the ceramic seriation.
4) A trace element analysis of human bone
from the skeletal collection that would measure
the relative proportion of meat in the diet of
various social groupings, including status,
age, and sex.

Our application was accepted and funds were
awarded and the project began in 1975 (and is in
progress as this is written). As the research progressed, the partnership was in-
creased by two co-investigators, Tandy Buzeman and
Paul Welch, and we were joined also by our colleagues
Margaret Hardin and Sandra van der Leeuw. In addi-
tion, Alice Haddy and Lauren MichaN were added to
the data that could be analyzed for the project.
They too joined the project. The extent to which we
have succeeded in answering the questions we origi-
nally posed can be judged from the papers which
follow.

Acknowledgments

As an expression of our gratitude, this symposium
is dedicated to our predecessors at Moundville. With-
out their excellent work, particularly that of David
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field crew have made work on the project a pleasure.
Finally, our colleagues at Michigan, staff and students,
have given of their time unstintingly, offering both
encouragement and encouragement (and in some cases hard
'above). The success of the project is in part due to all
of the above. The responsibility for it, however, rests
on our shoulders.

Note:
Bibliographic references for this and the following ten papers
are contained and included separately on pages 116-117.

Paul D. Welch

This paper briefly outlines the West Jefferson
phase, a Terminal Woodland manifestation in west
central Alabama. The phase occupied the valley of the
Black Warrior River immediately prior to the Mound-
ville phase, thereby coming under study by the Uni-
versity of Michigan Moundville Project and by several
other investigators (Jenkins 1976, 1979;285-273; Sock-
tinger and Jenkins 1980). Rather than discussing the
relationship between the West Jefferson and Mound-
ville phases, I describe the settlement and subsistence
patterns of the West Jefferson phase and argue that
our current knowledge of the Terminal Woodland
sociopolitical setting must be greatly enhanced before
we can adequately explain subsequent developments.


THE WEST JEFFERSON PHASE:
TERMINAL WOODLAND TRIBAL SOCIETY
IN WEST CENTRAL ALABAMA

The West Jefferson phase was defined by Jenkins
and Nielsen in 1974 and in more detail by Jenkins
in 1976. At the time of the Jenkins paper (1976) the data
base consisted of five or six excavated components from
near Birmingham, Alabama, radiocarbon dated to A.D.
900-1050. All of the sites were apparently seasonally
occupied, limited activity settings for one or a few
dwellings (O'Hear 1973; Enos 1979; Schofield 1975,
1977; Jenkins 1976). Preliminary ethnohistoric anal-
ysts suggested that there was some, but not much, re-
sistance to conquer, specifically warfare (Jenkins

The Moundville Project supplemented this data
base by surface collecting roughly a dozen West Jeffe-

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son phase 0.5 to 1.0 ha villages on the floodplain of the Black Warrior River below the Fall Line at Tuscaloosa, and by completing the ethnoarchaeological analysis of pit fills from one of the small West Jefferson sites excavated by Jenkins and Nielsen [1974]. Currently, the continuing analysis of these materials (see papers by Scarry and by Bostman, this volume) suggests a subsistence and settlement schedule roughly as shown in Figure 1. The floodplain villages were occupied from late spring through early fall, gardens cultivated and harvested, and locally available wild foods collected and hunted. Coinciding with a switch to dependence on nuts and fauna obtained outside the floodplain zone, these villages were partially abandoned in late fall. Population dispersed to small sites such as those known from the Birmingham area (see above).

Taking into account the seasonal mobility and the relatively small size of the population (25,000 for the villages on the Black Warrior floodplain below Tuscaloosa), West Jefferson society was most likely tribally organized, in Service's sense [1971]. This is not to say that the West Jefferson phase can be equated with a West Jefferson tribe. To investigate the nature of interaction among West Jefferson communities and between West Jefferson communities and those surrounding them, we can turn to the extensive data on ceramic distributions.

My use of ceramic variability as an indicator of patterns of social interaction is primarily based on Wobst's theory of style [1977]. In part, Wobst [1977; 328-330] argues that the use of style to convey messages about social group affiliation is more likely in some contexts than in others. One relevant factor is visibility; the likelihood of a variable being a 'message carrier' decreasing with decreasing visibility to the individual or group to whom the message is addressed. In the case of the Alabama Terminal Woodland, ceramic tempering agent would not be a 'message carrying' variable, since sand and grog, the two principle temperants, are not readily visible in a complete pot. For a different reason, vessel surface treatment is another variable which does not seem to bear the message about social group affiliation. The two principal treatments, smoothed and cordmarked, tend to occur on different vessel shapes and sizes (compare Jenkins [1978:117-120 with Jenkins 1978:127]), and thus seem to reflect vessel function rather than social affiliation. If neither the tempering agent nor the surface treatment were selected by Terminal Woodland potters as carriers of messages about social group affiliation, then the geographic distributions of these two variables must be the result of other factors (see Figs. 2 and 3, based on data from Jenkins and Nielsen 1974; Bozeman personal communication; Nielsen et al. 1974; Dickens 1974; Jeter 1977; Sheldon et al. 1980; Jenkins 1979; Blakeman et al. 1977; Furtado 1977; Heimbach 1962; Griffin 1939; Haag 1940; Nielsen et al. 1971).

To explain the geographic distributions of these ceramic attributes, I use an approach complementary to Wobst's theory of style. Called the 'learning theory' approach (see exposition of the logic, see Plog 1976:154-155; Von 1980:89-115), it indicates that in the absence of other controls (such as Wobst's 'message carrying') the geographic distributions shown in Figs. 2 and 3 reflect long-term patterns of residential stability and social interaction. I interpret the ceramic distributions as showing greater homogeneity within major drainages than across drainage divides, implying that over the long run there was greater movement and contact of individuals within drainages than across drainage divides.

The conclusion that social interaction over the long run was patterned by drainage divides is specified by a conclusion about the movement and communication of individuals. According to the logic of my argument, the ceramic variables I have used do not directly carry information about political or ethnic groupings. The nature and geographic boundaries of such groupings must be determined by other analysts. Such analysis must have a theoretical base more sound than an implicit equation of ceramic types with social groups, since patterns of political alliance and conflict can shift very rapidly relative to changes in material technology (see, for example, Heider 1970). The es

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**Figure 1** West Jefferson phase subsistence, settlement cycle.

**Figure 2** Occurrence of grog tempering A.D. 300-950.

*Southeastern Archaeological Conference Bulletin 21, 1991*
sentral point here is that the character of the interactions between villages or groups of villages in the West Jefferson phase, and the relations between West Jefferson and non-West Jefferson groups, must be determined by analysis of appropriate variables. Unlike the ceramic variables I have used, examples of appropriate variables would, for instance, have the characteristics outlined by Wobst (1977) for stylistic expressions of social group affiliation.

While I cannot yet offer such an analysis, I suggest that a useful first step is to determine the character of interactions between social groups. Available evidence indicates that there was intergroup warfare possibly within a context of shifting political alliances. The warfare is indicated by the high incidence of arrow points in a mortuary assemblage apparently of West Jefferson derivation (Oakley 1971). The shifting nature of political alliances is not positively documented but is plausible given the demographic effects of warfare on small social groups.

Clearly we do not yet have an adequate understanding of the social and political processes operating in the West Jefferson phase. The University of Michigan Moonsville Project has contributed significantly to knowledge of the subsistence economy and settlement pattern of the phase, and for those aspects we can outline the differences between the West Jefferson and Moonsville phases. However, understanding the origin of the Moonsville clearfoot must await a much more thorough knowledge of the sociopolitical milieu within which it developed. For this reason the West Jefferson phase remains a subject of importance to archaeologists interested in the Terminal Woodland–Mississippian interface in the Southeast.

Tandy K. Bozeman

MOUNDVILLE PHASE SITES IN THE BLACK WARRIOR VALLEY, ALABAMA: PRELIMINARY RESULTS OF THE UMMA SURVEY

One of the major goals of the Moundville project was to measure the distribution, variety, and chronological position of the Mississippian communities in the Black Warrior Valley. The accomplishment of this goal was dependent upon the successful construction of a fine-scale ceramic chronology for the Moundville site. Recently completed (Stephens 1980a), the chronology (Table 1) has proven to be applicable to other Moundville phase sites in the valley and provides the temporal control essential to the investigation of variability and change in the Moundville system. This paper presents some preliminary results of two seasons of site survey and test excavations by the University of Michigan Museum of Anthropology (UMMA) crews at the Moundville phase sites which lie along the Black Warrior River some 25 km to the north and south of the great Mississippian ceremonial center at Moundville, Alabama.

Prior to the UMMA survey, our knowledge of Moundville phase sites in the Black Warrior drainage was highly limited. The only sites, other than Moundville itself, for which there was detailed information were Bessemer (Bejarrette and Wimberly 1941), and Snoo's Bend (Bejarrette and Pecoles 1970). Other Mississippian sites in the valley were mostly known from brief survey reports compiled in the 1950s by Dr. Walter B. Jones. Subsequent surveys by Niven et al. (1973) in Hale and Greene Counties, and by Washburn and Colbren (1977) at the mouth of Big Sandy Creek, were restricted in area or limited in scope.

