

MAMMOTH TRUMPET



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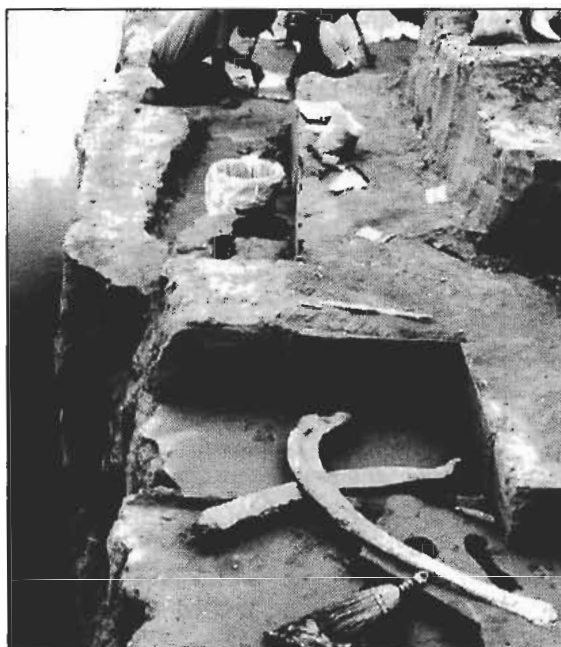
BONES OF NEBRASKA MAMMOTHS IMPLY EARLY HUMAN PRESENCE

Sites at Least 18,000, 14,000 Years Old

Two sites on Nebraska's high plains are offering evidence that people were in the Americas before Clovis time 11,000 years ago. Mammoth bones from these sites reveal patterns of modification researchers believe could only have been caused by humans.

Because both sites are in well-studied, primary deposits of Peoria loess that are confidently dated, the investigators are convinced people were there at least 18,000 years ago.

"There appears to be a tradition of mammoth-bone fracturing and flaking here in the plains that went on for seven to eight thousand years," says Steven R. Holen, Public Archaeologist and Research Assistant Professor with the University of Nebraska State Museum in Lincoln. He suggests that modifications to mammoth bone at the two sites appear the same as patterns documented at Clovis-age sites in the region. Samples of mammoth bones and soil humates from the La Sena site on the Medicine Creek Reservoir in Frontier County have been radiocarbon dated at between 19,000 and 18,000 years ago. At the nearby Jensen Mammoth site, where mammoth bone also appears to have been fractured and flaked by humans, radiocarbon dates of bone collagen and soil humates range



Mammoth ribs remained unbroken at La Sena site, though limb bones were highly fractured.

between 15,000 and 14,000 years ago. But unlike Clovis sites containing modified mammoth bone and well-made flaked stone tools, these two sites have revealed no stone tools.

The discoveries present Holen and his colleagues with a weighty challenge because according to the conventional wisdom in North American archaeology, there were

continued on page 4

INSIDE

8 Mastodon bones suggest butchery

Lithic flakes found with bones at new site in Tennessee

9 Clovis tools aplenty

Dates a challenge in Tennessee

10 Hands-on prehistory

Wyoming teacher earns Wormington award for his work with kids

14 Underwater site shows mastodons' life history

Florida team finds many stone and bone tools

16 Waco mammoth site reveals 28,000-year-old details

21 mammoths died in same event

2 CRP Vol. 11 now available

3 Clarification sought on hair

13 New books

18 Pack rats aid science

20 Suggested readings

KEN BOUC/NEBRASKA LAND MAGAZINE

We're sorry

Details that go amiss inevitably seem to do so in the most unfortunate times and places. And in publishing, another truism holds that errors in large or special display type are more likely to be overlooked than errors in conventional text. Production and editorial staffers at the **Mammoth Trumpet** deeply regret the error that appeared atop the front page of our September edition and we wish to apologize to the many admirers, friends, colleagues and family of the late Marie Wormington for any embarrassment caused by an error in her name. 🐾

Shelf-Sized Trumpet Has More Room for News

Over the years we have found that back issues of the **Mammoth Trumpet** provide excellent background on major developments in studies of the peopling of the Americas. They also provide information on archaeological controversies that is difficult to find elsewhere. But we've also observed that tabloid-sized newspapers are rather difficult to file and that old **Mammoth Trumpets** tend to yellow with age and crack from repeated folding and shelving.

This issue is our effort to remedy the situation. We trust that by shifting to an 8½ by 11-inch format on higher-grade paper, we are providing you with news that will be easier for you to shelve and file. We have made considerable effort to assure that the new format will not compromise content or readability, though it provides more space for news.

The **Mammoth Trumpet** will continue to be a newspaper that brings information on the search for the First Americans being conducted in various scientific disciplines to all who are interested, be they amateur archaeologists, armchair scientists, future scientists, or today's most active professionals. The **Trumpet** is an important part of the mission of the **Center for the Study of the First Americans** to disseminate scientific information to the public.

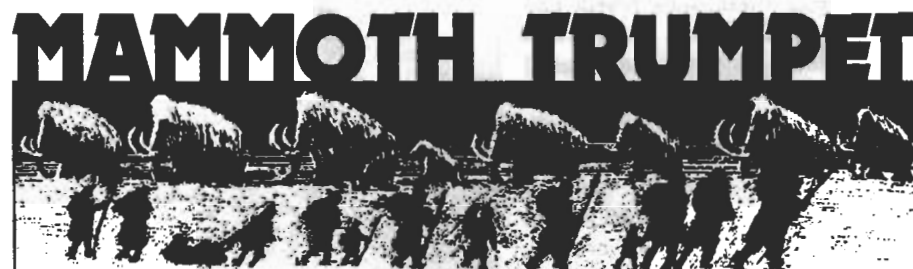
Because there is economy in numbers, we hope to offset the additional costs of our new format by attracting additional readers. We value your con-

CRP 11 Available; Papers Sought for Vol. 12

The recently published *Current Research in the Pleistocene* Vol. 11 contains a Special Focus section on Beringia comprising 20 papers. The 174-page journal, a Peopling of the Americas Publication of the **Center for the Study of the First Americans**, contains a total of 62 papers involving 111 investigators. *Current Research in the Pleistocene* is an annual compilation of multidisciplinary research notes on Quaternary investigations. The 1994 Vol. 11 is now available through the distributor, ISBS, in Portland, Ore.

Editor Bradley T. Lepper has issued the call for papers for Vol. 12. Contributors are asked to submit manuscripts of note length, no more than 750 words plus references, or 400 words with one figure and references. Papers are organized into six principal categories: archaeology, physical anthropology, lithic studies, taphonomy, methods, and paleoenvironments, which has subsections on plants, vertebrates, and geosciences. The Special Focus section for Vol. 12 will be on the Native American Graves Protection and Repatriation Act of 1990.

Information for contributors is being sent to persons who have contributed to recent issues of *CRP*; others may request copies from the **CSFA**, 355 Weniger Hall, Oregon State University, Corvallis OR 97331-6510. To get copies of *Current Research in the Pleistocene* and other Peopling of the Americas publications, see the order form on the mailing jacket of this edition. 🐾



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REGULATIONS currently proposed for the federal law that protects human remains from desecration may preclude scientists from studying DNA in naturally shed hair found in archaeological sites. Concern for the future of such research has prompted officials of the **Center for the Study of the First Americans** to urge that the definition of "human remains" in the regulations be clarified.

The Native American Graves Protection and Repatriation Act of 1990 was enacted to insure that human remains are respected according to the wishes of descendants of the dead. The widely supported act was passed to correct decades of insensitivity to the customs and wishes of Native American peoples. Under the Act, Native American remains held by museums and research organizations, and remains discovered in archaeological excavations on federal or tribal lands must be repatriated to tribal organizations.

CSFA officials are concerned by the potential impact of the proposed regulation's definition of human remains, which it describes as the physical remains of a human body, "including, but not limited to bones, teeth, hair, ashes. . . ." As currently drafted, the regulation makes an exception for human remains that were "freely given, by the person from whose body they were obtained." However, there is no exception for biological materials shed naturally during life as part of normal growth and health maintenance. In recent letters to Frances P. McManamon, consulting archaeologist with the National Parks Service's Archaeological Assistance Division, the agency charged with drafting regulations for administering the Native American Graves Protection and Repatriation Act, CSFA officials have presented strong concerns regarding the unqualified inclusion of all types of hair, regardless of origin. While it may not be unreasonable to conclude that the hair of a deceased person's body comes under the intent of the Act, hair shed normally and naturally during life does not. Hu-

Clarification Is Sought Regarding Status of Hair

**Naturally shed hair
is part of the archaeological
record that can be used to
study ancient populations.**

mans shed hair throughout life, and such naturally shed hair becomes part of the archaeological record that can be used to study ancient populations.

"New research indicates that where preservation circumstances are appropriate, ancient DNA can be recovered from naturally shed hair," Robson Bonnichsen, CSFA Director, told Dr. McManamon. "Ancient human-hair DNA is a much more common occurrence in the archaeological record than most specialists recognize. Our ongoing archaeological field research in Montana and Oregon is demonstrating that hair is ubiquitous. It occurs in many dry open-air sites, dry caves, in wet sites, and it undoubtedly occurs in permafrost sites."

Analysis of DNA from naturally shed hair can answer perplexing questions about the peopling of the Americas, Dr. Bonnichsen said in his letter. He emphasized that his discoveries of hair do not represent unique or accidental occurrences. "Hair is a major data set that is inadvertently discarded by most archaeologists, paleontologists, and paleoecologists because it is very difficult to recognize in the field." CSFA researchers developed a technique for sampling hair in the multicomponent Mammoth Meadow site in southwest Montana. Materials believed to be naturally shed human hairs were recovered from the site

as was the hair of animals ranging in size from mammoths to small rodents. Various permit-requirement issues relating to the hair research have cancelled field research at Mammoth Meadow for the past two seasons.

