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CSFA LEADER IS CHOSEN FOR JUSTICE JOB

Clinton Picks Harris to Head Criminal Unit

President Bill Clinton has chosen Jo Ann Harris, chair of the Advisory Board of the **Center for the Study of the First Americans,** to head the Criminal Division of the U.S. Justice Department. Harris, a New York City lawyer, will be the first woman to fill the important position if the Senate confirms the appointment.

Intensely interested in archaeology and prehistory, Harris says she hopes to continue to participate in **CSFA** activities during her tenure. Attorney General Janet Reno announced in late June that Harris was the President's choice for the position. "Harris is a seasoned prosecutor who has been intimately involved in the investigation and prosecution of major criminal and civil cases, including complex white-collar crimes," said Reno. "She will be a tremendous asset to the Department of Justice and to

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INSIDE

BUTCHERED MAMMOTH BONES MORE THAN 12,000 YEARS OLD

'Net Stones' May Have Anchored Meat in Lake

Mammoth bones with definite signs of butchering that were found on the bottom of a lake in northwestern Pennsylvania have proven to be more than 12,000 years old.

Dr. M. Jude Kirkpatrick, an archaeologist in the Anthropology Department at Gannon University, Erie, Pa., and Dr. Daniel C. Fisher, of the University of Michigan's Museum of Paleontology and Department of Geological Sciences, have reported details of the discovery for *Current Research in the Pleistocene* No. 10, which has just been published. An initial report on the find appeared in the **Mammoth Trumpet** 7:1 December, 1991. A diver, curious about what he had discovered in a lake in south Erie County, phoned Kirkpatrick and described the mysterious object as about two feet long and having three points. Kirkpatrick agreed to look at the object and found that it was the scapula of a mammoth. He soon organized an underwater search employing volunteer scuba divers that ultimately brought up about 80 percent of the skeleton of a young male mammoth from water about 20 feet deep. The location has come to be called the Moon Mammoth site.

The circumstances suggest an underwater cache created by Paleoindians to safeguard meat from scavenging and predatory animals.

What made the discovery intriguing was the fact that the bones were in four separate groups along the shoreline of the lake, a kettle formed during the retreat of the Wisconsin glaciation. Further, with the bones were sandstone fragments that showed signs of human alteration. The circumstances suggested an underwater cache created by Paleoindians to safeguard meat from scavenging and predatory animals. Kirkpatrick contacted Fisher, who had previously found such evidence (**Mammoth Trumpet** 6:4 "Clues to Paleoindian Survival: Underwater Caches May Have Supplied Meat in Winter").

A fragment of the bone was radiocarbon dated at 12,210 ± 120 years B.P. Examination has determined that the mammoth was an incompletely grown male that died in late autumn or early winter. Though they acknowledge that more study remains to be done, Kirkpatrick and Fisher say the location and condition of the bones, the animal's age, its sex and the season of its death, resemble other sites believed to be examples of Paleoindian underwater meat caches. "The Moon mammoth shows patterns of bone modification similar to those observed at other sites suspected to represent butchered proboscideans," Kirkpatrick and Fisher say in their paper. They note particular bone damage that closely resembles that seen on the

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WORKED FLINT FOUND WITH MASTODON BONES

Where the Wisconsin glacier met the highlands of the Allegheny Plateau in east-central Ohio, the ice sheet and its ultimate melting had profound effects on the geography. Streams were blocked by ice, and drainage patterns were altered and then altered again. The result is an area in Holmes County where Dr. Nigel Brush shows students examples of glacial landforms. There, about three miles north of the maximum advance of glaciation, a lake once abounded with snails and other small gastropods. A finger of land extended into its shallows, possibly creating a convenient place for large mammals to drink—and possibly a place for humans to trap and kill them.

Brush, a lecturer in anthropology, geology, and environmental studies at the University of Akron, had long heard that mastodon remains were buried in the farm field that had replaced the Pleistocene lake. This summer, with the help of several students learning field techniques in Pleistocene paleontology and archaeology, he proved the story true.

Brush discovered not only the remains of a mastodon, but eight clearly worked flakes of flint and two end scrapers in close association with the skeleton. The mastodon had first been discovered in 1938, when a farmer was cutting a drainage ditch through this formerly marshy area. The trenching machine apparently cut through the skull, as several teeth were brought to the surface. Eight mastodon teeth were eventually recovered as well as a large leg bone. Brush received permission to excavate the site during July to search what might be left. The son of the farmer who discovered its teeth pointed out the vicinity of the discovery, and Brush and his students dug a series of test units, 2 meters

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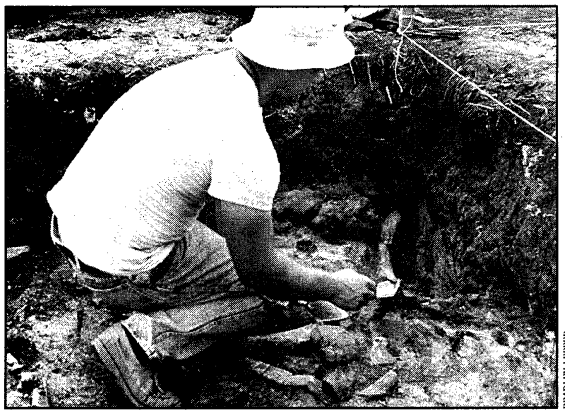

BRUCE J. LATIMER

Dr. Nigel Brush removes a third flint flake found in association with mastodon bones.

Limited Season at Montana Site Focuses on Hair

Film Crew Recording First-Americans Research

Work was under way in late August on another phase of the continuing investigation at the Mammoth Meadow site in southwestern Montana. The immediate goal was to establish multiple columns down through the site's deep stratigraphy to establish if there is a continuous record of mammal hair occurring from historic down into Paleoindian times.

Mammoth Meadow's extensive evidence of hair, especially from the site's oldest-excavated levels, is considered potentially the most significant discovery at the site because it establishes the presence of a wide variety of mammals. In some cases, hair is the only evidence left of the animals' presence. The site was a rich source of tool-grade chalcedony that was used by early peoples from the Plains and Rocky Mountain regions.

A new aspect during this phase of the investigation was to be the presence of a television crew. Principal investigator Robson Bonnichsen said producers from television's Learning Channel are making a series of half-hour archaeology films and plan to make one segment of a film about the search for the first Americans at Mammoth Meadow.

Mammoth Meadow's multidisciplinary scientific team was handed a disappointment earlier this summer when the U.S. Bureau of Land Management unexpectedly cancelled the project's excavation permit. Bonnichsen said he is confident that Montana BLM officials will resolve their problems with the Shoshone-Bannock tribes, members of which have questioned the need to investigate the history of the human presence on the vast Montana landscape.

The Mammoth Meadow hair record is a storehouse of data.

This year's abbreviated season is the eighth at this high-altitude site on a small tributary of the Missouri River that geologists say has followed a similar route down the slope near the eastern flank of the Continental Divide continuously for many thousands of years. The persistence of the water course and continuous deposition has expanded the record of human occupation from historic to ancient times, but more excavation will be required to determine the full extent of that antiquity. Soil scientists, however, have confirmed the presence of ash from an 11,200-year-old eruption of volcanic Glacier Peak in northern Washington in a stratum that preliminary testing suggests is nearly a meter above the oldest cultural materials yet discovered.