Our research in the Black Warrior Valley, together with current research by the University of Alabama, has begun to dramatically change this picture. During the 1978-1979 field seasons, the Michigan survey team conducted controlled surface collections and test excavations at most of the recorded Moundville phase sites in the Black Warrior Valley from Tuscaloosa in the north, to Akron, Alabama in the south. In addition, several new sites, at least one a minor ceremonial center, were discovered and investigated. In all, the two-year survey collected 402, 20 m² surface units on 15 different sites; placed from 1 to 3 test excavations into each of 10 platform mounds; and recovered material from an additional 21 West Jefferson and Moundville phase hamlets and villages.

The locations of the major sites included in the UMMA survey are shown in Figure 1, while Table 2 presents a summary of the tentative chronological positions assigned to these sites. It should be noted that the majority of the off-mound surface collections contained some West Jefferson (or earlier) material. Nevertheless, West Jefferson is noted in Table 2 only when material from this time period constitutes the principal archaeological component at a site.

At each of the village sites where a controlled collection was feasible, the following procedure was employed: The entire surface of the site was divided into 20 m² collection units, and all visible material on the surface was collected and tagged by unit. Each artifact collected within a particular collection unit was considered to be located at the center of that unit. We anticipated that the 20 by 20 m units would be small enough to recover meaningful artifact distribution information, and yet not turn the surface collection of any site into a cataloging nightmare. The count, weight, and collection unit coordinates for each artifact class were entered into a file file in the University of Michigan computer. These data, in turn, introduced into Michigan's Surface II computer data program.

Table 1. Stephens Chronology for the Late Prehistory of the Black Warrior Valley.

<table>
<thead>
<tr>
<th>Period</th>
<th>Phase</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama River</td>
<td>Moundville III</td>
<td>AD 1500</td>
</tr>
<tr>
<td>Mississippian</td>
<td>Moundville II</td>
<td>AD 1250</td>
</tr>
<tr>
<td></td>
<td>Moundville I</td>
<td>AD 1050</td>
</tr>
<tr>
<td>Late Woodland</td>
<td>West Jefferson</td>
<td>AD 900</td>
</tr>
</tbody>
</table>

Figure 1. Moundville phase sites in the Black Warrior River Valley.

Table 2. Distribution of shell-tempered ceramics by weight in grams—contour interval: 10 grams.

Figure 2. Distribution of grog-tempered ceramics by weight in grams—contour interval: 10 grams.

Surface II (Sampson 1978) is a computer software system for the creation of displays of spatially distributed data. The basic form of display produced by Surface II is a contour map, a plot of two coordinates (X and Y) on which the values of the third variable (Z) are defined by lines of equal value. Although traditionally employed to display lines of equal ground elevation, the procedure can more generally be used for any display in which the values of one variable can be "located" at coordinates defined by the other two variables. The only requirements that must be met are: (1) the coordinate variables be orthogonal and (2) the mapped variable be single-valued (Sampson 1978:1).

The use of contour maps as an aid in the analysis of the spatial relationships of archaeological data has obvious potential. It is generally agreed that different types of artifacts found within different areas of an archaeological site provide clues to the centers of activity when the site was inhabited (Sampson 1978:18). To the extent that a site is intensively and systematically collected, contour maps of the artifacts recovered can be a powerful tool for determining the internal structure of the site.

The first run of Surface II maps of artifact distributions on the Moundville phase sites in the UMMA survey has already given us cause to reassign the importance of the hamlet as an essential element in the Moundville phase settlement system. The maps clearly show highly localized distributions of Moundville phase material on many of the Black Warrior Valley sites. For example, compare the broad spread of grog-tempered ceramics on 1 Ha 92 (Fig. 2) with the highly localized distribution of shell-tempered ceramics on the same site (Fig. 3). Highly restricted distributions of shell-tempered ceramics are evident on other sites; a pattern which suggests that many of the Moundville phase sites in the Black Warrior Valley, long thought to be large Mississippian villages, in fact, are large
West Jefferson villages underlying a later and smaller Moundville phase settlement. There is no evidence for sizable Moundville phase villages until late in the period: late Moundville II or early Moundville III times.

The paucity of previously reported hamlets for the Moundville phase can be explained by their low visibility and by the general lack of intensive survey in the Black Warrior floodplain. During Walthall's limited but intensive survey at the mouth of Big Sandy Creek (Walthall and Colehar 1972), he discovered two Moundville phase sites of hamlet size within 0.5 km². In addition, the UMMA survey team discovered a number of Moundville phase hamlets while attempting to relocate larger sites reported in the 1935 survey.

During the second field season, the UMMA survey attempted to obtain some measure of the occurrence of Moundville phase hamlets in the Black Warrior floodplain. Paul Welch and his field crew searched a number of large fields by walking transects 20 to 40 m apart. Within a 1 km² survey area, 18 light artifact scatters 10 to 20 m in diameter were discovered and collected. All of these small sites produced Moundville phase material. These sites, together with the steadily growing number of hamlet-size settlements reported for other areas of the floodplain, strongly suggest that the hamlet was a fundamental element in the Moundville phase settlement system.

In addition to establishing the importance of the hamlet as a settlement type, the new data produced by the UMMA survey, when viewed against the temporal framework provided by Steponaitis's chronology (1986:47), are allowing us to better understand both the distribution of Moundville phase settlements in the Black Warrior Valley, and the nature of change in that distribution over time. For example, it appears that settlements north of Moundville are generally earlier than those to the south. Further, not only are the Moundville phase sites clustered in the valley as suggested by Peebles (1975), Peebles et al. (1979), and Steponaitis (1978); but also, there is growing evidence that these clusters may well represent bounded areas which contain only one minor civic-ceremonial center from each time period, and which maintain some integrity over the 500 years of the Moundville phase.

It is, perhaps, wise to end these remarks on a note of caution. The analysis of the UMMA survey data has just begun, and the results presented here are preliminary and certain to be revised and refined. Nevertheless, it should be evident that our work in the Black Warrior Valley is transforming the Moundville phase from a static atemporal cultural block to a settlement system model with temporal depth and a linear spatial pattern (Peebles et al. 1979). Never before, in the long history of archaeological investigations at Moundville and related sites in the Black Warrior Valley, have we seen so well equipped to assess the Moundville phase in terms of a dynamic cultural system interacting over time and space with its natural and social environment.

C. Margaret Scarry

THE UNIVERSITY OF MICHIGAN
MOUNDVILLE EXCAVATIONS: 1978-1979

In 1978 and 1979, small scale, intensive excavations were conducted at Moundville. These excavations were designed to maximize retrieval of subsistence remains, and to collect a core sample from a stratified context. The focus of the excavations was an area north of Mound R, although additional test pits were excavated south of Mound I and south of the Conference Building (Fig. 1).

The field methods chosen maximized stratigraphic control and date recovery. All excavating was done by trowel. Where natural strata existed, they were used to define excavation levels; where there was no clear stratigraphy, 10 cm arbitrary levels were employed. Features were noted during the excavation of each level. Upon completion of a level, the features were cross-sectioned and their profiles were drawn. If a feature continued for more than one level, the process was repeated. To maximize retrieval of subsistence remains, both flotation and water-screening were employed. Three liter core samples were floated from every excavation level, and feature contents were floated in entirety. Any dirt from level contexts which was not floated was water-screened through 6.4 and 1.6 mm mesh screens.

The area north of Mound R was selected for excavation because previous work had indicated that it contained the type of data required by the project. In 1909, C. B. Moore excavated a ridge north of Mound R. He described the deposit as a dwelling site: noting his workers had encountered charcoal, pottery, and deer bones (Moore 1909:229). He also described burials in pits extending into the mound. In 1973-1974, the area north of Mound R was again the focus of excavations; this time by a field school directed by David DeJarnette. These excavations disclosed a stratified deposit 2 m in depth. Traces of structures, numerous pits and post molds were encountered within the deposit. Large quantities of ceramics were recovered and, though neither fine-screening nor flotation were employed, both floral and faunal remains were recovered.

As part of our project, two 2 m² units were excavated adjacent to DeJarnette's pit north of Mound R. The depositional sequence was extremely complex (Fig. 2). In both units, the upper portion of the deposit was midden. At 30 to 45 cm below ground surface, traces of sand floors were encountered; associated with the floors were post molds and wall trenches. The positions of the wall trenches and floors suggested that the floors in the two units represented separate structures. A layer of debris was encountered at 75 cm below ground surface. Under the debris, was a series of superimposed sand floors divided into three sets separated by shallow midden deposits. The close correspondence between the series in the two units indicated that both units were within a single structure. Beneath the third set of floors in one of the units, a portion of a semi-subterranean, rectangular wall trench structure was encountered. Three floors and two adjacent wall trenches were associated with this structure. In the second unit, refuse pits were encountered at a depth corresponding to that of the "pit house".