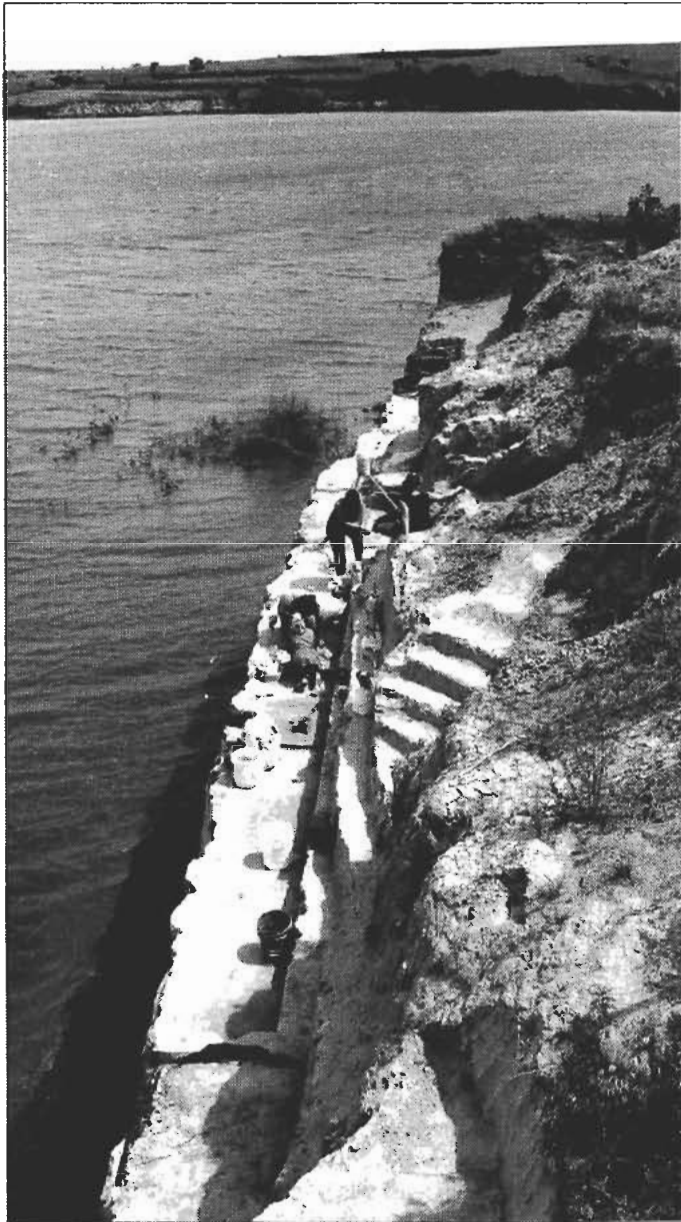
Great care must be exercised to accurately identify hair at archaeological sites. As a practical matter, archaeologists shed hair as readily as the people their research is focused on. Careful analysis under a microscope is necessary to determine the species of animal a hair came from, and even after microscopic examination, identification cannot be positive. To be positive, a hair tentatively identified as human must be sent to a DNA laboratory for analysis. There, part of the challenge is to ascertain that study samples were not shed by researchers.

If archaeologists are required to return human hairs found at sites to interested Native American groups, careful laboratory research would be necessary to ascertain which were ancient hairs and which came from the archaeologists themselves. Ancient hair can be used for radiocarbon dating, but samples must be at least 25 cm in length and samples are destroyed in the process.

"The prospect of routinely recovering ancient DNA from archaeological sites so dramatically increases our possibilities to answer questions about the past that we are on the threshold of a new era in archaeological information," Bonnichsen said in his letter to McManamon. "Yet, the potential of this new scientific era in the United States is threatened by the lack of clarity in the definition of human remains in the proposed NAGPRA regulations."

Alan L. Schneider, vice chair of the CSFA Board of Advisors, has recommended specific language for modifying the regulations. He proposed adding a statement that the term "human remains" would not be deemed to include "materials intentionally or naturally discarded or separated from a body during lifetime" provided they "are not part of a burial or found in association with other human

continued on page 7



The 1993 excavation at the La Sena site on loess bluffs above the Medicine Creek Reservoir.

Workers cast out
mammoth bones at
the Jensen site in
1993.

PHOTOS: STEVEN R. HOLEN



Nebraska Mammoths

continued from page 1

no humans in the Western Hemisphere before the makers of Clovis tools that date to no more than 11,500 years ago. By offering evidence to the contrary, they are likely to be told that either their chronology is wrong or the mammoth bone was modified by natural processes. Holen, however, is confident of the data. "I think we can demonstrate that this can only be human modification," he said in a recent telephone interview.

"The stratigraphic sequence is really well known and there's no doubt about the dates for these sites. They're well dated and the stratigraphy is well understood. That's the strongest part of our argument at this point." Working with Holen on the project is geomorphologist David W. May of the Department of Geography, University of Northern Iowa, a leading specialist on deposits of Holocene and late-Pleistocene age in central and southern Nebraska. They are confident that at each site bones of one individual mammoth were buried by loess—fine-grain, wind-blown silt—relatively soon after the animal died.

*"There's absolutely no doubt
about how old
these sites are."*

"We think we have very reliable radiocarbon dates," Holen said after explaining that the bone, especially at the La Sena site, is in good condition. Though water leaching down through loess can destroy bone, a weakly developed B soil horizon containing clay seems to have protected it. At the La Sena site this soil horizon actually caused some bones to become coated with a mineral deposit that helped protect them. "At the La Sena site the collagen content of the bone is very good."

"There's absolutely no doubt about how old these sites are," Holen added. The radiocarbon dates from humates in soil samples and mammoth-bone collagen from the La Sena site appear in a paper May and Holen recently published in *Quaternary Research* (**Suggested Readings**). Humates are organic acids in humus; collagen is an insoluble protein that is a chief constituent of bone. Two soil samples from approximately four meters below the surface were found to date to $18,860 \pm 360$ (Tx-7006) and $16,730 \pm 490$ (Tx-6708) years ago. The latter sample (8 kilograms) was immediately adjacent to a large piece of mammoth bone at the buried B horizon, while the former was a larger (50-kilogram) sample taken about 20 centimeters above the horizon and the



bones. Collagen in the mammoth bone was dated to $18,000 \pm 190$ years ago (Beta 28728). May and Holen consider the older soil date more reliable because modern rootlets, which would skew the dates toward the present, were found around the mammoth bones in the B horizon. The larger sample avoided animal burrows, rootlets, and cracks in the loess.

Fracture Patterns

If they are so confident of the antiquity of the sites, how can they be sure people were there?

"Our interpretations are based primarily on the fracture patterns of the bones," says Holen. At the La Sena site the bones are disarticulated. Limb bones are very highly fractured, but among them are unbroken ribs and vertebrae. "We see evidence of high-velocity impact points." Whatever broke the bone left impact scars that measured approximately four centimeters. "You can tell by the way the impact fractured the bones—the negative bulbs of percussion—that these were hit with something that had to be fairly large and coming at a pretty high rate of speed."

Further, the breakage occurs in the middle of the bone shafts, suggesting that the intent was to gain access to the marrow. Holen noted that studies of prehistoric bone breakage as well as ethnographic studies of people breaking elephant bones indicate that they were broken open for marrow. "We know that recent hunter-gatherer groups in Africa broke open elephant bones to extract marrow. We have good reason to think that people utilized marrow in prehistory." He noted evidence of marrow usage from Paleoindian bison kills. "People used marrow—it's a high-energy food."



Close-up view of fractured La Sena Mammoth thigh bone shows negative cone of percussion at the impact point, upper center.

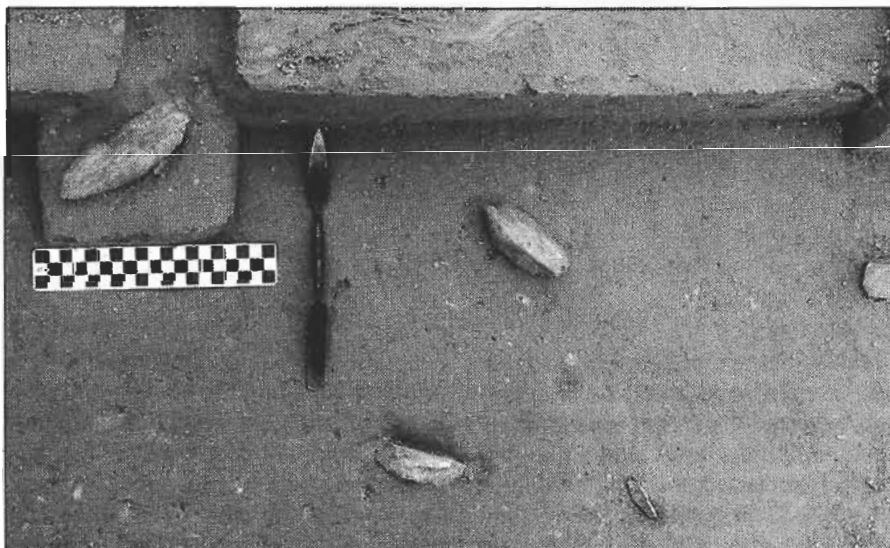
Bone as a "Lithic Resource"

Holen and his colleagues have observed that patterns in bone flaking in Clovis sites support their argument for human presence at the La Sena and Jensen sites. "There are well-documented cases at Clovis-age sites in North America of people breaking and flaking mammoth bone," says Holen, who has been investigating one Clovis site himself. In these cases, he says, "We see evidence of the bone being struck by something very hard, probably a hammerstone, and we see indications of high-velocity impact points. 'These points are *very* distinctive—they cause negative bulbs of percussion, and they cause radiating fractures from the point of impact,'" he said.