Well-preserved hair was first discovered relatively deep in the excavation. Since mammals can be identified by the hair they shed, the Mammoth Meadow hair record is a storehouse of data on earlier environments at the site. Confirmed species include mammoth, bison, bear, caribou, ancient horse, human, and many small mammals. The hair, originally embedded in the site's clay, is being recovered through the flotation process to which all excavated material is subjected. After being soaked in commercial water-softening agents, the material is processed in water tubs, which empty through fine-mesh screens that capture hair and other light substances. Heavier material from the tubs is then screened conventionally.

This summer's investigation is to complete the hair record through upper strata in the same manner used for the lowest strata. At strategic points, columns 50 cm wide were excavated and tested for hair. Once accomplished, the faunal record should be relatively complete from most-recent times to earliest times chronicled by the site.

–DAH

Harris

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the Criminal Division in particular." The Criminal Division employs more than 400 attorneys to develop, enforce and supervise the application of approximately 900 federal criminal statutes. It also formulates and implements criminal enforcement policy and provides advice and assistance to the Attorney General and Congress on matters of criminal law. Observers expected Harris's Senate conformation to go smoothly.

"Jo Ann Harris has all the right credentials, and she impressed [White House Counsel Bernard] Nussbaum and Reno during her interviews," said an administration official quoted by the *Legal Times*. The publication reports that crucial matters awaiting Harris' attention include the continuing Justice Department probe into allegations that Dan Rostenkowski (D-Ill.), chairman of the House Ways and Means Committee, improperly converted House postal vouchers into cash. She also could have an important role in shaping the administration's anti-crime legislation.

Harris worked at the Justice Department from 1974 through 1983, first as an assistant U.S. Attorney and then as Chief of the Criminal Division's fraud section. The *Legal Times* termed her advancement to head the fraud section "a remarkable ascent by any standard." In that position, Harris had a reputation for her aggressive pursuit of corporations, including defense contractors, who were defrauding the government. "Under her stewardship," the *Legal Times* reported, "Justice Department lawyers prosecuted some of the first major cases under the Foreign Corrupt Practices Act." The periodical also noted that Harris played a major role in implementing a 1978 law that established inspectors general throughout the federal government, a move that was resisted by some bureaucrats. Harris gained notice for successfully prosecuting a tax-evasion case against the Rev. Sun Myung Moon, leader of the Unification Church.

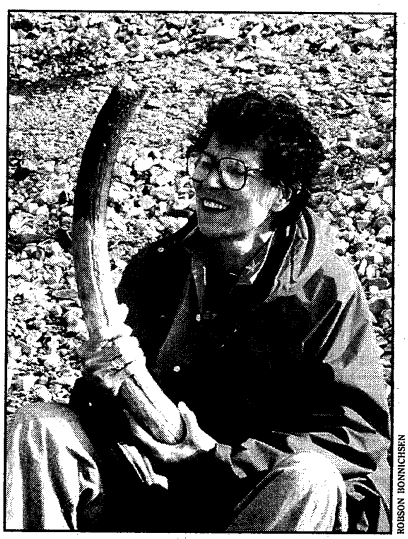
Entering private practice in 1983, her specialty was white-collar cases involving taxes, securities, antitrust and fraud. Harris worked for the special prosecutor investigating corruption at the Department of Housing and Urban Development in the Reagan Administration. She also has specialized in pro bono defense of indigents. Harris teaches law at Pace University School of Law in White Plains, N.Y. Formerly she taught at Emory Law School in Atlanta, Ga. She has also held an appointment as lecturer on the faculty of Harvard Law School.

Reno calls Harris an expert on evidence, trial techniques and advanced litigation. Center Director Robson Bonnichsen said he is impressed by her ability to convey legal clarity to questions of archaeology. "She brings the same integrity of thought to the archaeological record as she does to her law cases," he said. Harris was among members of the Center's Advisory Board who toured archaeological sites in Siberia with Bonnichsen in 1992. Earlier, she was active in arranging the **Center**'s move from Maine to Oregon State University.

A native of Illinois, Harris received a journalism degree from the University of Iowa in 1955 and worked 14 years in publishing before entering law school. She was graduated from the New York University School of Law in 1972. She has written on poverty law and military law and is married to Allen Gregory Harris, a New York City journalist. She has been an active member of the **Center for the Study of the First Americans** for several years, not only as a member of the Advisory Board but as a participant in excavations at the Mammoth Meadow site in southwestern Montana.

If Harris's success keeps her from involvement in **CSFA** activities, it will be the second instance in recent months of **Center** leaders having to put aside interest in the past to deal with the present and future. Christopher Pratt, former co-chair of the **CSFA** Advisory Board, resigned earlier this year, citing growth of his computer-related business. Bonnichsen says Harris intends to maintain her association with the **Center**, "although she may necessarily have to play a diminished role." He is confident that she will again bring her intensity of purpose and clarity of action to the academic debate surrounding the peopling of the Americas. "When she gets through sorting out the country," said Bonnichsen, smiling, "she'll come back to prehistory."

–DAH



ROBSON BONNICHSEN

Jo Ann Harris, pictured on a field trip to Siberia last year, displays the tusk of a Pleistocene elephant that she had just discovered.

Archaeologists Meeting in Maine

The Eastern States Archaeological Federation's annual meeting has been scheduled for Oct. 20–31 in Bangor, Maine, with the Maine Archaeological Society as host.

Special events will include visits to the Abbe Museum in Acadia National Park and the Maine State Museum in Augusta. Program chair James B. Petersen of the Archaeology Research Center at the University of Maine at Farmington (Farmington, ME 04938) is accepting suggestions for symposia and papers.

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MAMMOTH KILL DATED 10,960 B.P.

Discovery of Tool Flakes Pleases Wisconsin Team

A large mammoth found butchered in Kenosha County, Wis., died 10,960 years ago, archaeologists Dan Joyce and David Overstreet say. Excavation at the southeast Wisconsin site, which started Aug. 3, 1992, was continuing this summer. (The discovery was reported on last December in **Mammoth Trumpet** 8:1.)

There is overwhelming evidence that the eight-ton animal was butchered. In late July, the team found two stone-tool flakes in situ under the bones. The principal investigators say the flakes were "in perfect primary context."

"It's what we've been looking for," said Joyce, an archaeologist and Curator of Collections and Exhibits at the Kenosha Public Museum, in a telephone interview shortly after the discovery. "We're pleased with the context. There's no way they were introduced from above. They were underneath the pelvis; they were in a very dense, homogeneous clay matrix." Joyce said the flakes were of local material very typical of the Paleoindian complexes in the area, where lithic material is not abundant. Sources are glacial cobbles or beach cobbles from the shore of Lake Michigan, which is less than 10 miles east. Lithic material that had been found previously at the site revealed little about the Paleoindians who dined on the mammoth, a large *Mammuthus primigenius*.