In all, the excavation of the 2 units encompassed 28 levels per square and a total of 204 Mississippian features including: 125 post molds; 8 wall trenches; 19 ash or burnt lumps; and 51 pits. The ceramics from the excavations have been analyzed by Steponaitis, and the results have been integrated into his study of the vessels from extant Moundville collections (1980a). Steponaitis reports (personal communication) that all of the phases he defined (Steponaitis 1980b) are represented in the deposit north of Mound R. The stratigraphic order of the sample supports the chronologic sequence he postulated. However, the phases are not equally represented in the deposit. Below the lower layer, the assemblage is pure Moundville I; immediately above the dash, the predominant ceramics associated with the floors are also Moundville I. Moundville II and III ceramics seem to be confined to the upper midden zone. It is significant that not only is the assemblage below the dash pure Moundville I, but that there are no discernible changes in the ceramics associated with the floors.

The function of the area north of Mound R changed through time. The structure floors clearly indicate that the area was residential during the Moundville I phase. While the evidence suggests that the area was continuously occupied during Moundville I, it appears that house sites shifted through time. During the Moundville II phase, the area seems to have been little used; while some of the upper midden zone may have been deposited at this time, the function of the area is uncertain given the available data. The majority of the upper midden zone appears to date to the Moundville III phase; and the area may have served, in part, as a refuse dump at that time. Steponaitis's analysis of vessels from burials, found in prior excavations north of Mound R, indicates that the use of this area for interment dates to the Moundville II and III periods (Steponaitis this volume). Although Moore (1909:229) termed Mound R, he recognized no diagnostic artifacts; thus, we do not know when the mound was constructed, nor how it relates to the excavation area.

While the deposit north of Mound R produced a wealth of data, it is a limited sample of the Moundville site. In 1979, an effort was made to locate midden deposits elsewhere on the site. The need for subsistence data dictated a random selection of areas for testing. Field notes from previous excavations were used to identify promising areas. From the notes, five areas were selected for investigation.

A power auger was used to test the initial testing for midden deposits. Intervals between auger tests were determined by the shape and topography of each area. Paired holes, 1 m apart, were used to aid in determining whether deposits were localized features or general accumulations. After each hole was drilled, its profile was drawn and the soil was screened.

In two cases the auger tests detected deposits worth investigating. Previous excavations south of Mound I had uncovered residential structures, so auger tests in this area located a midden deposit at...
Figure 1. Locations of University of Michigan excavations. (*) = Locations of excavated deposits.
Figure 2. Stratigraphic profile of the west wall of square 8N2E north of Mound R.

Proximately 1 m in depth. Subsequent excavation of a 2 m² test pit revealed a hearth; a wall trench, which post-dated the hearth; and a line of post molds, not clearly associated with either of the features. Although artifact density was low, small samples of shells and plant remains were recovered. On the basis of the ceramic sample, the deposit has been provisionally assigned to the Moundville I phase (Stephens personal communication).

The second deposit located by the auger tests was in the northwest section of the site, in an area which had seen little previous work. The tests indicated a midden deposit 60 cm deep. Two 2 m² units were excavated in this area. The deposit consisted of a 10-15

Table 1. Dates from Or University of Michigan Museum of Archaeology Excavations at Moundville.

<table>
<thead>
<tr>
<th>Location</th>
<th>Provenience</th>
<th>Type</th>
<th>Laboratory</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. of Mound R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8N2E LS</td>
<td></td>
<td>Radiocarbon</td>
<td>Beta 1217</td>
<td>A.D. 1290 ± 50</td>
</tr>
<tr>
<td>8N2E LS F394</td>
<td></td>
<td></td>
<td>Beta 1180</td>
<td>A.D. 980 ± 80</td>
</tr>
<tr>
<td>8N2E LS L17</td>
<td></td>
<td>Hams</td>
<td>Beta 1280</td>
<td>A.D. 1290 ± 30</td>
</tr>
<tr>
<td>8N2W L14</td>
<td></td>
<td></td>
<td>Beta 1210</td>
<td>A.D. 1290 ± 80</td>
</tr>
<tr>
<td>8N2W L23 F28</td>
<td></td>
<td></td>
<td>Beta 1340</td>
<td>A.D. 1290 ± 80</td>
</tr>
<tr>
<td>8N2W L23</td>
<td></td>
<td></td>
<td>Beta 1340</td>
<td>A.D. 1290 ± 80</td>
</tr>
<tr>
<td>S. of Conference Bldg.</td>
<td></td>
<td>Radiocarbon</td>
<td>Beta 1207</td>
<td>A.D. 1270 ± 23</td>
</tr>
<tr>
<td>Test Unit D L5</td>
<td></td>
<td></td>
<td>Oklahoma</td>
<td>A.D. 1270 ± 23</td>
</tr>
<tr>
<td>Test Unit A F9</td>
<td></td>
<td></td>
<td>Oklahoma</td>
<td>A.D. 1270 ± 23</td>
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<tr>
<td>Test Unit A F9</td>
<td></td>
<td></td>
<td>Oklahoma</td>
<td>A.D. 1270 ± 23</td>
</tr>
</tbody>
</table>

*This date is considered too early and is out of sequence.

**This date is out of sequence.

The majority of the deposits excavated can be assigned to the Moundville I phase, Streponatis (1986:47), on the basis of ceramic criteria, has provisionally dated this phase to A.D. 1050 to A.D. 1250. Radiocarbon and archaeomagnetic determinations on samples from the excavations basically support this temporal placement; though they suggest the phase may have begun slightly earlier (Table 1 and Fig. 3).

While the excavations at Moundville were limited in scope, they produced an abundance of data pertaining to the Moundville I phase. The ceramic sample complements the extant collections, in which the Moundville I phase was poorly represented. Since subsistence remains were not systematically collected in earlier excavations, the floral and faunal remains add a new dimension to the collections. We hope that the analyses of these materials will build a better understanding of the development and operation of the Moundville system.

Acknowledgements

The excavations described in this report were funded by the National Science Foundation (grant BNS 78-01755-01); I would like to thank Dr. Richard Krause, Chairman of the Department of Anthropology, University of Alabama, Dr. Joseph Vogel, Director of the Alabama Museum of Natural History, and the staff at Mound State Monument for their cooperation throughout the project. Thanks are also due to my colleagues on the Moundville project. Though I have not always taken it, their advice has been of great help. Special thanks are due to Via Streponatis for his analysis of the ceramics recovered from the excavations.
THE EXPLOITATION OF FAUNA DURING THE MOUNDVILLE I PHASE AT MOUNDVILLE

I have partially analyzed the faunal remains from the 1955-1979 excavations at Moundville in an attempt to assess faunal exploitation in the Mississippian subsistence adaptation.

1) Which environmental zones were exploited by the inhabitants of Moundville?

2) What was the distribution of the faunal species as indicated by the faunal remains present in the sample, and why the hunting patterns implied by the remains?

3) Was there population pressure on the inhabitants of Moundville and their food supply which is reflected in the types and quantities of faunal remains recovered?

The remains used in my study were recovered at Moundville from the University of Michigan excavations north of Mount R (Scarry's volume). Of the 41 features determined to be sufficiently intact to warrant investigation, 11 were excavated. All but two of these features are from the Moundville I phase; the remaining two date to the Moundville III phase. The Moundville I features were associated with stratified house floors. While the Moundville III features were cut into the middens in the upper portions of the excavated units (Scarry's volume). The features themselves were all pits, well trenches and post molds were not included because of their potentially mixed contents.

In respect to the interpretation of the analysis and the results, it must be stressed that the faunal remains are from only one area of a large site and from mainly structural contexts. This latter factor would severely limit the recovery of faunal remains from processing stages, since most processing would probably have been done outside of the structures. Also, if differential access to and distribution of foods was taking place at the site, the faunal remains recovered from south of Mount R may not be representative of the site as a whole.

For the pur purs of the analysis, the features were treated as independent units. Thus, the minimum number of individuals was calculated by feature to derive a total for the sample as a whole. It should be noted that the birds remains have only been partially analyzed, and that fish remains have been looked at only to determine general species present rather than the numbers of individuals.

Environmental Utilization

In order to look at the environmental zones utilized by the inhabitants of Moundville, Tables 1 and 2 have been constructed to give a basic outline of the faunal species commonly found in the area in historic and recent times. By comparing these tables with the species represented in the faunal remains (Tables 3 and 4), it is possible to determine which environmental zones were exploited.

The large number of grey squirrels (Sciurus carolinensis) versus the number of fox squirrels (S. niger) represented in the remains is the most important development.


Table 1. Fauna of the region.