Clovis sites also provide evidence that people were flaking mammoth bone and using it as if it were a lithic resource. "They could take nice flakes off of these bones, which were presumably used as expedient tools in the butchering process. Bone flakes in very similar patterns to stone. You can see the platforms, bulbs of percussion, hinge fractures, and other diagnostic features of stone flaking on the bone flakes. These are the patterns we are looking for—and the patterns we see at both Jensen and La Sena sites as well as at Clovis-age sites."

Modification by Natural Processes?

How can Holen be sure the mammoth bones from these two Nebraska sites were not modified by natural processes? Couldn't natural erosion have caused much of the breakage? And what about the teeth of those big Pleistocene carnivores, the massive feet of live mammoths, or the hooves of bison? His most important evidence to the contrary may not be the bone itself but the stratigraphy which



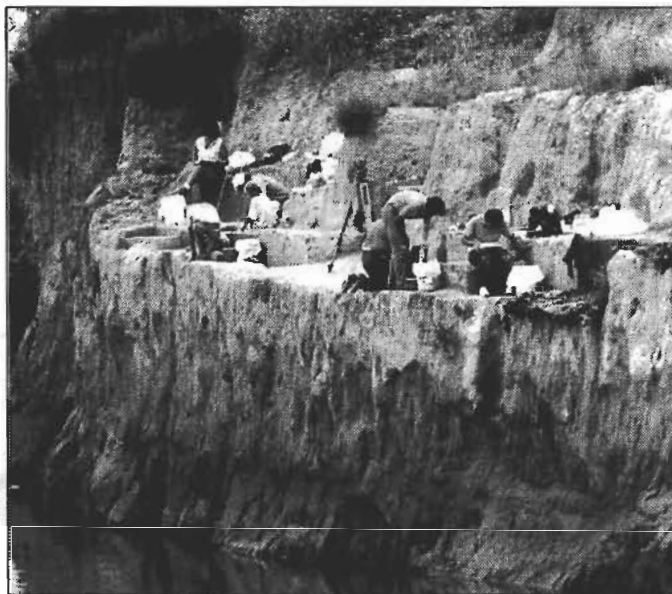
Highly fractured limb-bone fragments in situ at Jensen site in 1993 with bone flake on pedestal.



has held its secrets for so long. Loess—windblown silt from meltwater of the continental glacier, which would have been no more than a few hundred miles north and east of these sites at the time the mammoths died—covered the bones within a few years. Deposition of the loess began about 20,000 years ago and continued for approximately 10,000 years; by then 12 meters had been deposited on southwestern Nebraska. Both sites are solidly within the loess deposit; the bones have not been moved by running water or erosion.

The fact that the bones are situated in a fine wind-blown deposit eliminates many natural processes that could have broken the bone, for example, transport in rock-filled streams. "There's no rock that could have fallen and broken these bones naturally. There's no rock that could have washed against them and broken them." He also discussed and rejected two natural causes that have been found to modify modern elephant bone—carnivore actions and trampling by other elephants.

"Carnivores always begin gnawing at the articular ends of the bones and then work their way into the shafts," Holen said, pointing out that all the breakage at the La Sena and Jensen site occurs at mid-shaft. "We see very little evidence of carnivore action at these sites. It should be



KEN BOUC/NEBRASKA LAND MAGAZINE

La Sena site is excavated into Peoria loess, which displays its characteristic vertical bluffs.

very apparent if carnivores are in these bone assemblages, and that evidence just isn't there. There's only very minor evidence of carnivore activity."

Trampling? "We have very highly fractured limb bones lying right next to complete ribs and vertebrae." That suggests that mammoth trampling is not the cause of this fracturing because the ribs would be broken much more quickly; they're lighter bones. Further, there is the evidence that something with an impact point of four centimeters broke the bone. "That is much larger than carnivore teeth and much smaller than mammoth feet," Holen observed.

"Basically we're rejecting the natural processes in favor of the human process by eliminating the arguments of natural processes, and using comparisons with known human modification of proboscidean bone. And we're seeing a very strong relationship between our assemblages and the patterns caused by human breakage."

Mammoths are believed to have become extinct soon after 11,000 years ago, but mammoth bones from sites approximately of Clovis age have frequently been found to show evidence of butchering. Bones at the La Sena site are completely disarticulated, and limb bones are heavily fractured; at the Jensen site bones are scattered, but

they're more or less in anatomical order with front bones being toward the head and rear bones in the opposite direction. "So far we haven't seen any cut marks from stone tools," Holen said. "Nor have we found any stone tools."


Holen suspects that mammoth-bone processing sites are more common than they might seem. "I have worked now on four late-Wisconsin-age mammoth sites in the Central Plains in the past six years. I have not been selective—I have worked on every one that was found.

Three of the sites have high-velocity impact fractures and bone flaking. The other site has highly fractured limb-bone fragments, but no impact fractures or

bone flakes have been found yet. That site is under water most of the time so we have not yet had the opportunity to conduct extensive excavation."

Mammoth sites usually arouse excitement when they are found. "People know they aren't cow bones or bison bones. They get reported to professional paleontologists and archaeologists more often than, for instance, bison bones." But Holen thinks it is quite possible that bones processed by humans may not have been recognized as such. Many mammoths have been excavated in Nebraska over the past hundred years, and there is evidence in the records that fragmented bone was not

Hair Preserved At La Sena Site

Soil samples from the La Sena Mammoth site contain hair. Steven R. Holen of the University of Nebraska State Museum in Lincoln sent the samples to the Center for the Study of the First Americans at Oregon State University, where Director Robson Bonnichsen subjected them to procedures the CSFA has perfected to isolate mammal hairs from clays and other soil constituents. While the process recovered hair from La Sena, each individual hair still must be analyzed to determine its taxa. Mammoth bones and soil humates from the La Sena site have been radiocarbon dated at between 19,000 and 18,000 years ago. 

*"We see evidence of
high-velocity impacts."*

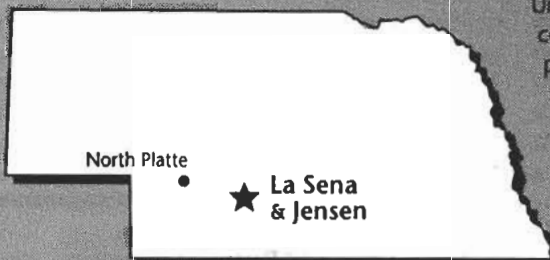


The Tale of Two Sites

NEBRASKA'S LA SENA AND JENSEN mammoth sites are approximately 40 miles apart, the former on land administered by the federal Bureau of Reclamation and the latter on the farm of Richard and Harriet Jensen northeast of Cozad in Dawson County. Steven R. Holen, Public Archaeologist for the University of Nebraska State Museum, has been working at the La Sena site since 1988. The Jensen site was not discovered until 1993.

La Sena site was found in 1987 by Bureau of Reclamation archaeologists Bob Blasing and Brad Coutant, during a survey of Medicine Creek Reservoir, also known as Harry Strunk Lake. It is a salvage site because it is being slowly eroded from a high cutbank. Investigation, funded since 1988 by the Bureau of Reclamation, has proceeded gradually and something less than 25 percent of a single Columbian mammoth (*Mammuthus columbi*) has been recovered. Though there is no way to know exactly how much of the skeleton remains and how much has been lost to erosion, Holen said that work earlier this year indicates that the

site is getting larger as excavation proceeds back into the bank. "So we are encouraged that we may have gotten in early on the erosional process and that the majority of the mammoth may be there." The most recent work found bone scattered farther north and farther south along the cutbank than had been found



before. La Sena excavations have reached a depth of about 14 feet below the surface.

At the Jensen site, county road workers hit bone while excavating a barrow pit at a bridge project. University of Nebraska State Museum paleontologists, assisted by several volunteers, investigated and found the lower jaw, skull, and tusks of another Columbian mammoth. Soon they found more including most of the vertebrae, at

least half of the ribs and part of a scapula. When paleontologists George Corner and Bruce Bailey discovered rear leg bones bearing long spiral fractures they contacted anthropologist Holen.

"They had seen those types of fracture patterns on mammoth bones that I had shown them from the La Sena site," Holen explained in a recent telephone interview. Holen estimated that 50 to 60 percent of the Jensen mammoth has been recovered. "We're still working on the site and we know there's still more there." The team experimented with ground-penetrating radar, but it would not work in the loess soil, probably because of the clay in the soil's B horizon, the zone where minerals leaching from above accumulate, and perhaps because these soil minerals limited penetration of the radar waves. "We were also experimenting with electromagnetism, but our experiments got rained out the first time and we haven't been back yet," Holen added.

Because the sites are in the region's well-studied Peoria loess, Holen and geomorphologist David W. May of the University of Northern Iowa, who are co-principal investigators of the project, predicted that the Jensen mammoth would be about 14,000 years old; subsequent radiocarbon tests provided dates of 13,880 and 14,830 years before present.

Paleoenvironmental studies at the sites have been based on microfauna and phytoliths; so far, the loess has not yielded any pollen. Holen said the research suggests that at the time the mammoths died the climate was drier and cooler than at present with cool-weather grasses dominating. There may have been gallery forests along the stream courses. The microfauna is interesting because many of the species now exist only at higher latitudes or altitudes. 🐾

—DAH

often collected. In fact it is probable that some mammoths were not excavated if the bone was highly fractured. "It's only been recently that people have recognized the importance of fracture patterns and flaking on proboscidean bone," he noted. 🐾

—DAH

Clarification on Hair

continued from page 3

body parts." In a letter to McManamon, Schneider said the suggested clarification "would be consistent with the intent of Congress and would allow legitimate

scientific research to continue without needless controversy and disputes."