Archaeologist Ruth Blazina-Joyce excavates behind a portion of pelvis at the mammoth-bone pile of the Schaefer site. Balks were left in place until the bones were pedestaled and photographed. By August, all bones but the skull had been removed.

The mammoth's mandible is pictured in situ. One of the right molars has rotated out of its socket, and the right mandibular ridge was broken off in antiquity and recovered prior to this photograph. All breakage has been found to be concurrent with the deposition of the animal. Drainage tile installed in 1964 (top) missed the mandible by only 4 mm, but the ditch did not disturb the fine, dense clay lake sediments that encased the bone.

ALL PHOTOS COURTESY KENOSHA PUBLIC MUSEUM

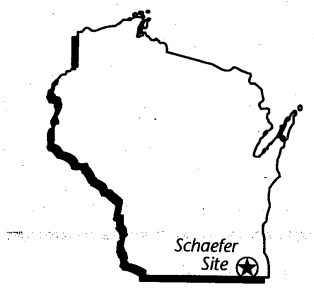
Those lithic fragments were from good context, said Overstreet of the Great Lakes Archaeological Research Center in Milwaukee, but they were small. They appeared to be broken stone tools, "like crushed edges or shattered parts." Joyce expressed obvious pleasure at the new discoveries, which he called "perfect, no-doubt-about-it flakes," a rare commodity in southeastern Wisconsin. "The lithic resources in this area are so poor that I don't think they would have left things lying around like they might have out West," he said.

Even if a complete stone tool had been lost by the mammoth's butchers, Overstreet doubts that it would be of classic Clovis or Folsom typology. "I've done a pretty detailed survey of this particular part of southeast Wisconsin associated with these landscapes, and there just isn't any Clovis or Folsom-like material around," he said in a telephone interview. Overstreet suspects that during the declining time of mammoths there were regional populations of people that had little to do with the classic Clovis culture.

Last summer, work at the site involved exposing the bones and removing the outermost ones. When winter was approaching, the team built a structure over the central bone pile. The structure had insulated walls as high as ground level with an insulated flat roof that was covered with soil.

As of this writing, the all-professional team was continuing to remove bones while water-screening surrounding sediments. "We're getting down to the end of the bones," Joyce said, noting that the animal's skull would be the final challenge. "The skull's going to be our major problem getting out; it's in a lot of different pieces."

Along with flakes, obvious cut marks, crushed and stacked bones, marrow gouging, and two clumps of red ocher, the team has found one other obvious clue to human association. "We found a rib that was stuck vertically into the lake-bottom sediment," said Joyce, adding that it was "very deliberately placed." The rib, thrust about 25 cm into the sediment, would have stood above the shallow surface of the water and may have served as a cache marker. "I see no other reason for it to be there," said Joyce, noting that at the Heisler mastodon-kill site in Michigan a wooden post has been interpreted as a cache marker by investigator Daniel Fisher of the University of Michigan's Museum of Paleontology and Department of Geological Sciences (**Mammoth Trumpet** 6:4 "Clues to Paleoindian Survival: Underwater Caches May Have Supplied Meat in Winter").



Investigators have found no evidence that there was more than one mammoth butchered at the Schaefer site, but the immediate area is very promising. Three sites in Kenosha County have evidence of Paleoindian involvement, and investigation of others is continuing. The Schaefer site is one of several megafauna sites in southeastern Wisconsin and northeastern Illinois. "Part of the emphasis of this project," says Overstreet, "is to get a good understanding of the immediate post-glacial environment." There are confirmed mammoth, mastodon, musk ox and caribou sites in a four-county area.

Examination of snails discovered in sediments indicate that the Schaefer site was a lake or pond of fairly cold, still water two or three feet deep. The mammoth presumably got mired in mud and was either killed or scavenged by the people who left the red ocher and placed the rib-bone marker.

Wood associated with the kill initially seemed to provide puzzling evidence of the age, for it dated to about 2,000 years before the mammoth, which was radiocarbon dated by bone collagen from one of its femurs. However, Overstreet is confident that the bone date of 10,960 ± 100 years is correct. "I really like the date of the bone, even though the wood was in close proximity." The wood, he explains, dates an earlier fluvial event. "It's consistent with some other dates that we have on wood that was wind-rowed up on the shoreline."

The mammoth died on the shore of a small glacial lake with a bottom of marl. It later became a marsh, and though the site is now on farm land rather than a lake, it has not been particularly dry. "We have had

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Mollusks, Not Mammoths

THE IDEA that people came to the Americas by way of an ice-free corridor is so widely accepted in both academic and popular circles that it is easy to forget that there are other hypotheses. To be sure, mammoth hunters and herds of their quarry were widespread in North America between 10,000 and 12,000 years ago. But a significant body of research is suggesting that people may have migrated from Asia much earlier by way of the North Pacific coast.

Evidence presented by a variety of investigators is proposing that mollusks and other seafood, rather than mammoths and other large land mammals, first brought people east out of Asia. These scientists argue that:

- Environmental conditions were suitable for a coastal migration.
- Pleistocene-age people did possess seafaring technology to build boats and sail them across open water.
- The archaeological record provides evidence of extremely old sites that support the coastal-migration hypothesis.
- Dated stone tools show that ancient industries existed along the route.
- A growing chain of circumstantial evidence in linguistics, human biology, and ethnographic analogy supports the idea of a Pacific Rim migration.

If the first settlers were prodded not by the movements of mammoth herds but by an abundance of clams, mussels, crabs, fish, sea birds and sea mammals, they would have progressed around the Pacific Rim as sea levels and tides permitted. They likely used some kind of boats, and their progress would likely have been blocked for periods by glacial ice. They may have moved initially north out of Asia then south out of Beringia. Unfortunately, the likelihood of finding archaeological records of a coastal migration is slim because of post-glacial rises in sea level, and that makes the coastal hypothesis unpopular with archaeologists. The coastal hypothesis also suffers because the earliest cultural pattern recognized and accepted by many archaeologists is based on the hunting of big-game mammals and is characterized by a tool kit containing fluted projectile points. Such points have not conclusively been found on the possible route along the coast of British Columbia or Alaska—at least none that is contemporary with, or older than, those found in mid-continent that date to an inland late-entry hypothesis benchmark year of about 11,000 years B.P.

Searchers may never find the coastal sites. However, the archaeological, linguistic, ethnographic and biological evidence supporting the Pacific Rim hypothesis is growing. Although mostly circumstantial, the evidence points toward peopling of the Americas by a coastal migration that Simon Fraser University archaeologist Knut R. Fladmark contends was environmentally possible anytime during the past 60,000 years.

In papers published more than a decade ago, Fladmark rejected an inland-corridor route of migration. Basically, he said the southern extension of Beringia was little more than an inhospitable and constantly shifting swamp of ice water during various stages of Pleistocene glacial activity. As early as 1979, he suggested that the Pacific Northwest Coast had environmentally hospitable havens of ice-free land that could have provided food, supplying way stations for southbound Paleoindian migrants. And in 1990, Fladmark wrote that radiocarbon analyses of buried plant material overlying glacial till deposits in a deep channel at Cape Ball near the northeastern end of British Columbia's Queen Charlotte Islands "indicate minimum ages for local deglaciation and establishment of a terrestrial and wetland plant community" at about 16,000 years B.P. In 1979 Fladmark wrote in *American Antiquity*:

> There is no evidence that the North Pacific became permanently frozen during glacial episodes, although seasonal freezing of sheltered waters seems likely. The Japanese Current would have continued to bring warm subtropical water masses along the outer edge of the continental shelf, undampened by any Arctic flow through Bering Strait, and mean annual temperatures at sea level were probably above freezing.