<table>
<thead>
<tr>
<th>Species</th>
<th>Habitat</th>
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<tbody>
<tr>
<td>Crotalus adamanteus</td>
<td>Black monk</td>
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<tr>
<td>Heteronotus eximius</td>
<td>Hog deer</td>
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<tr>
<td>Odontobutis tigrinina</td>
<td>Little dogfish</td>
</tr>
<tr>
<td>Otospermophilus</td>
<td>Uinta ground squirrel</td>
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<tr>
<td>Procyon lotor</td>
<td>Racoon</td>
</tr>
<tr>
<td>Canis latrans</td>
<td>Coyote</td>
</tr>
<tr>
<td>Canis lupus</td>
<td>Wolf</td>
</tr>
<tr>
<td>Canis familiaris</td>
<td>Dog</td>
</tr>
<tr>
<td>Castor canadensis</td>
<td>Beaver</td>
</tr>
<tr>
<td>Castor fiberinosus</td>
<td>Beaver</td>
</tr>
<tr>
<td>Canis lupus</td>
<td>Wolf</td>
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<tr>
<td>Canis lupus</td>
<td>Wolf</td>
</tr>
</tbody>
</table>

terminant for zone utilization. Although both species inhabit the same types of zones, they very rarely overlap in habitat where they are present. The preponderance of grey squirrels (15 individuals) in the sample
Table 3. Fish of the Region.

<table>
<thead>
<tr>
<th>Species</th>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leptinaurus sp.</td>
<td>Prefer quiet, stagnant water, near a field in lakes, ponds, bayous, estuaries, and the backwaters of streams and rivers with abundant vegetation.</td>
</tr>
<tr>
<td>Ambloplites fontalis</td>
<td>Found typically in sluggish water of bays and the backwaters of rivers and lakes with aquatic vegetation.</td>
</tr>
<tr>
<td>Ictalurus punctatus</td>
<td>Mostly a big river fish found in swift rivers and ponds with noticeable currents.</td>
</tr>
<tr>
<td>Tadarida bicolour</td>
<td>Found typically in large rivers and ponds with slow or moderate gradients.</td>
</tr>
<tr>
<td>Aplodinota grunniens peduncularis</td>
<td>Found in the main body and the backwaters of large rivers and lakes.</td>
</tr>
<tr>
<td>Family</td>
<td>Cottidae</td>
</tr>
<tr>
<td>Cottus gurneyi</td>
<td>Primarily inhabit the quiet water of lowland lakes and the backwaters of large streams.</td>
</tr>
<tr>
<td>Centrarchidae</td>
<td>Found in all aquatic environments.</td>
</tr>
<tr>
<td>Perissodactylus</td>
<td>Mostly inhabit large lakes and ponds.</td>
</tr>
</tbody>
</table>

indicates an exploitation of the zone directly around the site—the main bottomlands—that is the upper several kilometers away where the fox squirrel would be the dominant species.

By looking at Table 3, where the habitats of the various fish species are presented, it can be seen that the Moundville population was predominantly exploiting large river fish such as the drum (Aplodinota grunniens) and catfish (Ictalurus spp.), rather than those found in small creeks or in backwater drainages. However, the presence of suckers (Cottidae) in the remains does imply that other areas such as the marshes near the site, may have been used in addition to the main river channel.

Subsistence

Considering general subsistence patterns, it can be seen from Table 3 that there appears to be a clear cut preference for certain species. The dominant species in the remains appear to be the white-tailed deer (Odocoileus virginianus), grey squirrel, and the wild turkey (Meleagris gallopavo). In addition, fish remains were present in every sample. Based on figures obtained from Smith (1975), in terms of meat yields for the species identified, the white-tailed deer seems to have been the most important species; it was present in almost all of the features. Although in any given feature it is likely that only part of one individual rather than an entire deer was present, even one limb from a deer would contribute more meat than a squirrel (at 45-65 kg per individual) or a wild turkey (at 5.0 kg per individual).

The presence of two domestic dogs suggests their possible utilization as a food source, although this is not conclusive evidence, since only a small fragment from each individual was present. Swanton's ethnographic work on Southeastern Indians (1906:299) indicates a ceremonial usage of dogs, which may explain why only two of these were represented.

Table 4. Species Represented in Moundville I Samples.

<table>
<thead>
<tr>
<th>Species</th>
<th>Minimum Number of Individuals</th>
<th>Projected Meat Yield (in kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sciuereus carolinensis</td>
<td>11</td>
<td>5.9</td>
</tr>
<tr>
<td>Spermophilus lateralis</td>
<td>2</td>
<td>1.56</td>
</tr>
<tr>
<td>Sylvilagus floridanus</td>
<td>2</td>
<td>2.72</td>
</tr>
<tr>
<td>Dendroica cerulea</td>
<td>4</td>
<td>3.65</td>
</tr>
<tr>
<td>Canis familiaris</td>
<td>2</td>
<td>7.20</td>
</tr>
<tr>
<td>Canis lupus</td>
<td>1</td>
<td>15.01</td>
</tr>
<tr>
<td>Canis latrans</td>
<td>1</td>
<td>5.00</td>
</tr>
<tr>
<td>Odocoileus virginianus</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Melanitta fusca</td>
<td>6</td>
<td>25.00</td>
</tr>
<tr>
<td>Snake</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>non-poisonous</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Poisonous</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>water</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Turtle</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>unidentified</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

The presence of snake vertebrae, 11 individuals from 9 features, may represent a utilization of snakes as a food source. This possibility is supported by the fact that some of the vertebrae were burnt, ruling out a fortuitous presence of the individuals.

Although the bird remains have only been partially analyzed, the wild turkey appears to make up the majority of the remains. There is no evidence for the exploitation of granivorous or waterfowl. It must be noted, unlike the sites investigated by Smith (1976), Moundville is not located directly on a major flyway; this may explain the lack of such species in the remains.

A butchering pattern can be seen from the deer remains. Table 5 shows the elements of the 15 deer which were present in the samples. From this it can be seen that ribs, thoracic and lumbar vertebrae, femurs, and tubiae are the most commonly found elements. The lack of cervical vertebrae and cranial elements may be due to: (1) differential access to and/or distribution of food within the site; (2) transportation of deer from areas some distance away; and/or (3) hunting practices. The predominance of lower back, rib and posterior limb bones (Table 5) indicates that those parts which possess the best and most meat are those which are most represented. This implies that either the inhabitants of this area were receiving choice cuts of meat, reflecting an elite status, or that transporting meat was forcing the abandonment of the lesser cuts in favor of the meater areas of the body. The presence of only two cranial fragments in the entire sample may be a result of hunting as well as butchering practices. Swanton (1916:515) reported that almost all of the Southeastern tribes used deer heads as hunting decoys.

Population Pressure

One of the applications of this research is to determine, during the assumed growth of the site from Moundville I to Moundville II (Stephonsition this volume), pressure was put on the food supply causing the exploitation of different species, more species, and/or other parts of the animals.

Inspection of the number of individuals, and the types of species present from Moundville I and II samples (Tables 3 and 4) indicates that there is no apparent change; the figure of one deer per feature and one to two squirrels per feature remaining the same throughout. The types of bone present, such as cranial versus post-cranial, and limbs versus body parts, also do not appear to change. Since neither a change in species nor in anatomical parts is present in the remains, it can tentatively be concluded that there was no pressure on faunal resources, assuming that no dried, pre-baked meat was being imported.

Conclusions

In comparison with the three funeral groups identified by Smith (1976) as being of primary importance to Mississippians, several significant variations can be seen in the Moundville samples. First, the fish remains tend to imply a utilization of the main river channel rather than lack of water sources; this is probably a function of Moundville’s location directly on a main river channel. Second, migratory waterfowl do not appear to be present in the remains; this may be a function of Moundville’s location outside of the major flyways. Third, in regard to the terrestrial trinity of whitetail deer, turkey, and raccoon (Procyon lotor), the raccoon appears to be totally absent from the Moundville remains. Instead, the squirrel appears to have taken the raccoon’s place of importance in the diet. Deer and turkey do appear to be as important in the diet at Moundville as they were at other Mississippi sites.

Acknowledgments

This paper would not have been possible without the excellent excavations directed by Margaret Mozell Case at Moundville. In addition, the valuable discussions with Dr. Richard L. Ford, Dr. Christopher S. Pecold, Susan Scott, and Katherine Moore at the University of Michigan helped direct my research, although all of the results and interpretations are my own. I would also like to thank these people for all of the valuable time they spent helping me with my work.

Table 5. Odaxius virginiensis white-tail deer. Anatomical Parts Present.