Readers interested in obtaining copies of Bonnicksen's and Schneider's letters to McManamon should contact the **Center for the Study of the First Americans**, 355 Weniger Hall, Oregon State University, Corvallis OR 97331. 🐾

TENNESSEE MASTODON BONES SUGGEST HUMAN BUTCHERY

Lithic Flakes Found; Cut Marks Possible

Bones of a young bull mastodon being excavated by the Tennessee Division of Archaeology may provide that state's first positive connections between Clovis tool makers (page 9) and the mastodons that browsed central Tennessee's forests in the late Pleistocene. Regional Archaeologist John B. Broster says about a third of the mastodon's skeleton has been recovered in field work that continued into late November. As the site was being but-toned up for winter, Broster said he believes most of the animal's bones, which seem to have been spread somewhat as might have occurred in the process of butchering, will be recovered.

The mastodon was found last spring. Initial work at the site in Williamson County, south of Nashville, revealed a mastodon's tusk, a tooth, ribs, and three thoracic vertebrae, the parts of the back-bone to which the ribs were attached. One vertebra bears what may be cut marks made by someone cutting away meat with a stone blade. "And I emphasize *may be*," Broster said. One bone sample was sent to a radiocarbon-dating laboratory. The investigators are in the process of washing the bones and looking for more evidence of possible cut marks, particularly on the thoracic processes.

Last September Broster found artifacts—a core scraper and a large flake—in the same blue-clay matrix as the bone. Beginning in mid-October, Broster and his team excavated a block of soil down to the bone bed, and as of mid-November they had recovered about a third of the skeleton. "It looks like we have a near-complete skeleton," he said in a recent telephone interview.

And they found more flakes. "We now have nine flakes from within the bone bed," Broster said. Some of the artifacts were found under parts of the skeleton.

The mastodon site is on property being developed alongside a golf course. "We've got to take probably another four-meter-square block out to get the rest of him," Broster said. And his team

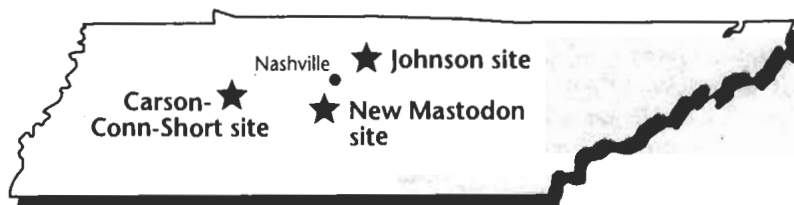
also must examine a wider area to see if the site offers anything more. "It appears we have one mastodon only. Probably a young bull under the age of 23," Broster said. Bones of another mastodon were discovered on adjacent property in 1977 when the golf course was being developed. That animal was quickly excavated paleontologically without thought that it might have been an archaeological site.

Broster said there are more than 60 known occurrences of mastodons in Tennessee, and until now none has been associated with human activity. The archaeologists are therefore carefully analyzing this new site, officially identified as 40WM31, and Broster is confident that the lithic flakes found with the bones are artifacts. "They're definite flakes, not

searched again. "And sure enough, he was walking down the canyon and said, 'Well, we've got one,'" Broster recalled. It was no more than 40 meters from the site of the 1977 discovery.

They soon found the tusk and several bones including the vertebra bearing the apparent cut marks. In late September, Broster and Breitburg returned to the site and made an additional discovery: "Sticking out of the bank in the same matrix that the mastodon was in, there were a core scraper and a large flake." Broster scheduled a full-scale excavation for October, and as the bones were uncovered Breitburg was able to examine them and determine the age and sex of the animal. Because the epiphyses, or end caps, of the long bones and thoracic vertebrae had not fused with the main sections of the bones, he was able to determine that the animal, though large in size, was likely between the ages of 18 and 23 when it died.

Although a small amount of the skeleton apparently was eroded away from the side of the ravine, Broster believes



just pieces of chert." Fortunately developers of the site are excited about the discovery, too, and have encouraged the project. "We haven't been in their way and we've gotten things done ahead of schedule," he said, adding that the developers have pledged to allow the Tennessee Division of Archaeology to monitor construction excavation near the mastodon discovery. "If they hit anything, they'll stop and let us take care of business."

Because of the 1977 mastodon discovery, Emanuel Breitburg, osteologist and paleontologist with the Division of Archaeology, had long suspected that there might have been more than one mastodon in the area. He decided to continue monitoring a ravine near the golf course where the first elephant was found. The first few searches proved fruitless, but last spring Dr. Breitburg and Broster

the site contains a near-complete mastodon skeleton that lay in blue clay. Analysis of the location of individual bones suggests they have been moved short distances. "It could be from the process of butchering," Broster speculated. "That is certainly possible given the amount of lithic material we found."

Broster said the skeleton was relatively concentrated and in some anatomical order. "It's not like a washed deposit—a random scatter of bones. There's been some movement of the bones within a very restricted area." Geologists involved in the investigation, Richard Stearns and Art Reesman of Vanderbilt University's Department of Geology, suggest that the site was a shallow pond in Pleistocene time. Discovery of the remains of a painted turtle there confirmed the likelihood of shallow, slow-moving water. Trenches the team excavated to


CLOVIS TOOLS PLENTIFUL IN TENNESSEE

Quality Chert Utilized;
Age Proves Challenging

There's a "mind-boggling density" of Clovis artifacts in sites near the Tennessee and Cumberland rivers, says John Broster, regional archaeologist for the Tennessee Department of Conservation, who has been working on several Paleoindian sites there in recent years. But dating the fluted-point horizon of the region's richest archaeological sites has proven difficult.

The Carson-Conn-Short site, which is on Kentucky Lake, a reservoir formed by the damming of the Tennessee River, was a source of tool-grade chert. Known formally as 40BN190, the site is west of Nashville. In a recent telephone interview Broster said it is revealing an intact fluted-point horizon that includes blade cores, blades, blade tools, and the entire sequence of the manufacture of fluted points. "We've got about 1,600 Clovis tools," he said, some found during surface mapping and others uncovered in the test units that have been excavated. So far the site has produced 12 complete or near-complete Clovis points, 89 fluted preform bases, and about 45 large prismatic blade cores distinctive of Clovis occupation. "We have in the neighborhood of six or seven hundred formal tools, all uniface and all made off these prismatic blades."

"So it's mind-boggling in the sense of the density of the material," he added. "Of course there are thousands and thousands of waste flakes." The site, which Broster suggests was a series of encampments over probably a couple of thousand years, is on alluvium

analyze the stratigraphy indicate a fairly extensive blue clay deposit, and that leads Broster to consider the possibility that other skeletons of Pleistocene fauna—and possibly more signs of Pleistocene humans—might be buried in the same general area. 

—DAH



A test unit at the Carson-Conn-Short site shows the density of lithic materials. A Clovis base is visible at the center of the square.

deposited by streams and ravines running down to the Tennessee River. Along with the alluvium came large amounts of tabular chert, some in chunks as big as basketballs.

"It's just beautiful material—excellent for knapping," says Broster. The prehistoric workers apparently used percussion techniques to prepare big prismatic cores, "knocking off the ends of a block and then going around and trimming it. They were driving some incredible blades off of these large chunks." They could be choosy, because there was such an abundance of chert, and they left much rejected material. "They seem to

*"It's just beautiful material—
excellent for knapping."*

have been operating there for generations," Broster suggests.

Initial tests indicated that fluted-point strata at this and other sites in the region might date to 12,000 years ago or older. (Mammoth Trumpet 8:2, "Sites in Tennessee Suggest Clovis Originated in East.") Speaking specifically of the extensive Carson-Conn-Short site in Benton County, Broster elaborated on the problems dating the material. "There seems to be a contamination problem. What we have are flecks of charcoal, but they probably are due to succeeding forest fires

over thousands and thousands of years because they're not reliable for dating." He said there is no bone preservation at the Carson-Conn-Short site.

"We really haven't gotten a carbon sample date that would fall into the area that we would like it to be," he said. Among those helping with the investigation is geoarchaeologist C. Vance Haynes, who has taken sample cores to his University of Arizona lab for dating. Though reliable ages for Clovis-type tools at this and other sites in the region, and from mastodon bones from the Williamson County site will enhance understanding of early human presence in the region, questions of chronology do not diminish the significance of the vast quantities of lithic artifacts found there.

Chert Heat Treated

Chert that was to be made into fluted points appears to have been heat treated, a process the Tennessee Clovis people didn't seem to employ on the blade cores. Broster said the heated chert takes on a waxy look and the color darkens or reddens depending on whether oxidation or reduction occurred during the firing. He suggests that the heating probably factored out some impurities; the chert was less likely to break when it was being flaked. "It seems to work much better."

Among those who have been working with Broster on the Carson-Conn-Short site are Smithsonian archaeologist Dennis

continued on page 19

Hands-on Prehistory



Wyoming teacher Roderick D. Laird watches with pride as eighth-grader Jessica Irvine uses an atlatl to hurl a spear. She made several atlatls during her studies with Laird. When she was a fifth-grader at Encampment, the Wyoming State Museum in Cheyenne persuaded her to donate one of her atlatls as part of a display on Paleoindians. Laird recalls Miss Irvine, now a freshman at Notre Dame, as "one of the best of the many super kids I've been fortunate to work with over the years."

Work with Kids Earns Teacher Wormington Award

If the turbulent twentieth century with its wars and upheavals remains a closed history book to many students, how can educators hope to inspire student interest in the far-off era of American prehistory?

Judging from student testimonials and a shower of honors, Wyoming teacher Roderick D. Laird has defied all odds and done just that. Over at least three decades, he has channeled his own ardent interest in paleolithic cultures into teaching programs and tools adapted to both academic learning and students' personal and skill development. His success was acknowledged in 1990 by the Wyoming Department of Education when it named Laird Teacher of the Year, an honor that came a year after the National Endowment for the Humanities, in partnership with the Reader's Digest Fund, made Laird its choice as Teacher-Scholar for Wyoming.

This year, Laird was awarded the H. Marie Wormington Award by the **Center for the Study of the First Americans**. The honor, given for exceptional contributions to First Americans Studies, was especially cherished by Laird because Dr. Wormington, long a leader in studies of American prehistory, had encouraged his work and participated in some of his community's archaeology awareness programs. Dr. Wormington died in May, 1994.