Fladmark is not alone is seeing the coastal route as more hospitable to Paleoindian migrants than an interior route. Although saying that evidence to support a coastal route is far from conclusive, University of Oregon archaeologist Jon Erlandson gives his "visceral" opinion (see **Suggested Readings**) that life along the coast had to be better than spending a winter in the "freezing, dark and forbidding landscape of Beringia's interior." And Ruth Gruhn, of the University of Alberta, has found that Paleoindians moving down the coast during the middle Wisconsin period between 60,000 and 30,000 years ago would have encountered environmental conditions similar to those of today. Migrants would also have found a rich variety of shellfish, fish and migratory waterfowl.

Caribou that live on Queen Charlotte Islands today also suggest to Fladmark an ancient survival of cold-adapted land mammals on an island that post-glacial flooding put beyond the range of their swimming ability. Human coastal migrants could have preyed on such mammals as part of their subsistence base. "The Queen Charlotte Islands," Fladmark wrote in 1990,

> would seem to represent a particularly important 'stepping stone' along any coastal route of migration for early people moving south from Beringia, despite their presently isolated location. Indeed, 'the Charlottes' are currently the first area in Canada south of Beringia for which there is incontrovertible evidence for the existence of a terrestrial plant community, theoretically capable of supporting some animal and perhaps human life, during the peak of the last glacial period.

However, Gruhn has noted in a recent publication that it might be difficult to identify an exact middle-Wisconsin coastline along the North Pacific, largely because of local uplifting of land. She says that deep-sea core samples from the Bering platform suggest that the middle-Wisconsin phase was the best time for human movements along the south edge of the Bering Land Bridge. That environment, analysis of the core sample indicated, would have consisted of winter sea ice, with thawing in the spring uncovering a productive marine ecosystem capable of feeding people. And farther south, the environment only would have become more hospitable.

Shellfish Low in Calories

There is little doubt that, if the review by Fladmark and Gruhn of coastal environmental conditions is correct, early Americans would have used all the food sources available to them. Archaeologist David R. Yesner, in discussing the prehistory and ecology of maritime hunter-gatherers, has noted 150,000-year-old shell-midden evidence of marine foods as a central subsistence focus in South Africa. However, Yesner also observes that shellfish diets are notoriously low in calories and would not provide an adequate diet in a cold climate. Indirectly, that lends support to the need for Pleistocene coastal hunters to augment a water-based food supply with meat, as Fladmark suggests may have happened where caribou probably occurred on the Queen Charlottes. It also bolsters Fladmark's contention that the "classic" big-game hunting tradition associated with fluted points might also have developed out of earlier cultural patterns adapted to hunting on coastal refuges. Fish, sea birds, and sea mammals could just as easily have added to humans' meat supplies.

Extensive analysis by Erlandson of shell middens on the California coast and offshore islands shows that by 10,000 years ago, and possibly earlier, people had adapted to a marine-subsistence economy.

Yahgan People as an Analogy

To establish a case for adaptability of a coastal people to live in a middle-Wisconsin, high-latitude coastal environment, Gruhn turns to ethnographic analogy of the Yahgan Indians of coastal Tierra del Fuego. Observed as early as 1578 by Sir Francis Drake, by Charles Darwin in 1832, and in the twentieth century by others, the Yahgan people were lightly clothed and lived in stick huts in a stormy environment that sometimes includes snow in summer. Gruhn also notes that they hunted, fished and captured birds with a meager tool kit that included bone points on wooden spears, pronged sticks, mussel-shell knives, wooden clubs, fiber snares and stone-tipped arrows. They also used canoes made of several strips of bark cut from beech trees with a bone chisel or mussel-shell knife. The strips were sewn together with lashing of whalebone or shredded saplings. The canoes leaked badly, Gruhn reports, but were adequate for the frequent movement of families along the coastline. As she wrote for the forthcoming book, *Method and Theory for Investigating the Peopling of the Americas*:

> One could surmise that even a population as poorly endowed with material culture as the ethnographic Yahgan could have made it into the New World along the North Pacific coast during the middle Wisconsin interval.

Erlandson suggests that exploitation of coastal resources 13,000 years ago might provide another circumstantial tie to a coastal route of migration—if the near-coastal site at Monte Verde in Chile withstands careful scrutiny. Erlandson notes that Monte Verde is about 50 km from the Pacific coast and contains trade resources such as salt, although the trade link remains to be established.

The Evidence for Boats

Boats of some sort seem mandatory for people to have lived and moved along the shore. So, too, would be the seafaring knowledge necessary to ply a frigid and dangerous Beringian seacoast. No Pleistocene-age boats have yet been found. And authorities such as Jesse D. Jennings have declared that open-water voyaging capabilities were not known until thousands of years later than Pleistocene people would have needed them for such trips. Although Erlandson has reported that

maritime peoples lived in California, British Columbia, and southeast Alaska as early as 10,000 years ago, circumstantial evidence must be used to arrive at earlier dates. But that evidence offers some interesting possibilities.

Recent data from Greater Australia strongly suggest that boats were used to colonize the southern end of New Ireland from New Guinea by way of New Britain about 33,000 years ago. That evidence is based on analysis of shell-midden material, obsidian from New Britain, and on faunal remains. Similar evidence puts humans in a rockshelter on Buka Island in the Solomons 28,000 years ago. Ocean voyages of up to 80 km would have been required to reach those islands—strongly implying a firm grasp of seafaring knowledge—because the only way to get there would have been by boat.

The Pleistocene North Pacific would have presented different problems for mariners from those faced by seafarers in the warm waters of the South Pacific, but archaeologists have been finding evidence that Paleolithic peoples there were moving across open water near Japan at least by 30,000 years ago. Shizuo Oda has reported on archaeological evidence that people used seagoing boats to obtain obsidian from Kozushima Island. The island—about 170 km south of Tokyo and about 54 km from Shimoda on the Izu Peninsula—appears neither to have been covered by glacial ice nor connected by a land bridge to mainland Japan during Pleistocene glaciation; boats would have been necessary to transport that toolmaking material.

The Case for a Pacific Rim Migration

by George Wisner

"On the Japanese mainland," Oda writes in the book *Man and Culture in Oceania*,

> the Kozushima obsidian is found in Paleolithic and Jomon sites on the Musashino Upland, where it is identified in Paleolithic sites as old as 30,000 B.P., and in Jomon sites as far as 200 km from the source. Significantly, even during the late Pleistocene, when sea levels were 100–140 m lower than today, Kozushima was separated from the Izu Peninsula by a wide strait of water, making it impossible to acquire Kozushima obsidian without the use of dugout canoes or rafts. The very early use of obsidian from the Izu Islands shows that Paleolithic peoples in Japan had already developed the means to travel across water, setting the base for the later highly developed water transport technology of the Jomon.