<table>
<thead>
<tr>
<th>Elements</th>
<th>MNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ribs</td>
<td>10</td>
</tr>
<tr>
<td>vertebrae</td>
<td>7</td>
</tr>
<tr>
<td>thoraic</td>
<td>6</td>
</tr>
<tr>
<td>thoracic/lumbar</td>
<td>4</td>
</tr>
<tr>
<td>scapula</td>
<td>2</td>
</tr>
<tr>
<td>humerus</td>
<td>2</td>
</tr>
<tr>
<td>ulna</td>
<td>1</td>
</tr>
<tr>
<td>radius</td>
<td>1</td>
</tr>
<tr>
<td>ulna</td>
<td>1</td>
</tr>
<tr>
<td>femur</td>
<td>1</td>
</tr>
<tr>
<td>tibia</td>
<td>1</td>
</tr>
<tr>
<td>metacarpal</td>
<td>1</td>
</tr>
<tr>
<td>tarsal</td>
<td>2</td>
</tr>
</tbody>
</table>

*Modified from.

C. Margaret Scary

PLANT PROCUREMENT STRATEGIES IN THE WEST JEFFERSON AND MOUNDVILLE I PHASES

It is generally agreed that the subsistence adaptations of the Late Woodland and Mississippian cultures were based on intensive collection of a variety of plants and animals, supplemented by small-scale cultivation (Ford 1974:165; Strum 1968:28-39). Mississippian systems were based on intensive maize agriculture, although there was a continued use of wild food resources. While the general nature of the subsistence systems as characterized by the faunal and floral remains is generally understood, this paper presents preliminary results of an analysis of plant remains from West Jefferson and Moundville I contexts. Using these data, a model is proposed which accounts for the intensification of agriculture and the changes in wild food utilization observed to occur with that intensification, and which suggests other changes we might expect to observe when more samples are analyzed.

Data Base

The Late Woodland data are drawn from nine features from five West Jefferson phase sites in the Black Warrior Valley. Seven of these features are from the three West Jefferson Seam Plant sites (1J32, 1J36, 1J35) 129 km northeast of Moundville (Jenkins and Nielsen 1975). The remaining two features are from sites 1J18 and 1T1256, both of which are located on the floodplain within 13 km of Moundville. The Mississippian data were collected from Moundville during the University of Michigan excavations (C. M. Scary this volume). Only data from pure Moundville I contexts have been used. The samples included: 8 pits, and 20 samples from house and midden contexts from the deposit north of Mound R; and 1 pit from the deposit south of the Conference Building.

Results

The plant food remains from the West Jefferson sites form a typical Late Woodland assemblage. All samples contained hickory shell (Carpa sp.), acorn shell (Quercus sp.), and maize kernels (Zea mays); maize cobs were present in all but one sample. In addition, a variety of seeds were identified including: pigweed (Amaranthus sp.); gooseneck (Chenopodium sp.); persimmon (Diospyros virginiana); marshgrass (Phalaris arundinacea); portulaca (Portulaca sp.); sunflower (Helianthus annuus)—were identified in the Moundville samples. The spectrum of seeds from wild plants was similar to that in the West Jefferson samples, but included four types: elderberry (Sambucus canadensis), blueberry (Vaccinium sp.), blackberry (Rubus sp.) and cane (Arundinaria sp.)—not found in the Terminal Woodland assemblage. The shift in the proportion of plant food resources is clearly evident from inspection of Tables 1 through 5. In the Moundville samples, maize and acorn increased relative to the West Jefferson samples, while hickory decreased. Perhaps the most dramatic of these changes was the increase in the proportion of maize remains. While the decrease in the representation of hickory is, in part, a function of the increase in the other two resources, it is clear that there was a change in the importance of the two nut types.

It is unclear whether the presence of small seeds in the Moundville samples reflects their utilization. The presence of persimmon in most of the samples suggests that it was aed, and the quantities of goosefoot seeds in Feature 108 and pokeweed seeds in Feature 5

<table>
<thead>
<tr>
<th>Procurement</th>
<th>Hickory</th>
<th>Acorn</th>
<th>Maize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpa sp.</td>
<td>80%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Quercus sp.</td>
<td>10%</td>
<td>5%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Table 1. Proportionate Representation of Hickory, Acorn, and Maize in West Jefferson Phase Features.
Table 2: Proportionate Representation of Hickory, Acorn, and Maize in Moundville I Phase Foods.

<table>
<thead>
<tr>
<th>Provenience</th>
<th>Acorn</th>
<th>Maize</th>
</tr>
</thead>
<tbody>
<tr>
<td>MN Post 9 Cylindrical</td>
<td>45%</td>
<td>45%</td>
</tr>
<tr>
<td>MN Post 108 Cylindrical</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>MN Post 150 Cylindrical</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>MN Post 156 Cylindrical</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>MN Post 108 Cylindrical</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>MN Post 150 Cylindrical</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>MN Post 156 Cylindrical</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

suggest that their inclusion in the samples reflects utilization. While the evidence is slim, the presence of hickory seeds in only the Moundville I samples may indicate an increase in the use of subsistence resources.

The sample from TA656 is more like the Moundville I samples than it is like the other West Jefferson samples. While it may be an anomalous or mixed sample (though we have no reason to suspect contamination, it should be noted that TA656 is a multi-component site), it may also be an indication that the intensification of agriculture preceded the development of other Mississippian traits.

Discussion

The intensification of agriculture and the consequent changes in wild food utilization can be exploited by reference to economic and ecological factors. Earle (1980) has proposed an economic model which explains how subsistence systems change. The basic assumption of his model is that cultural systems attempt to minimize subsistence costs. Procurement strategies have different costs relative to their outputs. These costs vary according to the quantity of a resource being exploited; ultimately costs are subject to the law of diminishing returns, they increase more rapidly than do yields. Subsistence systems are combinations of procurement strategies which can be pursued at roughly equivalent costs, and which fulfill subsistence needs at the lowest possible cost.

If subsistence demands increase, a system can either diversify or it can intensify existing strategies. Because costs generally increase with increasing exploitation, diversification is usually the lower cost option. Thus, when possible, new strategies will be added to existing ones to meet increasing demands. Intensification is the second option. Hunting and gathering strategies have low initial costs, but intensification of such strategies results in sharply rising costs. Agriculture, on the other hand, has high initial costs, but, since yields are expandable, costs increase more slowly as agricultural endeavors are intensified. Where diversification is not an option, intensification efforts will soon focus on agriculture.

Both ecological and scheduling factors affect the mix of procurement strategies. Land clearing, a byproduct of agricultural intensification, decreases the availability of climax plant resources and may also increase the availability of successional components (Floyd 1974:10). These changes in the ecosystem alter the costs of procurement strategies. Since planting and harvesting are labor intensive activities, scheduling conflicts may occur with agricultural intensification (Finney 1980). Thus, resources whose availability coincides with such activities may be neglected.

In the Terminal Woodland period, the Black Warrior Valley witnessed population growth, warfare, and changing demographics (Welch personal communication). These conditions could have resulted in a population-resource imbalance which created stress on the subsistence economy. If the West Jefferson population was already using the full range of natural resources, then diversification would not have been a viable option. Attempts to intensify procurement of wild resources would have resulted in sharply increasing costs. The point would soon have been reached where, despite its high initial costs, intensified agriculture was cost effective.

Cleanace of large areas of bottomland for fields may have altered the availability of wild plant resources. It is possible that land clearance affected the availability of hickory nuts more than that of acorns. If so, this would account for the changes in nut utilization between the West Jefferson and Moundville I phases. Land clearance might also have enhanced the production of successional fruits.

The harvest period would have coincided with the maximum availability of seeds from pioneer annuals. Such a scheduling conflict would have been resolved in favor of agricultural activities, probably not to a great extent in the use of pioneer annuals. Unfortunately, the number of samples analyzed is not sufficient to detect such a trend.

With the exception of those resources affected by land clearance or scheduling conflicts, the initial intensification of agriculture would not have impinged heavily on the use of wild resources and a diverse assemblage of plants would have continued to be exploited.

Acknowledgments

This paper would not have been possible without the help of a number of people and institutions. Grants from the National Science Foundation provided funds for the Moundville excavations (BNS 78-01735-01) and
The touchstone of research at Moundville is the collection. Over the last 15 years these data, a few concepts, and some analytical methods have been combined to add to our knowledge of Mississippian societies in the Southeast. They have provided the foundation for a detailed ceramic chronology and served as the basis for models of social, political, and economic organization of the Moundville phase. They also have posed more questions than they have answered, and they have generated new implications from the answers to old questions. One such set of implications leads from social ranking, established in the analysis of the burials; to sumptuary rules and diet; to the amount of strontium deposited in human bone. The sketch which follows gives a description of our initial attempts to forge the links in this chain of reasoning. Our results must be considered preliminary, and the statistical measures must be taken as indicative of significant trends rather than expressing statistically significant differences.

1. The analysis of the Moundville burials (Peebles 1971, 1977; Peebles and Kas 1977) has shown patterns and differences among individuals. At its most fundamental, this pattern separates a small group of persons of all ages and both sexes, who are buried with elaborate artifacts in or near mounds, from a much larger group of persons, whose grave goods differentiate among them by age and sex, and who are buried in cemeteries and residential areas. The argument developed in the analysis is that the small group of burials represents the remains of a chiefly lineage, and that the occupants of ritual and political offices were drawn from the adults of this lineage. The remainder of the population - the bulk of society, in which age, sex, ability, and idiosyncratic elements account for all the variability in the mortuary ritual.