Recalling her part in the atlatl-throwing contests that were held in Saratoga, Wyo., in the 1980s, Laird said, "Marie used to come to our Atlatl World Open, where she would speak at our campfire programs and even serve as a judge at our atlatl competition. To her, our amateur efforts were just as important as any international gathering of professional archaeologists. She was a world-class scientist, one of the true greats, but she was never too busy to support and come

MIMI GILMAN

BECAUSE OF RODERICK D. LAIRD, people all across North America have tried throwing spears with age-old launching sticks, an invention from deep antiquity. Called atlatls, an Aztec word, the devices enable spears to be thrown with supercharged force by producing increased leverage. Before Laird could popularize atlatl



contests, he had to learn the art of making atlatls and, of course, Paleoindian spears. His first "Kids' World Open Atlatl Contest" was in Saratoga, Wyo., in 1981, and subsequently the popularity of the sport spread. Laird's book *How to Make and Use the Atlatl*


was published by the Saratoga Historical and Cultural Association and Atlatl Press in 1984. It quickly went out of print, but the popularity of flinging replicas of Paleoindian spears with handmade launching sticks continues to grow.

"Search for the First Americans," the BBC-produced television program seen on PBS's

Nova series, featured Laird to illustrate how Clovis points could be hafted securely onto a shaft. "This is a Clovis point with the fluted base," Laird said to a group of Native American children as he coupled it to a straight stick. "It fits into the foreshaft—like THAT." And the camera showed Laird's fingers binding the basal end of the point to the shaft with sinew. "This really holds it

on here better than anything we have today. In fact it will break right here [he indicates the base of the point] before it will come off." The Nova presentation went on to show the children learning

from Laird how to throw the spear with an atlatl. One child's attempt drives the spear deeply into bright concentric circles of a target on a large drawing of an elephant.

"It must have had a profound effect on the life style of those who possessed it," Laird wrote in *The Atlatl*. "It has been called the 'atom bomb of the stone age,' and though this may be a bit extreme, there can be little doubt that it was indeed a major milestone in human technological development." 

be with us amateurs," Laird said in a telephone interview.

Though he modestly refers to himself as an amateur archaeologist, Laird has exceeded amateur status on many important fronts. In 1971 he and a party of friends were responsible for discovering the Casper site, a Hell Gap bison-kill site near Casper, Wyo. Laird told the story of this important find with its 11,000- and 10,000-year-old spear points in his 1992 book, *Window in Time*. Written as part of a curriculum package, the book is now being used in a major university's archaeology classes.

Even in the early 1960s, ancient peoples fired his imagination as he watched archaeologists at work uncovering a Clovis site in New Mexico. He reported later: "I peered intently over their shoulders and into the distant past. . . . There in the rib cage were the only surviving traces of the weapon system which had killed the elephant: beautifully crafted Clovis points. What ancient hunting weapon had been responsible for such accuracy and power? How had the Ice Age hunters brought down such a large animal?"

He has been persistent in interceding

with professionals to draw attention to sites discovered by amateurs—sites that might otherwise have gone ignored. Occasionally he has called on Robson Bonnicksen, director of the **Center for the Center of the First Americans**, to give proper attention to discoveries of amateurs. For example, Dr. Bonnicksen traveled to western Kansas at Laird's in-

They built atlatls and the spears and spear points that went with them.

sistence to look at a collection of blades unearthed by rancher Dan Busse. He immediately identified them as Clovis, and they are currently being investigated by another prominent scientist.

Archaeology for Laird is an unflagging search for answers to the question: "How did these ancient peoples live?" His curiosity flowed through his long teaching career and resulted in a still-continuing stream of teaching materials, activities, books, transparencies, and projects to

enrich classroom instruction. His more than 30 years of teaching include 15 years at elementary and middle schools in Saratoga, Wyo. and 16 years in teaching and administrative posts in Casper and a year at Encampment (Wyo.) High School. Laird has taught English, social studies, and history, and he often incorporated archaeology as part of social studies and other programs. In addition to working with elementary, middle-school and high-school students, he has worked with gifted/talented students and deaf students. This year he is teaching special education at Saratoga Middle School, and he also is giving the school's first offering of First Americans Studies as an exploratory class for seventh- and eighth-graders.

"They're eating it up," said Laird.

What is necessary to arouse student interest in academic subjects? For those familiar with classrooms where students alternate between hyperactivity and boredom, Laird gives a surprisingly simple answer:

"Not really very much. Just give students some decision-making power to choose activities and some hands-on op-

portunities, responsibilities for their own learning, high expectations, and treat them with dignity," he says.

"I use the First Americans Studies and primitive technology activities not only to teach subject matter neglected in the regular curriculum, but also to stimulate reading and writing skills, research skills, thinking skills, and to motivate students, especially the special-education kids, both gifted and learning-disabled."

His most popular and visible hands-on project, offered as part of a primitive technology unit in middle school social studies, has been the design and construction of ancient spear-throwers: atlatls. Even the atlatl project, and the contests that accompanied it, were built on Laird's earlier teaching and administrative positions in Casper where he put together the "Wyoming Students' Paleoindian Museum," a mini-museum with displays of atlatls and tools and dioramas of the Casper site.

At Saratoga, however, the role for students expanded. They built the atlatls, together with the spears and spear points that went with them, out of materials available in ancient times—wood, bone, antler and sinew—and under precise instructions from Laird. He even wrote a book, donated to the Saratoga Museum, on atlatl construction. Written for kids, it has been widely used by professionals.

To make their weapons, students had to explore local resources: find the most supple natural woods; prepare the animal sinews for binding; attach the feathers that would steady a spear in flight; and practice with stone tools similar to those of ancient peoples. Creativity and persistence went into this exercise, along with manual dexterity and the readiness to follow instructions. But skills and personal development were only part of its value. It helped build reading and language skills, as one of the middle school students in the 1994 atlatl contest testified:

"We wrote papers during the year on our findings about how to make spears, and what animals lived during the Pleistocene. We made atlatls. We enlarged our drawings of three of the ancient megafauna and made huge, life-sized targets of *Panthers atrox* (American lion), *Canis dirus* (dire wolf) and *Smilodon californicus* (saber-toothed cat)."



As he watches a student prepare to demonstrate an atlatl that he made in class with the help of kids, Laird holds a spear and atlatl he made exclusively of materials available to Paleoindians—elk antler, sinew, walnut and juniper wood, and beeswax.

The art work was needed for the last phase of the project—the atlatl-throwing competition held at the middle school from 1981 to 1994. Another event, the "big" World Open, was held each summer in Saratoga during the early 1980s, as part of an innovative archaeology awareness program. Laird's students would compete against adults, including several distinguished archaeologists. Contestants would hurl their spears with atlatl launchers, keeping a hold on the atlatls but propelling the spears with the power of the throw. They aimed at models of Pleistocene bison and mammoths as had hunters of old. Eventually the summer event got so big that it was moved to Casper, but the all-student contest continued at Saratoga Middle School.

"The idea has spread from our school and town to quite a few state parks, and to a small number of schools across the country," he said. After sending some of its members to the Wyoming competitions, the Colorado Archaeological Society started its own annual event at summer outings. Laird credits two individuals who were major factors in the spread of the idea: Leni Clubb of the Colorado Archaeological Society and Ada Jackson, who persuaded him to write the book and then handled its sales.


Several of Laird's students have gone on to major in anthropology in college. Others, regardless of their chosen fields, remember Laird as a pivotal figure in their educations and their personal growth.

"I have been one of the many lucky people that have been touched by Mr. Laird's gifts," wrote a former student. "I have seen the effects he has had on numerous others; both academically and personally. He encourages students to exceed their potential and see themselves as special. Rod Laird holds both my admiration and respect, for he truly is an outstanding educator."

The mother of a one-time problem son who spent a year in Laird's classes wrote this to Laird: "Somehow, as he entered your classrooms, something 'clicked' for the first time. . . . I feel that he has achieved his potential and by setting him high standards you have encouraged him to reach a level I would not previously have believed possible."

In 1989-90 Laird took a year off from classroom duties under the sabbatical granted him by the National Endowment for the Humanities-Reader's Digest award. He attended an international symposium in the Soviet Union on ancient humans and visited prehistoric sites spanning more than 100,000 years. The symposium, he says, was "a priceless opportunity not only to hear the papers and meet the world's foremost archaeologists, but to personally ask them for information pertinent to my research on the peopling of the Americas."

The many honors and successes of this tireless teacher would seem to suggest that prehistoric studies can be assured of a spirited welcome in any classroom. But Laird says that's far from true. At the local level some citizens prefer to measure humanity's span of time as only a few thousand years. At some levels of administration and teaching, educators prefer rote learning and workbook assignments to the clutter of hands-on projects. But supportive parents reflecting their children's enthusiasm have been an unfailing ally in keeping these studies going.

In their personal life, Rod Laird and his wife, Pat, also a teacher, cherish the time they can spend with their four children and seven grandchildren. The older grandchildren, Laird says, "are already learning to spot bison bones, chips and hearth stains in the sand." Another generation of archaeologists is on the way. 

-Jeanne Riha

New Books

Geoarchaeology at the Burnham Site: 1992 Investigations at a "Pre-Clovis Site" in Northwestern Oklahoma by Don G. Wycoff and Brian J. Carter. 112 8½x11-inch pages. 1994. Special publication of the Oklahoma Archaeological Survey, University of Oklahoma, Norman.

This detailed chronicle of research at the Burnham site in northwestern Oklahoma begins with a summary of First Americans studies. As the authors note: "Given its distance from likely coastal or overland entry points into North America's Interior, Oklahoma has had a surprising role in questions about the peopling of the Americas." The volume goes on to describe the site and discoveries there. There is a section on geoarchaeology work done at Burnham in 1992 complete with two fold-out profile maps and a final section on interpretation and conclusions of research. Contributors include James L. Theler, Larry D. Martin, T. J. Meehan, Kent J. Buehler, G. Robert Brakenridge and Wakefield Dort Jr. Detailed soil descriptions and vertebrate remains discovered are listed in the appendices.