The earliest Jomon culture dates to 11,000 to 13,000 B.P.

Stepping Stones to the New World

In a 1991 paper on the origins of Japanese Paleolithic, archaeologist Charles T. Keally says, "It is not known when humans in eastern Asia acquired the capability to cross large bodies of water." But, he says that, "humans of southern Chinese type" were on the island of Okinawa roughly 30,000 years ago "when that island was probably separated from the continent." The statement, in context, is designed to support his contention that people were on Japan no earlier than 35,000 years ago. Although no Paleolithic boats have been found, the combined circumstantial evidence surrounding the obsidian mine strongly suggests that there was very early boat travel in the North Pacific—early enough to make possible a hypothesized boat voyage to the New World.

Erlandson suggests that at the height of the last glaciation the Kuril Islands, which form a crescent north and east of Japan toward the Kamchatka Peninsula, could have been stepping stones for Paleolithic people going from the Japanese archipelago to the south shore of Beringia—and then possibly south through the Queen Charlottes. This suggestion echoes those of Fladmark and Gruhn.

Although many archaeologists remain skeptical of the seafarers' route to the New World, Fladmark has no problem defending the idea of a sea passage along the Northwest Coast. "Given any kind of steerable watercraft, [people's] ability to reach the sea-level refugia of the North Pacific from Beringia seems undoubted. The only difficult area is the Pacific Coast of the Alaska Peninsula west of Kodiak Island, where there is no direct evidence, as yet, of any unglaciated refugia," he wrote in a 1979 paper (see **Suggested Readings**).

If coastal migration by boat can be seen as possible, it also can be seen as perhaps the most rapid method to settle fully the coastal areas of the New World and ultimately push human culture inland. That idea collides with the implications inherent in Paul S. Martin's prehistoric-overkill hypothesis. An element of that hypothesis suggests that a small group of Paleolithic hunters armed with new technology—fluted stone spear points— coupled with population growth allowed them to move rapidly south through Beringia about 12,000 years ago, reaching the tip of South America approximately 1,000 years later. Fladmark calls that slow. "Theoretically," he has written, "even primitive boats could traverse the entire Pacific coast of North and South America in less than 10–15 years." Such rapid southward movement, coupled with an early entry into the New World, would help explain sites in South America that predate the 12,000-year-old late-entry model favored by many North American archaeologists.

Part of the Pacific Rim hypothesis assumes Paleolithic migrants came from Asia, not elsewhere. Although few North American sites contain human fossil remains, D. Gentry Steele and Joseph F. Powell have analyzed available skeletal remains ranging from 8,500 to 10,000 years old and found that the closest affinities are with Asian populations. (See **Mammoth Trumpet 7:2** "Paleoindian Skeletal Data Re-examined.") Comparisons of recent American Indians with other populations indicate that American Indians are most similar to Asian populations, most notably northern Asians.

Arguments for Early Arrival

The timing of the colonization of the Americas also is an issue with supporters of a Pacific Rim hypothesis. Many such as Gruhn argue that paleolithic people arrived in the New World considerably earlier than the 12,000 years ago allowed by "late arrival" theorists.

Hard archaeological evidence to support a Pacific Rim hypothesis is scarce, but various circumstantial methods have been used to estimate timing of the arrival in the New World. Linguistics is one technique. Ruth Gruhn regards linguistics as concrete evidence supporting the Pacific Rim peopling of the Americas. In a 1988 publication, she examines the distribution of aboriginal languages and concludes that there is "great linguistic diversification [that] implies great time depth for human occupation of the Pacific Coast, the Gulf Coast, Central America and South America." It has been estimated, she says, that there are more than 1,500 native languages in South America alone; from 200 to 350 known languages in Mexico and Central America; and all but one of seven language groups identified on the Northwest Coast are considered independent languages. Such language diversity does not exist along the suggested inland migration routes, she adds, and therefore linguistics supports her contention that seafarers first reached the continent and moved rapidly south.

Genetic Markers Indicate Early Migration

Some scholars also are turning to the biological record in an effort to determine when people began coming to the new world. Among these is Moses S. Schanfield, whose analysis of genetic markers of the GM-AM system on heavy-chain immunoglobulin (a protein antibody) from living American Indian people indicates that their ancestors arrived in the New World in four different migrations (see "Crawford" entry in **Suggested Readings**). "The best estimates are that the first migration occurred before the major Wisconsin glaciation in the period 17,000–25,000 years B.P.," he says. Schanfield stops short of offering a possible route of entry for the migrants. But his study does appear to fortify arguments that people of Asian descent have been in the New World far longer than the 12,000 years suggested by the "late entry" model, which posits migration by way of an inland route south from Beringia.

Dated archaeological sites are considered to be the most direct evidence for establishing how early people arrived in the Western Hemisphere. If people came through a mid-continent ice-free corridor, it would follow that the oldest sites should be found in the north rather than in the south. But at the present time, the oldest firmly dated sites for the Americas come from two areas of South America—Pedra Furada in northeast Brazil and Monte Verde in Chile. Dates as old as 20,000 years have been reported by Gruhn for sites in Mexico where extinct fauna such as camelids, horse and mastodon have been found in association with lithic artifacts.

Incontestable proof of migration to the Americas by way of the Pacific Rim remains elusive and may never be found, but dismissing it offhand also is becoming more difficult in light of the growing archaeological, linguistic, biological and circumstantial evidence being used to champion a position that Fladmark and others have been trumpeting for more than a dozen years. As Paul Martin has reminded readers: "Absence of evidence is not evidence of absence."

Like other hypotheses, the Pacific Rim hypothesis may be proved or disproved by the testing of hypotheses that can be derived from it. Gruhn sees at least two predictions she believes could settle the issue:

> The model would be supported if an archaeological site of middle Wisconsin age is demonstrated in western Oregon, California, or Mexico. The model would be discredited if an archaeological site dated 50,000 years B.P. or older is discovered on the northern Great Plains, at the southern end of the Ice Free Corridor.

The coastal-route hypothesis offers a scenario for a peopling of the Americas that is tantalizingly different from that of the heavily armed hunters clad in mammoth skins trudging down a windswept Beringian landscape inland toward South America. Perhaps the quarry was mollusks, not mammoths.

PHOTOS: HARINGTON, GRANT & MOTT

These coprolites provide Harington and his colleagues convincing evidence that the trapped animal starved to death.

COPROLITES GIVE EVIDENCE MASTODON DIED ACCIDENTALLY

New Brunswick Find Dates to before Wisconsin Glaciation

Scientists with the Geological Survey of Canada and the Canadian Museum of Nature have hard evidence that a well-preserved mastodon discovered near the coast of New Brunswick died, not by human hands, but as a result of its own carelessness.