2. Summary analyses of ethnographic data from chieftains (Service 1971, 1975; Fried 1967) show that such societies have sumptuary rules which set off and validate the status of the elite. These rules assure the chief and his lineage a qualitatively and quantitatively superior diet. In the Southeast, for example, Peninast observed among the Natchez:

It is ordinarily the great chief who orders the Great Sun, if he be present, or that one he has succession, more or less, in all the villages of his dominion. These feasts are ordinarily under-takes when the great chief has need of provisions, such as flour, beans, or other such things, which they place at the door of his cabin in a heap the last day of the feast (Peninast in Swanton 1941:121).

Further among the Natchez, DuPratz reported:

Having seized the deer, they present it to the Great Sun, if he be present, or that one he has sent to give him this pleasure. When he has seen it at his feet and has said "It is good," the hunters cut open the deer and bring it back in quarters to the cabin of the Great Sun, who distributes it to the leaders of the band who have gone on this hunt (Swanton 1911:71).

If the observations about the Natchez can be generalized, then the diet of the elite in the Southeast was varied, high in meat, and supplies were replenished by every hunt and on demand.

3. Some aspects of diet are reflected in the elemental and isotopic composition of human bone mineral. Certain domesticated plants, in some circumstances, leave isotopic "signatures" that can be measured by an isotopic ratio mass spectrometer (DeNiro 1977; Bondou 1979). The proportion of meat to vegetable food, given proper controls, can be measured by analysis of the amount of strontium (Schoeninger 1972, 1980; Sepenkar 1979; Gilbert 1975). In brief, if strontium-concentrating organisms like mollusks (Schoening and Peebles n.d.) and marine animals did not participate in the diet, then there is an inverse ratio between the amount of meat in a diet and the amount of strontium in bone. Conversely, the greater the contribution of vegetable foods to a diet, the greater the amount of strontium in bone.

Because meat seems to have comprised the major qualitative difference between the diet of the elite and commoners, and because confidence can be placed in the analytical techniques used to measure strontium, this element was chosen for analysis. The proposition to be tested was: the elite stratum of society at Moundville had significantly more meat in their diets than did commoners; therefore, the skeletons of the elite stratum would contain relatively less strontium than those of the commoners.


Christopher S. Peebles and Margaret J. Schoeninger

NOTES ON THE RELATIONSHIP BETWEEN SOCIAL STATUS AND DIET AT MOUNDVILLE

helped make a seemingly endless task easier. I am indebted to Dr. Richard I. Ford, Dr. C. Earle Smith, and Ms. Gloria Cardell all of whom have generously shared their ethnological experiences. I have spent long hours discussing Moundville and West Jefferson with my colleagues, Chris Peebles, Yito Stéphanakis and Paul Welsh and my husband John. While these discussions have been a source of inspiration to me, the interpretations herein are my own.
Alice Haddy and Albert Hanson

RELATIVE DATING OF MOUNDVILLE BURIALS

A large group of human bones was excavated during the 1930s from Moundville burial sites. If dates could be assigned to them, the towns might provide a guide to the people which took place as Moundville flourished. Since all bones were treated with the preventive measure of being preserved by cold storage, radiocarbon dating is not possible. In this preliminary study, bones from 15 individuals were analyzed for nitrates and fluorine, since the concentrations of these elements might provide relative dates for the bones.

Nitrogen dating is based on the fact that buried bones and teeth lose nitrogen as bone protein decomposes over time (Ottmer et al. 1972; Garlick 1969). Nitrogen dating is based on the irreversible accumulation of fluorine in bone by replacement of hydroxides, in the mineral hydroxyapatite (Ca$_5$(PO$_4$)$_3$(OH)) portion of bone (Hokin and Fryd 1955:85). Both processes are dependent on environmental factors, such as temperature, soil pH, and water content, and soil water composition (Ottmer et al. 1972:514; Garlick 1969; Hokin and Fryd 1955:85; Hagen 1973:259). It is necessary to date the bone using a similar nitrogen and fluorine dating method, if the dates can be similar and different for nitrogen with nitrogen and fluorine concentrations. Variation in concentration is one of the many factors which is necessary for both nitrogen and fluorine dating methods. Since not all bones were exposed to the same environment, it is necessary to date the bone using a similar nitrogen and fluorine dating method.

Another assumption made in both of these dating methods is the comparability of bone types. Variations in fluorine and nitrogen concentrations are to be expected between bones of different thickness or density.
beam from a 3.5 MeV Van de Graaff accelerator. The gamma rays were counted at a 90° angle with a thallium
free Ge(Li) detector. Data were analyzed with a Nuclear
Data 6660 analyzer and minicomputer. The glass sam-
ple holder was lined with mylar to reduce the number of
gamma rays from fission contamination within the
system. The contamination gamma ray yield was less
than 0.1% of the yield from the samples. Absolute
fluorine calibration was performed by comparison with
National Bureau of Standards certified phosphate rock.

Results

Results of nitrogen and fluorine analyses are pre-
sented in Table 1. For nitrogen, two to three analyses
were done. For fluorine, one to four analyses were
done. The average standard deviations for repeat
nitrogen and fluorine analyses were usually less than
4%. When powdering the bone, the Alvar had a
tendency to remain in flakes for samples on which it
was relatively thick. This caused inconsistencies that
resulted in a higher statistical error for those par-
cular samples.

As expected our data indicate the importance of
choosing comparable bone types. We found that thin-
ner bones may accumulate average fluorine at a faster
rate than thicker bones. Thin bones may be incompar-
able with thicker ones for nitrogen analyses as well.

Among the 15 samples, 11 were analyzed for both
nitrogen and fluorine. A rank correlation between the
two methods was performed for these samples. Using
Spearman’s method for rank correlation (Yule and
Kendall 1966), the rankings were found to be sta-
tistically significant at a .05 confidence level.

Table 2 presents data classified by mound associa-
tion. Possible relative ages have been assigned based
on nitrogen and fluorine amounts, with classifications
ranging from “early” to “late”. The bone samples
from

<table>
<thead>
<tr>
<th>Sample</th>
<th>Nitrogen (%)</th>
<th>Fluorine (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1441E</td>
<td>1.57 ± 0.07</td>
<td>175 ± 26</td>
</tr>
<tr>
<td>1447</td>
<td>1.81</td>
<td>169 ± 14</td>
</tr>
<tr>
<td>1477</td>
<td>1.81</td>
<td>169 ± 14</td>
</tr>
<tr>
<td>1465</td>
<td>1.81</td>
<td>169 ± 14</td>
</tr>
<tr>
<td>1478</td>
<td>1.81</td>
<td>169 ± 14</td>
</tr>
<tr>
<td>1487</td>
<td>1.81</td>
<td>169 ± 14</td>
</tr>
<tr>
<td>1496</td>
<td>1.81</td>
<td>169 ± 14</td>
</tr>
</tbody>
</table>

Table 2. Comparison of Gruvlein by Mound.

<table>
<thead>
<tr>
<th>Mound</th>
<th>Sample</th>
<th>N (%)</th>
<th>F (ppm)</th>
<th>Relative Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mound B</td>
<td>1441E</td>
<td>1.57</td>
<td>175</td>
<td>late</td>
</tr>
<tr>
<td>1447</td>
<td>1.81</td>
<td>169</td>
<td>moderate-late</td>
<td></td>
</tr>
<tr>
<td>1477</td>
<td>1.81</td>
<td>169</td>
<td>moderate-late</td>
<td></td>
</tr>
<tr>
<td>1465</td>
<td>1.81</td>
<td>169</td>
<td>moderate-late</td>
<td></td>
</tr>
<tr>
<td>1478</td>
<td>1.81</td>
<td>169</td>
<td>moderate-late</td>
<td></td>
</tr>
<tr>
<td>1487</td>
<td>1.81</td>
<td>169</td>
<td>moderate-early</td>
<td></td>
</tr>
<tr>
<td>1496</td>
<td>1.81</td>
<td>169</td>
<td>early</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Nitrogen and Fluorine Concentrations.

Discussion

The vicinity of Mound B fall in a moderate to late time
period. Ceramic analysis places them in a period be-
tween late Moundville II and late Moundville III
(Stephens’ personal communication). The individuals
from the vicinity of Mound B show a much wider age
range than the samples from Mound E and F. The bone
samples from Mound B and E are from burials found in
a single pit, and by ceramic analysis have been classed
together as late Moundville II or early Moundville III.

The bone samples from Mound B and E are from burials
found in a single pit, and by ceramic analysis have been
classed to together as late Moundville II or early
Moundville III. The bone samples from Mound B and E are from burials found in a single pit, and by ceramic analysis have been classed to together as late Moundville II or early
Moundville III.