The First Immigrants from Asia. A Population History of the North American Indians by A. J. Jaffe, with Carolyn Sperber. 333 pages. 1992. Plenum Press, New York.

This book offers a unique approach to Native American studies, and because we missed it when it first was published, we want to call it to the attention of **Mammoth Trumpet** readers, however belatedly. The book truly appears to be the "labor of love" that it is called in the foreword. Not only does the book treat data and arguments on the peopling of North America from the perspectives of statistics and probability theory—offering a refreshingly objective outlook—it provides a historical and cultural perspective on the native populations. Chapters cover topics as diverse as growth and dispersion of the population, life expectancy and health problems, population size, vital statistics, food resources, family structure, and intermarriage, including thorny issues surrounding definition of "Indian" today. The author is a retired Columbia University statistician who has been fascinated by and involved with research on the Native American population for many years and is a Research Associate of the National Museum of the American Indian.

Proceedings of the First International Conference on Pedo-Archaeology edited by John E. Foss, M. E. Thompson and M. W. Morris. 210 8½ x 11-inch pages; softbound \$15, 1994. University of Tennessee, Knoxville.

The major objective of the First International Pedo-Archaeology Conference in Orlando, Florida, in 1992 was to encourage multidisciplinary efforts by pedology, geology and archaeology in the study of archaeological sites. This book is an outgrowth of that conference. Its 22 papers are organized into four groupings: "Introduction to Florida," "Position Papers," "Techniques in Pedo-Archaeology," and "Application of Pedo-Archaeology Techniques."

Dar and the Spear-Thrower by Marjorie Cowley. 118 5 x 8-inch pages; hardbound, \$13.95. 1994. Clarion Books, New York.

This book of juvenile fiction is the work of a writer and artist who has taught prehistoric archaeology to children from kindergarten to high school age. It is the adventure of a 13-year-old boy 15,000 years ago in southern France who acquires his first spear thrower—an atlatl. Thus, because we focus in this issue on teacher Roderick D. Laird's accomplishments in teaching ancient prehistory to youngsters, it is appropriate that we take note of another example of a teacher devoted to introducing a new generation to the quest for knowledge of humans' ancient past. 

IN THE HEAT OF SUMMER, mastodons gathered in a limestone canyon a few miles north of the Gulf of Mexico to drink from a pool in a sinkhole about 40 feet below the level of the land. As had been their habit for thousands of years, the animals had been browsing trees, vines and herbaceous plants in thickets and forest margins some distance from the water hole. The concentration of these browsing behemoths drew hunting and scavenging people to the canyon, now underwater in the Florida lowland forests between Perry and Tallahassee. Sea level was at least 40 meters lower in the late Pleistocene than it is now, and most of Florida's peninsula was dry because the water table was proportionally lower, too. With the subsequent rise in sea level, the land grew wetter and the sinkhole, which was at the base of a limestone bluff about 12 meters high, became part of the bottom of the Aucilla River.

And there, sealed from the air by water and accumulating sediments, much evidence of Paleoindians, mastodons and other animals has been preserved. The Aucilla River Prehistory Project, a long-term underwater archaeology project, has been uncovering amazing detail there including not only stone and bone tools and animal remains, but also delicately preserved plant remains. The research, in progress on the Aucilla for a dozen years, is a project of the Florida Museum of Natural History at the University of Florida and the Florida Bureau of Archaeological Research in Tallahassee. Scores of Paleoindian sites and Pleistocene mammal sites have been found in inundated sites along the Aucilla and other northwest Florida rivers. ("Florida Archaeologists Plunge into the Past," *Mammoth Trumpet* 3:2.)

S. David Webb, Curator of Vertebrate Paleontology at the Florida Museum, and James S. Dunbar, Field Supervisor of the Florida Bureau of Archaeological Research, co-principal investigators of the project, recently described new discoveries from the Page-Ladson site, which has been the principal focus of the Aucilla River project.

"In principle it is no different from a land excavation," Dr. Webb said in a recent telephone interview. "It's just cooler and we use more equipment," he added

with a laugh. "It can get logistically heavy with all the scuba and support gear. We use six-inch and four-inch dredges with floating screens to monitor our tailings, and typically we carry a thousand-watt light to make sure we have good visibility." Webb described a particularly interesting part of the project where work has proceeded downward in the river's west bank with divers working under 30 to 40 feet of water. Excavation has stair-

dates that range from about 12,200 to 12,300 radiocarbon years.

"For several years we had been excavating what we facetiously called 'the straw mat,'" Webb recalled. "It finally dawned on us to look carefully at that material. That is when we recognized that the chop lengths were very regular." Most of the plant material had been cut to a length of 8–10 millimeters by the chewing teeth of a *very large herbivore*—the

Underwater Site Details Mastodons' Life History

Florida Team Finds Many Stone, Bone Tools

stepped down the wall of the west bank in 20-centimeter units or on natural breaks. Each surface is trowel-collected within a 1-by-2-meter grid organized on a movable-track system. Identified as Test F, this portion of the site has come to be known as "The Stairway into the Past," because its 5-meter section spans about five thousand years from 8,000 to 13,000 years before present.

The Page-Ladson site has proven an important source of information about late-Pleistocene and early-Holocene people and their environments. Many different types of lithic projectile points have been found as well as some bone tools and butchered bones. More recent research has focused on plant remains as they illuminate past environments. An extensively analyzed area of The Stairway is Level 23, which is under more than 20 feet of water about 35 feet out from the present shore. Sediments there have

team had been excavating digesta, almost certainly the gut contents of mastodons that had gathered at the late-Pleistocene water hole. Underwater workers sometimes saw spheroidal clumps of the material, but most of these digesta had already been disintegrated during deposition in quiet water.

The team's paleobotanist, Lee Newsom, now at the Southern Illinois University Museum in Carbondale, analyzed the material and identified many species of plants it contained. There were two species of local pines (*Pinus* sp.), cypress (*Taxodium* sp.), willow (*Salix* sp.) and buttonbush (*Cephalanthus occidentalis*)—plants a large browsing animal would eat. The fragments represented the leaves, tendrils and terminal twigs of the woody plants. Webb notes that the assignment of the digesta to American mastodon (*Mammot americanum*) is only an interpretation. "Mammoth re-



mains also occur at the site, but mammoths were grazing animals. The plants indicate a browser, not a grazer, and from the size we knew it ought to have been a proboscidean."

Of the dozen partial to complete skeletons of proboscideans in this part of the river, mastodons account for three fourths of the sample. The mammoths were probably more common in the savannas.



Preliminary studies show that mastodon digesta preserved much more than botanical information. "In our frozen samples we found four kinds of steroids preserved at a very high level," Webb said. "Our analyst, Tim Gross, tells us that the material is analogous to what you would find if you swept out an elephant's cage at a zoo." Preliminary samples were found to contain progesterone, estrogen, testosterone and estradiol.

During screening and flotation analyses of the preserved dung some epithelial cells—probably from the gut walls of the animals—have been discovered. Presence of the cells and hormones opens a new avenue. Last year, when the movie *Jurassic Park* was released, newspaper articles discussed the possibility of Webb's team recreating Florida mastodons by recovering their DNA and putting it into the egg of a living elephant. Webb is cautious: "We have only begun our analysis, and we

can't say definitely that these are cells from the mastodon. For the moment it is our working hypothesis.

"We were amazed when our campfire speculations about chopped vegetation began to come true. Now, as we continue in the field, we are amazed at the volume of it," Webb said. "These digesta occur up and down in our site in three-dimensional volumes," he added. "It looks like a fairly compact organic clay, but the chopped ends give it a definite signature." And although the material appears most abundant in Test F, Level 23, and samples from that level have been most carefully studied, team members have observed what looks like the same kind of chopped vegetation at a newly identified site more than twice as old. "We haven't done any lab analyses at the new site; in fact we have not even collected frozen samples," Webb said. "We just have seen it."

The new Latvis-Simpson site, more than a mile from the Page-Ladson site, has yielded preliminary dates of about 34,000 years at the basal bone bed and about 24,000 years in a peaty unit above. If biological material there proves to be as well preserved as the already-analyzed materials from the 12,000-year-old level of the Page-Ladson site, scientists will be able to compare environmental signals and proboscidean digesta occurring between full glacial times and the end of the Ice Age. Such information may lead to a better understanding of the extinction of mastodons. A much older deposit of proboscidean digesta also is likely to provide totally unexpected discoveries, too, perhaps some as interesting as those found at Page-Ladson.

For example, the gourd, *Curcubita pepo*, previously had been thought to have been native to Central America, was found in the 12,500-year-old dung material. It is the species that has been developed into pumpkins and many varieties of squashes including acorn, crookneck, scallopini and zucchini, but there it was in Florida, long before people developed agriculture, and it was being munched on by mastodons. The Page-Ladson researchers dated the presence of gourds back to 12,545 years ago.

The mastodon digesta included other seeds including those of the grape (*Vitis* sp.), which also proved valuable. The principal fruiting time for wild grapes in

Florida is July and August, so Webb and his team know that these accumulations took place in late summer. Further, grape seeds provided ideal samples for radiocarbon analysis by the accelerator mass spectrometric technique. "They are nice hard little objects that are nearly of instantaneous products of a terrestrial plant," says Webb. The exact date from *Vitis* in the earliest Page-Ladson digesta (level 26) is 12,545 ± 80 radiocarbon years.