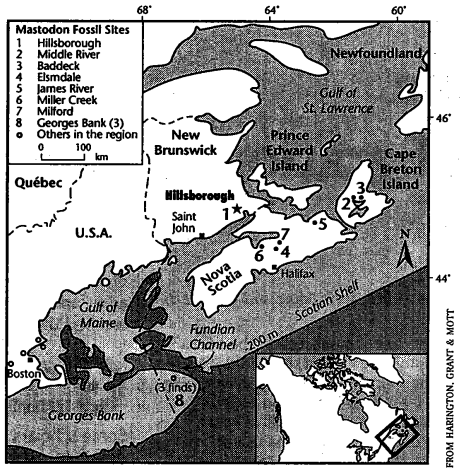
The animal, one of the most complete mastodon specimens in Canada, was discovered in 1936, when a sinkhole near Hillsborough, New Brunswick, was being excavated to form a fishpond, but it has only recently been studied. Newspaper accounts tell of the recovery of 312 bones along with "the hide with its hair" and "stomach contents." It has been on display for decades at the New Brunswick Museum in Saint John.

What is unusual about the animal is its antiquity, condition of preservation, and the circumstances of its demise, as explained by the authors, C. R. Harington, of the paleobiology division of the Canadian Museum of Nature, and D. R. Grant and R. J. Mott, of the Geological Survey of Canada, in the June issue of the *Canadian Journal of Earth Science*. They conclude that the animal was a young adult that had weighed about 8.3 metric tons (more than 18,000 pounds) and dates to the latter part of the Sangamon interglacial before the Wisconsin glaciation. Further, they are confident that the lithified spheroidal masses that were described as "stomach contents" in 1936 newspaper accounts are actually coprolites—petrified dung balls. "We have several dozen," Grant told the **Mammoth Trumpet**.

These coprolites provide Harington and his colleagues convincing evidence that the trapped animal starved to death. "The largest are roughly similar in size and shape to dung boluses of living elephants and to some coprolites that have been attributed to the mammoth." The difference is "that the Hillsborough coprolites have surface corrugations, which may suggest extrusion in pulses through the anal sphincter." They say the composition is "reasonably consistent" with intestinal origin. "In particular, fungal remains . . . include many components naturally related to dung."

In addition to the spheroids the size of elephant droppings, up to 136 mm (6 inches) in diameter, there was a second size group of much smaller nodules, down to 15 mm (one-quarter inch) in diameter. The authors contend that they too are fossilized dung. All have high mineral content, which earlier investigators had suggested was clay that had somehow gotten into the carcass, but the new study indicates that the mineral matter was swamp mud ingested by the mastodon before it died. "We think that the mired, starving animal drank the muddied water and filled its gut with whatever was within reach," they write. "We interpret the spheroids as essentially normal size boluses representing a limited diet during the early stage of entrapment and speculate that the nodules are abnormal smaller products of a more impoverished diet near the time of death." Grant provides a more graphic explanation: "The size range and ornamentation is interpreted to mean that the beast was becoming constipated on the diet of mud that he was forced to eat as he slowly starved to death."

What about the "hide with its hair?" Nothing of the sort was found in the museum collection, so the authors suggest they are a journalistic misinterpretation of some fibrous peat that was preserved along with the mastodon. All that remains is bones and coprolites. The condition of the bones indicates that the animal sank into the mud on its right side, leaving the left side exposed to weather and scavengers—and possibly a glacier.



FROM HARINGTON, GRANT & MOTT

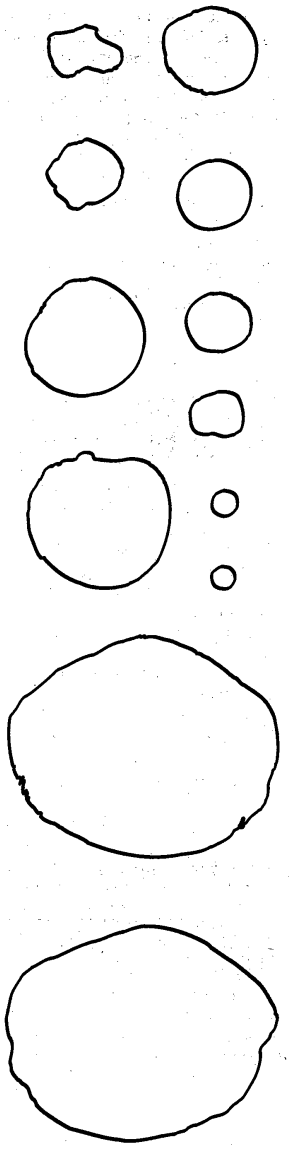
Dating when the mastodon died raised problems because when it was cleaned for display in the museum, the bones were treated with a thick coat of organic preservative. Radiocarbon dating of bone collagen produced a date of 13,600 years, but the date is considered artificially young because of the preservative. Other dates show the animal to be much older: the calcite cement in the coprolites was dated at 51,500 ± 1,270 years B.P., and the associated peat more than 43,000 years. Electronic spin resonance, employed to find the age of one of the molars, failed because of technical problems with the purity of the material. Grant says they hope to try the technique again. The best estimate of age was arrived at by Mott through pollen analysis. The assemblages are virtually identical to those in beds in the same area which are thorium/uranium-dated to the latter part of the last interglacial period.

Mott found that pollen and microfossils in the coprolites and in the enclosing sediment indicate that the depression was bordered by boggy and swampy areas where alders and herbaceous plants grew. Spruce, jack pine, balsam fir and birch—forest similar to that near the northern part of the Boreal forest today—probably grew in surrounding uplands.

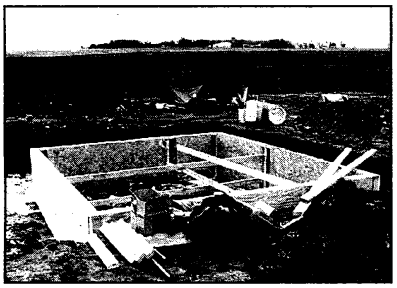
The paper also describes nine other finds of fragmentary mastodon fossils in the area—six in Nova Scotia and three from Georges Bank. Most have been dated to the last interglacial or the Wisconsin glaciation. The scientists hypothesize that the absence of postglacial mastodons in the region was caused by a combination of deep coastal waters and glacial ice that kept the animals in southern New England and the adjacent continental shelf.

In contrast, mammoth and mastodon teeth dredged from the sea floor northeast of Boston and other finds indicate that these species likely were contemporaries with that area's earliest humans. A mammoth discovery currently being investigated by the Maine State Museum (**Mammoth Trumpet** 8:3 "Maine Coast Mammoth Dig is Unusual") was dated at between 10,000 and 12,000 years old.

–DAH



These drawings indicate relative size of coprolites (the actual diameter of the smallest is about 1 cm).



After mammoth bones from the site's periphery were removed, this insulated structure was built last November to protect the bone pile from winter weather. The remainder of the site was backfilled, and soil was heaped over the structure's flat roof as insulation. The site was reopened in May.

Kenosha Mammoth

continued from page 3

tremendous amounts of rain here so far this year," Joyce said. "We're dealing with some mud and a rising water table. So far we're coping with it." Dense clay sediments are being screened with water.