Tibia 1447 and ulna 1473 show the largest dis-
terences in their relative rankings. A likely source
of disagreement is the Alvar content. Although Alvar
do not interfere chemically with either analysis, it
does add additional weight to each sample. Extra total
weight will make a sample appear older by nitrogen
dating and younger by fluorine dating.

We assume that all of the bones started with the
same amount of nitrogen, 5%. It has been shown by
investigators such as Ormer and Von Endt that the
amount of nitrogen decreases exponentially over time
(Ormer et al. 1972). Therefore, the rate of nitrogen
loss also decreases over time. Following this line of
reasoning, a bone with 1% nitrogen would be more
than twice as old as a bone with 3% nitrogen. If this
is true, it indicates that the oldest bone in this study,
1645, is probably at least twice the age of the newest,
putting it in the Moundville I period.

Acknowledgments

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est thanks go to Vinca P. Steponaitis, whose help and encouragement made this study possible. We also thank David W. Van Etten for the nitrogen analysis procedure. Others who gave their invaluable help include Dale E. Oceander, Christopher S. Peebles, Margaret J. Schoesinger, Paul D. Welch and C. Loring Brace.

Vincas P. Steponaitis

The moundsite on the Black Warrior River in west-central Alabama is one of the largest Mississippian sites in eastern North America. The site contains at least 20 artificial mounds, most of which surround a large rectangular plaza. The plaza itself covers some 35 ha, and the site as a whole some 100 ha (Moore 1965; Peebles 1978, 1979). Despite the fact that Moundville is a well-known site with a long history of investigations, many aspects of its internal chronology have, until recently, re-  
tained obscure. Previous workers generally were forced to deal with Moundville in a static framework, as though all the remains were archaeologically cor-  
tained to a single moment in time. This synchronic outlook did not stem from a lack of interest in dia-  
chronic patterns, but rather from a lack of fine chronological control. The "Moundville phase", as it was previously defined, encompassed a 500 year span within which no temporal distinctions were recognized (e.g. McKenzie 1960). As long as this block of time remained unmodified, developmental cycles could not proceed.

My own recent work at Moundville has been di-  
rected especially toward solving this problem. Based on a series of whole vessels and on a stratigraphic analysis of sherds, it has been possible to subdivide the "Moundville phase" into three shorter units—Mound-  
ville I, Moundville II, and Moundville III (Steponaitis 1969a, 1969b). Adding these three new units to the previously-defined phases which come before and after (West Jefferson and Alabama River), the entire late prehistoric sequence now consists of five phases span-  
ing the period from A.D. 950 to 1700. Using this new chronology, it is now possible to trace how the site and configuration of the Moundville site changed through time.

Changes in Community Patterns through Time

All the evidence we have suggests that people at Moundville were usually buried in close proximity to residential areas—in the floors of dwellings, just out-  
side the-dwellings' walls, or in cemeteries nearby (Jones and Defoerter n.d.; Peebles 1978:575-581, 1979:  
passim). Burials also occur in many of the mounds. Therefore, by plotting the distribution of dated burials and vessels for each time period separately, it should be possible to get at least a rough idea of when dif-  
ferent parts of the site were occupied, and when vari-  
ous mounds were built.

The present discussion of community patterns is based on a series of maps, each showing the distribu-  
tion of burials and unassociated vessels belonging to


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CHRONOLOGY AND COMMUNITY PATTERNS AT MOUNDVILLE

a particular phase of occupation (Figs. 1-5). To ensure reliability, only the most narrowly-dated vessels and burials are plotted—those which could be securely as-  
nigned to a range that spanned no more than two adjacent time segments (e.g., Moundville I/early Moundville II, early Moundville II/late Moundville II, late Moundville II/early Moundville III, etc.). Thus, one should keep in mind that the number of vessels/burials plotted on these maps actually repre-  
sents a minimum, since numerous vessels and burials which lacked sufficiently diagnostic features are ex-  
cluded (for further details, see Steponaitis 1980a:285- 286).

West Jefferson Phase (c. A.D. 900-1050). This com-  
moment, unlike the others, cannot be determined by plot-  
ing the spatial distribution of burials, since West Jefferson graves have never been found to contain pottery. East Jefferson, c. A.D. 1050-1250. There are literally thousands of burials without ceramics reported at Moundville, but for now it is impossible to tell which ones are West Jefferson and which ones are late. The principal evidence for a West Jefferson com-  
ponent at Moundville exists in the form of shell mounds, mostly from excavations which took place in the 1930s. Although these collections have never been fully analyzed, a number of preliminary reports indicate that most of the West Jefferson pottery was recovered from the western hilltop of the site, in the area to the west of Mound O and P (Winifred W. 1956:18-19;  
Wigfall and Winifred 1976:122-125). Wallick and Winifred (1976:125) recently estimated that the West Jefferson occupation was a village of approximately 5-10 ha in size, judging from the position of the ex-  
cavations which produced the greatest number of megatemples shell; this village was located within the area shown on Figure 1.

Moundville I Phase (c. A.D. 1050-1250). The great-  
est concentration of Moundville I burials and vessels occurs in the western part of the site, showing con-  
siderable continuity in location from the previous phase (Figs. 2). The base of the site at this time appears to have consisted of at least a single mound, an early stage of Mound O. Immediately to the west of this mound was a cluster of burials—probably a small cemetery. The overall distribution of burials also sug-  
gests scattered occupation to the north, south, and east of the mound, especially in the areas along Carriage Branch. It is difficult to tell whether the absence of burials and vessels in the central portion of the map represents an actual lack of occupation, or merely the paucity of excavations in the area that was later to become the plaza.

The pattern evident in Figure 2 is quite intriguing.
for it seems to be consistent with patterns found elsewhere in the Warrior valley at the same time. Recent surveys have indicated that during this phase, Moundville was one of a series of small, more or less equivalent political centers, each with a single mound, and a number of small hamlets or farmsteads scattered in its immediate vicinity (Peebles et al. 1979; Bozemans, personal communication). The elaborate three-level settlement hierarchy, which many of our previous models took for granted (e.g., Steponaitis 1978), clearly had not developed by this time.

Moundville II Phase (ca. A.D. 1250-1400). In Moundville II times, the situation changed dramatically as Moundville grew to become a major political center (Fig. 5). There were considerably more burials dating to this phase at the site, probably indicating a much larger population. Moreover, the evidence suggests that this was a time when a considerable amount
Figure 4: Spatial distribution of burials and associated mounds. Moundville III phase (some possibly only Mound River phase) was significantly lower compared to the other phases, with one burial mound. Mound A, another mound with one burial mound, and Mound B, another with two burial mounds, are possibly dating to this phase. Mound D (1097-25245), all in this space representation, seems to be a small mound more than a few houses of the mound period. The site appears as a small moveable village in the West Jefferson phase, then became...
a small local center with a single mound in Moundville I, and finally evolved into a large regional center during Moundville II and Moundville III. Decline became evident only in the Alabama River phase, by which time the site had lost its political importance, and was left with only a trace of its former population.

Overall, the sequence is marked by strong continuities in settlement location from one phase to the next, especially notable in the transition from West Jefferson to Moundville I. These continuities, together with certain continuities in ceramic style (Seepenattis 1980a:227-228), are fully consistent with the notion that the Moundville phases I-III—and the socio-political complexity they represent—evolved locally from the indigenous West Jefferson base, and were not the result of any migrations into the valley from outside (for a contrasting opinion, see Jenkins 1993).
Preliminary Report on the Analysis of Moundville Phase Ceramic Technology

The following remarks are a preliminary report on an analysis of Moundville Phase ceramic technology. The results presented here are based on a small sample of pottery sherds from Moundville, Alabama, and are intended to provide a general overview of the technological and stylistic characteristics of this phase.

In reading these remarks, a few considerations should be kept in mind. First, the sample is limited in size and may not be representative of the entire ceramic assemblage found at Moundville. Second, the results are based on the examination of a relatively small number of sherds, and further research may reveal additional varieties and characteristics.

The analysis was conducted using standard methods, including macroscopic observation, petrographic analysis, and thin section microscopy. The results suggest that the Moundville Phase ceramic assemblage is characterized by a variety of distinct technological and stylistic features.

1. **Coiling with a Rod**

   Much of the black slipped, jar-like vessels from Moundville are coiled with a rod. This method of construction results in a smooth, even surface with well-defined contours. The vessel wall and the surface upon which the vessel was set are both well-defined, providing a strong contrast between the two.

2. **Building Tradition**

   The building tradition of the Moundville Phase is characterized by the use of coiling as the primary method of construction. This tradition is responsible for the distinctive shapes and forms of the pottery vessels found at Moundville.

3. **Surface Treatment**

   The surfaces of the vessels are treated in various ways, including slips, polishes, and paints. These treatments are applied after the vessels have been formed and dried, and serve to enhance their appearance and durability.

4. **Decorative Elements**

   Decorative elements are an important aspect of the Moundville Phase ceramic tradition. These elements include incising, stamping, and painting, and are used to create a wide range of designs and patterns.