Though there are many clues to indicate that Paleoindians did interact with mastodons, mammoths and other Pleistocene animals now extinct, the Aucilla project team is proceeding cautiously to study how the animal bones at Page-Ladson and related sites may have been butchered and/or scavenged. The multidisciplinary studies now proceeding will be presented and synthesized in a forth-

*"It's analogous to what
you'd find if you
swept out an elephant's
cage at a zoo."*

coming book. Dunbar and Webb have written a recent chapter analyzing the most elaborate bone tools from extinct animals in north Florida (see **Suggested Readings**).

Though Paleoindian sites have been found above water in Florida, the state's inundated sites are particularly valuable because they preserve organic materials. Because sea level controls the groundwater level in Florida's aquifer, many dry inland sites were swamped after Pleistocene ice melted and raised sea level. Though this flooding was advantageous to archaeology, Webb says scientists have been reluctant to put underwater discoveries on an equal footing with those found in conventional dry land sites.

"There's an inherent suspicion about underwater sites," he noted, adding that "most people assume that river currents have disturbed the stratigraphy." Fortunately, that is not the case at Page-Ladson and a few other sites in the Aucilla River. 🐘

—DAH



STRECKER MUSEUM

Joe Taylor, left, of Crosbyton, Texas, prepares the bull for casting. Calvin B. Smith, right, is director of Baylor University's Strecker Museum Complex, which is planning to feature a recreation of the Waco Mammoth site.

Waco Site Reveals 21 Mammoths Died Together 28,000 Years Ago

Five more skeletons of a herd of Columbian mammoths (*Mammuthus columbi*) that died 28,000 years ago have been discovered during continuing research at the Waco Mammoth site in the city of Waco, Texas. The latest finds, including one located in September, bring to a total of 21 the number of animals found since 1978, buried in sediments of what was once the Bosque River near its confluence with the Brazos. All were females and young except for one bull, and evidence indicates they died in a single event.

The concentration of mammoth skeletons provides an inestimable source of information about the great animals that have long been associated with the Americas' earliest peoples. Calvin B. Smith, director of the Strecker Museum complex at Baylor University in Waco, who has been intimately involved with work there for 10 years, says the site also is significant as an example of how information can be preserved, interpreted and presented. The mammoths presumably died in flood and bank cave-in as the result of herd instinct as individuals followed the matriarch and attempted to

rescue floundering juveniles (**Mammoth Trumpet** 4:3 "The Waco Mammoth Site"). There is no indication of human interaction with the bones. "Not even a scratch mark," Smith said in a recent telephone interview. Most of the bones remained exactly where the mammoths died. "They're articulated extremely well," Smith added. There are not even gnaw marks indicating scavenging by predators. "It is absolutely the cleanest site I ever saw." Early in the investigation of the site, Gary Haynes, University of Nevada taphonomist, said the mammoths had been covered very rapidly, and a decade of continuing research has revealed no evidence to the contrary.

Among the first discoveries at Waco was an adult female with its 6-foot-long tusks beneath the chest and belly of a baby animal. Presumably she had been trying to save it before both became trapped in water and mud. The other mammoths died in close proximity.

Smith says that animals 17 and 18, initially located in 1992, presented the project's greatest challenge. These were found when investigators were excavat-

ing to get a north-south profile of the site. They lay immediately north of where that other female and baby had been removed. The concentration of mammoth bones proved to be those of a large bull, the first uncovered at the site, and a fairly large juvenile. It was another case of an adult evidently attempting to rescue a young mammoth in trouble.

"After studying the juvenile skeleton, positioned between the 8-foot tusks of the big bull," Smith says, "it seemed that the only way to preserve the information evident by the positioning of the skeletons was to cast these specimens in situ before they were removed. This had never been done on such a large scale, especially with two mammoths."


In April, Joe Taylor, owner of Mt. Blanco Fossil Casts of Crosbyton, Texas, began the project, creating a latex covering on all the bone. He sectioned it so it could be removed and reassembled along the lines of contact to minimize casting marks. Then he built a plaster jacket and a wooden frame that supported it during the casting process and later during transit to his lab. The field portion

of the project was finished in June, and then in Taylor's lab the bull and the juvenile are to be cast as they died 28,000 years ago. Taylor had cast the Burning Tree Mastodon excavated by archaeologist Bradley Lepper and a multidisciplinary team in 1989 near Newark, Ohio (*Mammoth Trumpet* 6:1 and 6:4). The original bones of that animal were sold to a museum in Japan.

A new, 88,000-square-foot Strecker Museum, now in the planning stages at Baylor University, will feature a recreation of the Waco Mammoth site, giving visitors a chance to experience the animals' Pleistocene drama as well as the scientific excitement of the discovery of this largest single-cause mass death of mammoths known. Smith, who also heads Baylor's Department of Museum Studies, called the in-situ casting of the bull and juvenile a monumental challenge. "This was a tremendous accomplishment," he told the *Mammoth Trumpet*. "We were able to remove the portion of the juvenile that lay on the right tusk of the bull and then cast the complete tusk so that it can be seen in the reconstruction in the new museum."

He said an incalculable amount of information would have been lost had standard field methods been used to remove the bones, but with financial assistance from the Cooper Foundation of Waco, the expensive on-site molding was accomplished.

Smith says the 19th and 20th mammoths proved to be another female and infant. These were discovered in a small wash below and west of the bull. "It was as though they had fallen into the same ravine that contained the infant that was being extricated by the female." He said the bones of individuals 19 and 20 are more disarticulated than any previously discovered; the bones had been washed somewhat downstream. In the same area early this fall workers confirmed discovery of the 21st individual; the lower portion of a right mandible was definitely not part of female No. 20. Smith said it was still too early to tell if No. 21 is articulated or if its bones had scattered downstream before being buried in sediments.

He and his colleagues hope to present details of the latest discoveries at Society of Paleontology meetings next year. 

—DAH




FIELD TRIP Director Robson Bonnicksen of the Center for the Study of the First Americans, left, describes for participants of the November meeting of the CSFA Board the potential of the Navarro-Leonard site, which has revealed bone and hair of several taxa. With him at the site in Oregon's Kings Valley are Joanne Turner and Anne Stanaway of Boulder, Colo., Board vice chair and chair, respectively, and David Rice, Seattle archaeologist with the U.S. Army Corps of Engineers.

Travel Grants Offered to Quaternary Meeting

The American Geophysical Union jointly with the U.S. National Committee for the International Union of Quaternary Research is expecting to obtain funding for its travel-grant program to the XIV INQUA Congress in Berlin, Germany, Aug. 3–10, 1995. Completed applications, including abstracts of papers and a one-page curriculum vitae, must be received or postmarked by Jan. 31.

Field trips are planned before and after the congress. The U.S. National Committee, under sponsorship of the American Geophysical Union and with the cooperation of the American Quaternary Association, is seeking to ensure U.S. representation at the congress by providing travel grants to enable Quaternary scientists residing in the United

States (regardless of citizenship) to participate. Travel grants, which will cover only a portion of a participants's expenses—mainly airfare—are to be awarded competitively, in part on the evaluation of papers submitted for presentation at the congress.

Applications and detailed instructions are available from Anne Linn, USNC/INQUA-HA-460, National Academy of Sciences, 2101 Constitution Ave. NW, Washington, D.C. 20418, or phone 202-334-2744. Persons receiving grants will be required to use U.S. flag carriers and to file meaningful trip reports emphasizing the benefits of attendance within 60 days of the end of the congress. Most of the travel awards will be announced by early spring. 



Pack Rats' Ancient Stashes May Aid Science in New Ways

MUCH CAN BE SAID about old pack rat middens. In an archeological context, they are an under-utilized resource. Perhaps they have been neglected because of their peculiar composition: piles of leaves, twigs, and rubbish that over time have been solidified by rodent urine into an amber-colored, crystalline matrix called amberat. If not exposed to rain or flood, amberat can preserve voluminous plant and animal remains for thousands of years. Fortunately for science, the best-known pack rat, *Neotoma cinerea*, or bushy-tailed woodrat, frequently nests in caves, rockshelters, and crevices in the Great Basin, where its crystallized middens may persist for millennia.

Pack rats occur over much of North America; there are eight species in the West and two in the East. They live in woods, deserts, and occasionally in attics or outbuildings. Their common name comes from their curious habit of hoarding all manner of small objects in their nests. These nocturnal rodents may steal cans, coins, and small tools, often replacing them with another object. Before manufactured items were available to them, they probably stashed naturally occurring curiosities such as bones left by predators. They also hoard sticks, leaves, and food. Thus "pack rat" probably is the most popular name, although "woodrat" tends to be used in the literature.

The oldest known pack rat middens in North America are found in dry caves and rockshelters and date to 40,000 years ago, although many are less than 10,000 years old. The middens are found from the Southwest north to Montana. The twigs, leaves, needles, and seeds encased in the amberat have been well studied by paleobotanists to identify ancient plant communities. This work has produced data on changes in ancient climates, most recently by a group in Arizona, as reported in *Science* (see **Suggested Read-**

ings). The small animal bones haphazardly included in pack rat middens have been studied by paleozoologists, thereby providing information on changes in geographic range of various Western American mammals, especially after the last ice age. Among others, bones of pikas, mice, and foxes have been found in these middens (Harris, 1985).

According to an article by William Stolzenburg in the September/October issue of *Nature Conservancy* magazine, studies of pack rat middens at Chaco Canyon shows that Anasazi people disappeared from their canyon city when they ran out of lumber and firewood. Pack rat middens there reveal remnants of pinyon pine woodlands until 800 years ago, just when the Anasazi left town.

Midden sites, it has been discovered, were not used continuously by generations of pack rats. Since occupation was

It's possible that amberat contains hair of humans and other cave visitors.

sporadic over many centuries, plant and animal materials in middens must be radiocarbon-dated individually or by microlayer, to assure dating accuracy. Whether humans coexisted in caves or rockshelters with pack rats may not be known with certainty, but it seems likely because natural shelters have been prime real estate for humans. It is not surprising that a few caves reveal clear evidence both of humans (bones, artifacts, hearths) and of pack rats (bones, amberat).