The Schaefer mammoth was discovered in 1964 when the Schaefer family was installing a drainage ditch. Their ditching machine hit the well-preserved bone, unearthing part of a femur and fragments of tusk. The Schaefers donated the find to the Kenosha Public Museum, and there, a quarter of a century later, Joyce and avocational archaeologist Dave Wasion examined the bone and discovered obvious cut marks. With the aid of a 1964 sketch map by local naturalist Phil Sander, the site was found and the recovery project begun.

–DAH

Book on Brazil Sites Available from Center

A new book, *Brazilian Studies*, by Alan L. Bryan and Ruth Gruhn, has been published by the **Center for the Study of the First Americans.** The two-part volume begins with Bryan's analysis of the Sambaqui at Forte Marechal Luz in the State of Santa Catarina, on Brazil's south coast. In addition, Bryan and Gruhn describe archaeological research at six cave or rockshelter sites in interior Bahia, in east-central Brazil. After an introduction to the archaeology in the region, there are separate chapters detailing stratigraphy and artifacts of Toca dos Buzios, Toca de Manoel Latão, Abrigo da Lesma, Abrigo do Pilão, Toca do Cosmos and Toca do Gameleira.

The book may be ordered by mail from **CSFA,** 355 Weniger Hall, Oregon State University, Corvallis, OR 97330.

JAPANESE MUSEUM BUYS BONES OF BURNING TREE MASTODON

Bones of what is perhaps North America's most famous mastodon have been sold to a museum in Yokohama, Japan, for a reported price of $600,000. The mastodon skeleton was discovered in 1989 at the Burning Tree Golf Course near Newark, Ohio. The 11,000-year-old mastodon received worldwide attention when researchers discovered that its intestinal bacteria had survived alive in the bog site, which preserved the animal's apparently butchered remains (see **Mammoth Trumpet** 6:4 "Evidence of Mastodon's Last Meal: Bacteria Still Working After 11,000 Years").

The sale touched off controversy in Licking County, Ohio, when it was reported several weeks ago. Golf-course owner Sherm Byers did not confirm the sale price or reveal the mastodon's new owner, but journalists and others close to the case learned that the sale was made at a fossil and mineral show in Tucson, Ariz., where scientific information compiled by the team of researchers who excavated and studied the animal was presented with a sales prospectus. Dr. Bradley T. Lepper, Ohio Historical Society archaeologist who excavated the mastodon, learned that the skeleton was purchased by the Kanagawa Prefectural Museum of Natural History in Yokohama, which is planning a large hall that will be filled with fossil proboscideans. Lepper and Dee Anne Wymer, a paleoethnobotanist at Bloomsburg University of Pennsylvania who also is a member of the team that studied the Burning Tree site, were critical of the sale. They asserted that it was the freely provided work of scientists that resulted in the high value of the skeleton.

Owner Byers attributed the value to the animal's excellent state of preservation. He said he spent $10,000 recovering and replicating the mastodon bones. He expressed disappointment that Ohio could not come up with a way to display the skeleton locally. Byers reportedly sold one full-scale replica of the animal to a Japanese buyer for $50,000. He said keeping the bones himself was out of the question because of the high cost of upkeep.

Symposium in South Dakota Will Salute Leading Proponent of Overkill Hypothesis

A symposium this month in Hot Springs, S.D., is scheduled as a tribute to the father of the overkill hypothesis, Paul S. Martin. Thirteen speakers are scheduled Sept. 24 and 25 for the two-day symposium, "Late Quaternary Environments and Deep History," which will precede a five-day Bone Modification Conference sponsored by the Commission on Nomenclature of Bone Industries.

Martin is widely known for the argument that human hunters were responsible for the extinction of Pleistocene megafauna such as mammoths and mastodons. The symposium is sponsored by the Mammoth Site of Hot Springs, S.D., and Northern Arizona University. Organizers Larry Agenbroad and Jim I. Mead of Northern Arizona University note that there are many who believe Martin has done more to encourage Quaternary research than anyone else. "He has stimulated multidisciplinary research in the area of pollen, packrat midden, paleo dung and extinction worldwide," they say. "His model for the Pleistocene overkill and large-animal extinction has provoked three decades of intense research."

Scheduled speakers and their topics are **Dave Adam,** U.S. Geological Survey, Menlo Park, Calif., "The Development of Quaternary Palynology in California"; **Agenbroad,** "Paul Martin: Man of the Pleistocene"; **Julio Betancourt,** U.S. Geological Survey, Tucson, "Vegetation History of the Central Rio Grande Valley, New Mexico"; **Kenneth L. Cole,** National Park Service and University of Minnesota, "Two Hundred Years of Ecological Chaos on the Continent of Doom"; **Steve Emslie,** Florida Museum of Natural History, University of Florida, "Taphonomy of a Late Pleistocene Carnivore Den, Dade County, Florida"; **Patricia L. Fall,** Arizona State University, "Shaping of Our World: The Legacy of Ancient Environmental Impact"; **Mead,** "Pikas and Paleoecological Reconstructions of the Intermountain Region"; **Peter Mehringer,** Washington State University, "Ice, Flood and Fire: Late Glacial and Early Holocene Environments of Eastern Washington"; **Eric Mellink,** CICESE, "Use of Rangelands: Lessons from the Pleistocene"; **Eleanora Robbins,** U.S. Geological Survey, Reston, Va., "Utilization of Palynological and Sedimentological Information to Determine Ancient Wetland Functions"; **W. Geoffrey Spaulding,** Dames & Moore, Las Vegas, Nev., "Environmental Change, Ecosystem Response, and the Late Quaternary Development of the Mojave Desert"; **Tom Stafford,** University of Colorado, "Chronological Foundations of Paleontology"; and **David Steadman,** New York State Museum, "Paul Martin in the South Pacific." The symposium will be at the Mueller Civic Center at Hot Springs.

The Eighth Meeting of Working Group No. 1 on Bone Modification is scheduled to follow, Sept. 26–30, at the same location. Hosts are the Archaeology Laboratory, Augustana College, Sioux Falls, S.D., and the Mammoth Site of Hot Springs, South Dakota, a nonprofit organization. Conference organizers are L. Adrien Hannus of the Archaeology Laboratory, Augustana College; Suzanne Miller of EG&G, Inc., Idaho Falls, Idaho; and Agenbroad of the University of Northern Arizona.

UPCOMING CONFERENCES

Oct. 29–31 — Annual Meeting, Eastern States Archaeological Federation, Bangor Motor Inn, Bangor, Maine.
Contact: James B. Petersen, Archaeology Research Center, University of Maine, Farmington ME 04938, (207) 778-7012 Fax: (207) 778-7024.

Nov. 5–7 — Fall Meeting, New England Antiquities Research Association, Danbury, Conn.
Contact: Roslyn Strong, R.R. No. 1, Box 3630, Edgecomb, ME 04556.

Nov. 7–11 — Annual Meetings, Soils Science Society of America, Cincinnati.
Featuring one-day symposium: Pedological Perspectives in Archaeological Research. Contact: David Cremeens, GAI Consultants; Fax: (412) 856-4970.

Nov. 12–15 — 25th Annual Chacmool Conference, Calgary, Alberta.
Plenary speakers: Alice Kehoe, David Kelley, Robert Janes and Jeremy Sabloff. Contact: Department of Archaeology, University of Calgary, Calgary, Alberta TN2 1N4. (403) 220-5227 Fax: (403) 282-9567.