5. **Chronology**

   The Moundville Phase ceramic tradition is dated to the late 13th through early 14th centuries. This date is based on radiocarbon dating of associated artifacts and structures.

6. **Conclusions**

   The results of this preliminary analysis suggest that the Moundville Phase ceramic tradition is characterized by a distinctive building tradition, surface treatments, and decorative elements. Further research is necessary to fully understand the technological and stylistic characteristics of this phase.

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**Figure 1:** Showing the process of production at Moundville. (Woodcut, 1697)
The subject of this investigation is the evaluation of the performance of a certain group of students in their academic studies. The study was conducted in a high school setting and involved a total of 150 students who were randomly selected for participation. The research design included pre-test and post-test assessments to measure the students' knowledge and understanding of the subject matter.

The results of the study showed a significant improvement in the students' performance following the intervention. The analysis of the data revealed that the instructional methods employed were effective in enhancing the students' understanding of the subject. The study also highlights the importance of continuous assessment and feedback in the learning process.

In conclusion, the findings of this study suggest that the current educational methods are effective in promoting student learning. However, further research is needed to explore the long-term impact of these methods on student performance.

References:


The Cancer Gene: The Complete Story

Introduction to the Cancer Gene

The Cancer Gene is a term used to describe a gene that is altered or mutated in cancer cells. These genes play a critical role in the development and progression of cancer. The identification and study of cancer genes have been pivotal in advancing our understanding of cancer biology and improving the treatment and prevention of cancer.

Cancer genes can be divided into two main categories: cancer predisposition genes and cancer driver genes. Cancer predisposition genes are inherited and increase the risk of developing cancer in individuals who inherit them. Cancer driver genes, on the other hand, are acquired in cancer cells and are responsible for the uncontrolled growth and survival of cancer cells.

The discovery of cancer genes has revolutionized the field of oncology. Understanding the role of these genes in cancer has led to the development of targeted therapies that specifically target cancer genes, leading to significant improvements in patient outcomes.

Conclusion

The Cancer Gene: The Complete Story explores the discovery and implications of cancer genes, providing insights into the molecular basis of cancer and the potential for personalized cancer treatments.

Further Reading

For more information on the Cancer Gene, please refer to the following resources:

- "Cancer: The Disease of Genes," by RichardEF. Roberts
- "Cancer Biology: From Cell to Society," by Robert A. Weinberg
MAGNETIC PROSPECTING: PRELIMINARY RESULTS OF THE 1999 FIELD SEASON

Michael J. Womack and

(381) 300-0000
order of 9.16 gamma. This correlated very well with the increased intra-unit density (2:1 ratio) distribution of artifacts and observed A horizon enhancement. The same held true for the 45 positive gamma difference in the NE corner of N59E399 where an even more dramatic correlation between the magnetic contour and artifact density was observed.

Block 7, Mound E

The magnetic trends in Block 7 on Mound E consist of several, variable sized monopolar anomalies of both high and low values (Fig. 3). A total of three aligned 1 x 2 m units were excavated. Two of these were continuous and partially covered a roughly 5 x 8 m anomaly of high gamma value while the other unit was part of to investigate a portion of a rather distinct dipolar anomaly. The soil sequence consists of a thin plowzone, construction loading, submound midden A horizon, A1 and B horizons. The construction loading is of variable thickness, but is most prevalent. (by about 30 cm) in two continuous units. Within these units, the plowing could be broken into primary A horizon slips overlapped in a lateral extension by primary B horizon slips. The submound A horizon surface is particularly well developed with lots of cultural debris. A total of seven features and soil stain/post-mold were excavated. Many of these originated in the middle zones of the A horizons, and except for Feature E1 midden, appear to have had no effect on the survey and were either too subtle or deep and/or masked by loaded soil overburden.

The high magnetic region noted was apparently influenced by both the staging and type of loaded soil. In the westernmost part, the high gamma readings were influenced by a central or slightly positive A horizon loaded soil and underlying culturally developed A horizon. A comparison of the two continuous units by artifact density and soil development showed no significant difference, yet one has much lower positive readings. This apparently is due to the B horizon loading which is strongly masking the magnetic intensity of the underlying A horizon surface.

The magnetic values in unit S31722 can be attributed to Feature E1, an off-mound midden inter-faceted between the plowzone and submound surface. These higher positive values coincide almost precisely with the horizontal mapping of Feature E1's extent in this unit. As well as the 1979 excavation unit where a particularly dense artifact concentration was recovered (Fig. 4).  

Block 8, RSA-B TR-17/Mound S

The magnetic trends in Block 8 in RSA-B (now also Mound S) show several dipolar anomalies in addition to two distinct high regions (Fig. 5). The excavations in this block consisted of a 1 by 14 m long trench (TR-17) that cut one of the two magnetic high regions between our old excavation units, and a 1 by 2 m unit just 2 m south of the trench to investigate a smaller dipolar anomaly.
too small and deep to produce a visible anomaly, while Feature 2, a small oval pit, produced only an undetected one gamma "infilling". However, when re-run at a finer 0.05 gamma interval, the magnetic contour showed Feature 2 clearly.

The high monopolar anomaly centered at the middle part of TR-17 was not as dramatically obvious as the dipolar anomaly representing Feature 3. Field observations indicated that the magnetic influence was a shell concentration at the N40225 coordinate, in addition to a thin, discontinuous zone of midden soil and debris within this area. A more subtle correlation exists, however, between the relative magnetic values of each trench unit and the density (by weight) of artifacts recovered from the subsurface A horizon surface, as can be seen in the following:

<table>
<thead>
<tr>
<th>TR-17 Unit</th>
<th>N42</th>
<th>N44</th>
<th>N46</th>
<th>N48</th>
<th>N50</th>
<th>N52</th>
<th>N54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Magnetic</td>
<td>5y</td>
<td>10y</td>
<td>25y</td>
<td>35y</td>
<td>35y</td>
<td>35y</td>
<td></td>
</tr>
<tr>
<td>Peak Value</td>
<td>258g</td>
<td>403g</td>
<td>113g</td>
<td>78g</td>
<td>68g</td>
<td>41g</td>
<td></td>
</tr>
<tr>
<td>Artifact</td>
<td>29g</td>
<td>41g</td>
<td>13g</td>
<td>7g</td>
<td>5g</td>
<td>2g</td>
<td></td>
</tr>
</tbody>
</table>

Block 9, Mound G

The magnetic trends in Block 9 on Mound G are much more generalized, showing a very low central region flanked by two higher or more positive areas (Fig 6). Five discontinuous 1 by 2 m units covering all three areas were excavated along a single trench line across the northern part of the block.

As noted, this remnant portion of Mound G contains a typical stratigraphic sequence of midden, 15-35 cm thick, loose sand or A (90%) and B (20%) horizon silts, in situ artifact-bearing A horizon, and B horizon.

Nine features, including post mohs and small pits, were excavated along with 8 other amorphous soil stains and 2 artifact clusters. Most of these originated in the middle section of a B horizon and extended down into the B horizon. Only two features appear to have influenced the magnetic readings. Feature G-1, a small about shaped pit, gives the one point anomaly of 2.5 gamma, as does Feature G-9, another small pit filled with midden debris. In general, the elliptically shaped core area of very low magnetic values corresponds well with the remains soil construction stage containing variable amounts of A and B horizon silts.

To the east of the complex of small monopolar anomalies

The excavation data point to several trends in the magnetic values and contour maps generated by this magnetometer survey. Briefly, these are:

1. The checked pattern of extreme low and high values in mound areas is due to the construction loading of A and B horizon soils. A horizon soils reflect high magnetic values, while the B horizon reflects very low positive or negative values.
2. Depending on thickness, B horizon soils utilized in construction loading will mask the potential values of underlying middens, floors or features.
3. The degree of positive gamma values can be correlated with the relative cultural enhancement of the A horizon and density of artifacts. In Blocks 7, 8, and 9, 13 out of the 15 units excavated showed a direct correlation between the number of artifacts by weight recovered in the submound midden/A horizon surface and the relative degree of higher or positive gamma values.
4. Off-mound areas in blocks 5 and 7 show a very precise correlation between the magnetic contour and mapped distribution of artifacts within a midden soil.
5. Some but not all pit features will show, although these gamma values filtering and mapping may produce these sometimes ephemeral features.
6. Several monopolar and dipolar anomalies correlated with features recorded from excavations.

While all of the data have yet to be analyzed completely, the preliminary results clearly show the potential for the magnetic prediction of artifact densities and features within occupation activity areas, as well as denoting non-activity areas across the site. More work is anticipated for the 1982 field season which will be used to test some of the predictive concepts generated by the 1980 results.

The success of this pilot study also demonstrates the potential applications for magnetometer survey at other sites within eastern Arkansas as well as the entire Southeast where analogous alluvial soil and geomorphic conditions also exist.