Excavations at Idaho's Jaguar Cave in the 1960s revealed hearths dated to at least 10,000 years ago in lower deposits. The deposits in this small cave contained nu-

merous remains of bushy-tailed pack rats (minimum 68 animals) and a few mice (*Peromyscus* species) and voles (*Microtus* species). It is possible that pack rats had nests in the cave in the past. The Wasden site (Owl Cave) in Idaho also contains bones both of pack rats and of *Peromyscus*, dated to at least 8,000 years ago (see Harris in **Suggested Readings**).

Given this background, one might conjecture that amberat will be found to contain hair shed by humans and other cave visitors or residents. By identifying such hairs by species, they could provide a record of numerous kinds of cave-ophiles over long periods of time. It may be possible to analyze the DNA composition of such hairs and compare it with the DNA of today's mammals, including humans.

A second way in which pack rat middens appear attractive for future study involves medical concerns about hanta viruses (see Marshall in **Suggested Readings**). A previously unknown strain of hanta viruses has been discovered to be the cause of an acute, sometimes deadly, pulmonary illness among people in the southwestern United States. This viral illness was identified in sporadic cases from other parts of western North America. The virus was found to be carried primarily by *Peromyscus* species of mice and shed in their urine and droppings. Since these mice are abundant in many rural areas of the continent, they naturally have come into contact with pack rats over many generations. In addition, one species of pack rat has already been found to harbor the virus.

The type of hanta virus causing the pulmonary illness is not new, despite its unexpected outbreak in 1993. Research at the Centers for Disease Control in Atlanta strongly suggests that the virus has coevolved with its rodent host or hosts over a considerable period of time (Spiriopoulou in **Suggested Readings**). This medical investigation is context for a second conjecture about pack rat middens: the crystallized excreta of pack rats—or of cohabiting mice—may contain ancient hanta viruses. Since the evolution of human (and other) viruses is not well known, pack rat middens may offer an elegant opportunity to study certain aspects of the history of human disease. So far, there are few other ways to attack this viral-evolution question directly.



Tennessee Clovis

continued from page 9

Stanford and Argentinean archaeologist Hugo Nami (*Mammoth Trumpet* 8:1 "Paleoindians of Patagonia" and 5:3 "From the End of the Earth"). Nami, an expert at tool making who is on a two-year study program at the Smithsonian, has done heating experiments with the site's chert. He and Stanford took samples of the raw material to Washington, D.C., for more experiments. "They say that heating it makes it an even better material," Broster said. "It's more resistant to breakage."

Possibly the Clovis tool makers visited the site only periodically to get new material. Evidence indicates they may have traveled to other sources of tool-making chert; while at the site they also reworked tools from elsewhere, leaving behind the unwanted fragments.

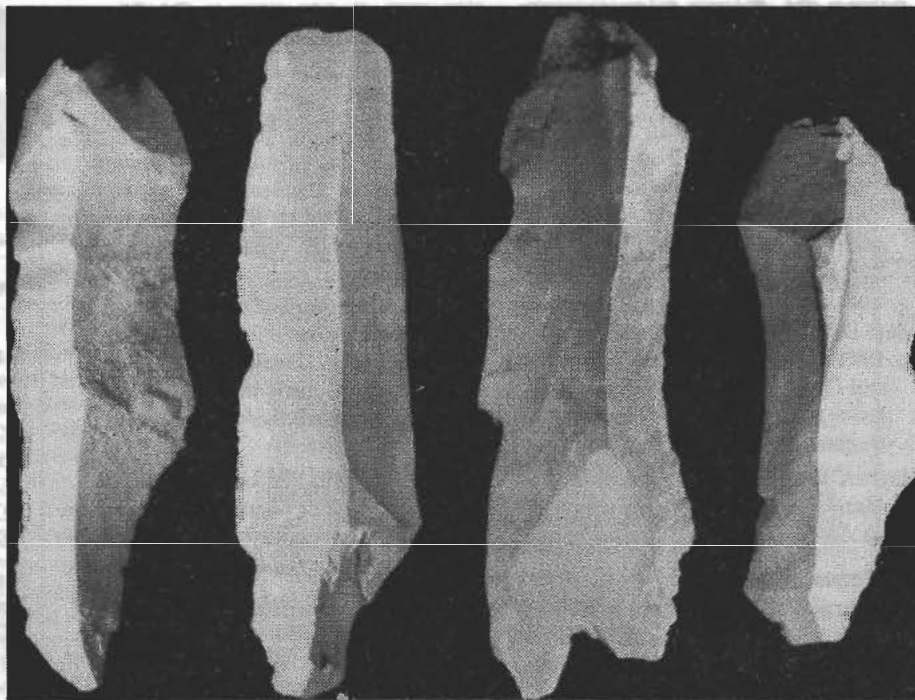
Big Pleistocene animals likely were another significant attraction to the tool-making people. Large mineral springs exist both east and south of the Carson-Conn-Short site. Like other such springs in Tennessee, they produce water rich in salts and other minerals that attracted animals—particularly elephants. Broster says that back in the 1840s, a large tusk, probably from a mammoth, was found at the mineral spring south of the site. Bones of Pleistocene animals, primarily mastodons, have been found in proximity of many such springs.

The Johnson Site

The Clovis tool deposits of another middle-Tennessee site, the Johnson site

It may be that crystallized rodent urine does not preserve viruses well. Donald Grayson (page 115 of *Suggested Reading* listing) recounts an instance in which people handled and ate amberat without developing hanta-viral symptoms. In 1849 a wandering—and hungry—party of pioneers heading south from Nevada toward Death Valley observed "balls of glistening substance" in cavities along a canyon cliff. Those who "made a good meal" of the rock-hard substance (amberat) experienced only a little nausea afterward, not a life-threatening illness. 🐾

—Dee Baer



JOHN B. BROSTER

Prismatic blade knives from the Carson-Conn-Short site are between 12 and 16 centimeters long.

in Davidson County east of Nashville, also have been difficult to date. The one date Broster considers "relatively good" is quite old for Clovis ($11,700 \pm 980$ years B.P.), but the unfortunately high standard deviation makes it impossible to answer the question of whether Tennessee's Clovis tools are older than those from long-known sites in the West. The date, Broster notes, "could drop well within Clovis for the West. It's in the ballpark of Western Clovis. Whether it's slightly older or slightly younger is debatable." Speaking of the plus-or-minus 980 years, he said, "We need to get something a little tighter than that."

The Clovis stratum, which has yielded about 25 fluted preforms and three complete Clovis points, is below an early-Archaic level dated solidly to 9,000 years ago. Yet he is not optimistic that definitive dating work can be done at the Johnson site anytime soon because of costs that would be involved. "The problem is that we've got 20 to 25 feet of dirt above it and there's really no way to run any kind of full-scale excavation there considering how much that would cost." Most of the Clovis-style material was washed out, but Broster's team managed to find three of the preforms in place and charcoal in association with one of them yielded the

11,700-year age. The Division of Archaeology is preparing a final report on the site that Broster expects to be published early in 1995.

Careful analysis of the ages of Clovis sites in the West by Dr. Haynes and others suggests that they date to the relatively brief span of time between about 11,200 and 10,900 years ago. That timing fits well with the theory that the handsome fluted spear points were employed by hunters who eradicated North America's Pleistocene elephants, already under extreme population stress because of drought and radically changing climate. Spear points somewhat similar to Clovis typology found in northern Alaska have been dated as early as 11,700 years ago, supporting the theory that makers of Clovis spears entered North America from Siberia 12,000 to 14,000 years ago and spread southward and eastward. Obviously American prehistorians will have to rethink existing theory if fluted-point sites in Tennessee and elsewhere in the East prove as old as the Alaskan points.

"It's not going to surprise me if Eastern Clovis is at least the same age as Western Clovis," says Broster, "which makes one wonder what the heck's going on." 🐾

—DAH

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ON Tennessee Sites

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ON Underwater Site Details

Dunbar, James S., S. David Webb and Michael K. Faught 1988 Page/Ladson (8JE591): An Underwater Paleoindian Site in Northeastern Florida. *Florida Anthropologist* 41:442-452.

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COMING CONFERENCES

March 9-12 72nd Annual Meeting, Central States Anthropological Society, Indianapolis. Contact: Larry Breitborde, Department of Anthropology, Beloit College, Beloit, WI 53511; 608-363-2500

March 11 Upper Paleolithic Image and Symbol: Beyond Art, Wattis Symposium, San Francisco.

Contact: Deborah Stratmann, Department of Anthropology, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118; fax 415-750-7346, e-mail: DStratmann@calacademy.org.

March 13-14 Molecular Anthropology: Toward a New Evolutionary Paradigm, Detroit. Contact: Mark Weiss, Department of Anatomy and Cell Biology, Wayne State University Medicine, 540 E. Canfield Ave., Detroit, MI 48201; 313-577-2935, fax 313-577-3125, e-mail: mweiss@cms.cc.wayne.edu.

March 15-19 Annual Meeting, Association of American Geographers, Chicago. Contact: AAG, 1710 16th St. N.W., Washington, D.C. 202-234-1450.

March 29-April 1 64th Annual Meeting, American Association of Physical Anthropologists, Oakland.

Contact: Robert Jurmain, Anthropology, San Jose State University, San Jose, CA 95192.

April 2-5 35th Annual Meeting, Northeast Anthropological Association, Lake Placid, NY.

April 19-21 Annual Meeting, Southern Anthropological Society, Raleigh, NC.

Contact: Kate Young, Anthropology/Sociology Department, North Carolina State University, P.O. Box 8107, Raleigh, NC 27695-8107; 919-929-6306, e-mail: young@server.sasw.ncsu.edu

May 3-7 Annual Meeting, Society for American Archaeology, Minneapolis.

Contact: SAA, 900 2nd St. NE #12, Washington, D.C.; 202-789-8200, fax 202-789-0284.

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