Jan. 5–8, 1994 — Annual Meeting, Society for Historical Archaeology/Advisory Council on Underwater Archaeology, Vancouver, B.C.
Contact: SHA/CUA Program Chair, Dept. of Archaeology, Simon Fraser University, Burnaby, B.C., Canada V5A-1S6. (215) 898-4000 Fax: (215) 898-0657.

May 23–29, 1994 — Symposium on Paleoindians and the First Americans, Museum of Natural History of San Rafael, Mendoza, Argentina.
Participants are asked to submit titles and abstracts of papers before Sept. 30. Contact: Committee on the Symposium on Paleoindians and the First Americans, Archaeology Division, Faculty of Natural Sciences and Museum-UNLP, Paseo del Bosque s/no, 1900 La Plata, Argentina. Fax: 54 (21) 257527 or C.C. 275, (7630) Necochea, Argentina, Fax: 54 (0262) 21209.

Aug. 25–Sept. 2, 1994 — International Conference on the Arctic and North Pacific, Anchorage, Alaska, and Vladivostok, Russia.
Themes include Natural Resources and Environmental Changes, Recent Discoveries about Beringia, Development and Adaptation of People and Culture, and Communication and Information Exchange. Contact: Dr. Gunter Weller, Geophysical Institute, University of Alaska, Fairbanks, AK 99775-0800, E-mail: Gunter@dino.gi.alaska.edu; Fax: (907) 474-7290.

November, 1994 — International Symposium on Pleistocene/Holocene Boundary, Mendoza, Argentina.
Contact: Marcelo Zárate, Centro de Geología de Costas y del Cuaternario-UNMP, Castilla de Correo, 722 Correo Central, 7600 Mar del Plata, Argentina.

Worked Flint

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square and 5 feet deep, that paralleled the drainage ditch. The first 18 units were largely an exercise in Ice Age stratigraphy. Below the reach of the plows, excavations revealed a layer of dark peaty material, under that an almost-black organic clay, which overlays a shell-rich marl that indicates the gradually sloping bottom of the old lake. "We moved a lot of dirt," said Brush in a recent telephone interview after a day working at the site.

In the 19th unit, between two and three feet deep, they came upon the crushed pelvis bones of the mastodon. "We presume it is in a lot worse condition than it was in 1938 because of the lowering of the water table and the driving of tractors back and forth above it." The bones lay at the interface between the dark organic clay and the shell marl and were partially embedded in both of these horizons, Brush explained. Continuing excavation proved that the bones were dispersed, suggesting that they may have been scattered by scavengers or perhaps butchered. Discovery of the first flint flake, approximately an inch and a half in diameter, made butchery a likely hypothesis. When two more flakes were found, lying among rib and ankle bones, Brush left them in place and called Dr. Bradley T. Lepper, Ohio Historical Society archaeologist at the Newark Earthworks State Memorials. Lepper not only has experience excavating a mastodon believed to have been butchered, but his doctoral research on Paleoindians of nearby Coshocton County gave him expertise on flints of the area and their early use.

Lepper saw two of the flakes in situ and agreed that they were clearly associated with the mastodon bones. One lay directly on the marl, and the other was only a few centimeters above in the heavy, dark clay. Lepper said it is extremely unlikely that they could have been displaced from above. Brush described the flakes as being large enough to have served as cutting tools. Two are Upper Mercer flint, a dark material, while the third is light tan in color. The latter was in association with the bone of a deer-like animal and no more than two feet from a mastodon leg bone.

The bones are proving to be scattered over an area approximately 10 meters wide. "It was certainly disarticulated," Brush said. "We noticed . . . that apparently one of the knee bones is in association with ribs." Handling the badly cracked mastodon bone was a challenge to Brush and his crew. They applied preservative to it and employed plaster casts to the larger ones. Observing the quality of the bone, Lepper advised sacrificing a considerable quantity for radiocarbon dating in order to assure the most reliable results.

Test excavations at the site, which has been termed the Martin's Creek Mastodon site, were concluded for the summer on Aug. 7. The discovery has not yet been dated, but Brush and Forrest Smith, Professor of Biology at the University of Akron's Wayne College, are preparing the materials for analysis. Brush reported that the two endscrapers and four of the flint flakes will be submitted for blood-residue analysis. The flint flakes and endscrapers will subsequently be studied for diagnostic patterns of edge wear. The mastodon bones will be examined for cut and pry marks. Carbon, shell, pollen, wood, bone and soil samples will also be analyzed in an attempt to reconstruct the environmental setting of this probable Paleoindian butchery site.

–DAH

Butchered Mammoth

continued from page 1

mastodon excavated near Newark, Ohio, during construction of a pond in a wetland at the Burning Tree Golf Course. The Burning Tree mastodon had apparently been butchered and cached in three piles, but it also surprised investigators with foul-smelling vegetable matter complete with live intestinal bacteria (See related article on page 7).

The bones revealed obvious cut marks and scrapes. Further, damage to bones from one side of the animal was very similar to damage on the same bones from the opposite side, and there were no tooth marks to indicate predators had chewed the bones. "Bone damage is often localized at sites of muscle insertion or in matching tracts along the periphery of conarticular joint surfaces or at contacts between epiphyses and diaphyses," Kirkpatrick and Fisher report.

The scapula that first attracted a scuba diver's attention was protruding from the marly, somewhat sandy clay of the lake bottom, but most of the bones recovered had to be excavated. During two seasons divers probed an area of approximately 60 square meters, excavating by gently suspending the sediment by manually induced turbulence. They recorded positions of many of the bones by measurements to reference markers, but the work created poor visibility that precluded photographic documentation of bone distribution. Kirkpatrick and Fisher say the divers reported "the skeleton occurred as multiple, articulated (or only slightly disarticulated) units, separated from other such units." Four principal groups of bones were found staggered along the shoreline. There were only fragments of the cranium, except for tusks and molars and few tail bones. Scattered among the four groups of bones were the epiphyses and bone fragments.

There were also the "net stones," pieces of sandstone girdled by coarse flaking, that could have been used to anchor the mammoth out of the reach of wolves and other carnivores. "We do not yet know whether net stones occur beyond the area of bone distribution," the authors write. Samples of the surrounding clay have been processed by flotation, allowing the recovery of seeds of pondweed and other aquatic plants indicative of aquatic, calcareous environments.

Kirkpatrick and Fisher say divers have found remains of several mammoths and mastodons in past years, but except for the Moon site, neither the bones nor the exact locations are available. Bones, they say, were taken as souvenirs.

–DAH

SUGGESTED READINGS

ON Mollusks, Not Mammoths

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ON Butchered Mammoth, Mammoth Kill, and Flint Found

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ON Coprolites Give Evidence Mastodon Died Accidentally

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Mott, R. J., and D. R. Grant 1985 Pre-Late Wisconsinan Paleoenvironments in Atlantic Canada, *Géographie Physique et Quaternaire* 39:239–254.

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Weir, J. S. 1972 Mineral Content in Elephant Dung, *East African Wildlife Journal* 10:229–230.