



MAMMOTH TRUMPET

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Center for the Study of the First Americans
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Will Murray Springs Mammoth Tracks Be Restored for Public Viewing?



Scientists and the U.S. Bureau of Land Management would like to preserve Arizona's best-known Clovis sites as scientific tourist attractions. Will the in situ tracks and bones of the Murray Springs mammoth-kill site be recreated in concrete? Only if enough money can be raised. **See page 2.**

The Center for the Study of the First Americans fosters research and public interest in the Peopling of the Americas. The **Center**, an integral part of **Oregon State University**, promotes interdisciplinary scholarly dialogue among physical, biological and social scientists. The **Mammoth Trumpet**, news magazine of the **Center**, seeks to involve you in the late Pleistocene by reporting on developments in all pertinent sciences.

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GREAT LAKES PEOPLE LIVED 2,000 YEARS WITH GLACIER

Butchery Sites Prove Much Older Than Once Thought

Discoveries in southeastern Wisconsin are calling into question the conventional theory of the peopling of the Great Lakes region. It had seemed simple enough: the glacier melted, Holocene biota developed, and then people moved in to utilize a primordial environment. But archaeologist David F. Overstreet is compiling a convincing body of evidence that indicates people lived for centuries in sub-arctic conditions near the shifting front of the great Laurentian ice sheet.

Careful analyses of sites, some of which contain evidence that humans scavenged meat from mammoth and mastodon carcasses, indicate that Paleo-Americans lived for at least 2,000 years in an ice-margin environment rather than simply moving into Holocene conditions that developed later. "The information we've got suggests that these people had long adapted to a sub-arctic or ice-front environment," says Dr. Overstreet. "And they were literally moving back and forth with the ice-front positions."

Newly reported dates taken by Thomas W. Stafford, a leading authority on radiocarbon dating of bone, indicate that two well-known Wisconsin mammoth-butcher-

ing sites are 1,000 to 1,400 years older than had been thought originally (**Mammoth Trumpet** 8:4 "Mammoth Kill Dated 10,980"). Dr. Stafford's analysis of purified bone collagen by the AMS (accelerator mass spectrometry) technique, for example, showed that the Schaefer mammoth is more than 1,300 years older than the age previously indicated by conventional radiocarbon methods.

Overstreet and colleagues had assumed that because of the association of stone tools with the Schaefer mammoth, a date of less than 11,000 radiocarbon years was correct. That date, $10,960 \pm 100$ years B.P. (Beta 62822), was taken a few years ago from unpurified bone collagen. At the time, conventional wisdom dictated that 12,000 years ago there could not have been tool-makers near what is now Lake Michigan. However, Stafford's assay of highly purified bone material placed the date of Schaefer Mammoth at $12,310 \pm 60$ years B.P. (CAMS 30171). That corresponds closely with two conventional radiocarbon dates from spruce wood recovered at the Schaefer site: $12,220 \pm 80$ B.P. (Beta 62823) and $12,480 \pm 130$ B.P. (Beta 62824). Initially, the dates on that wood puzzled the investigators, who originally hypothesized that it must have been older wood washed up onto the shore of the shallow lake or pond associated with the site.

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Why is this archaeologist excavating with straw, tweezers?

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Pete Bostrom tries to protect lithic heritage

PHOTOS: JON ERLANDSON & PETE BOSTROM

Arizona's Famous Clovis Sites Could Be Displayed for Public

Scientist Outlines Plan for Preservation

Celebrated Clovis sites of southeastern Arizona's San Pedro Valley would become an extended interpretive area under a proposal being considered by public land managers, scientists, and other interested individuals. The concept would combine Murray Springs, Lehner, and other nearby sites into coordinated displays that would educate the public while protecting the remaining archaeological resources.

The proposed Clovis display would be expected to attract visitors from all over the world, many of whom already are drawn to the region's rich Native American cultural and historical sites, as well as to spectacular landforms such as the Grand Canyon. Tourist destinations such as Tombstone are nearby, and the San Pedro Riparian National Conservation Area attracts bird watchers from all over North America.

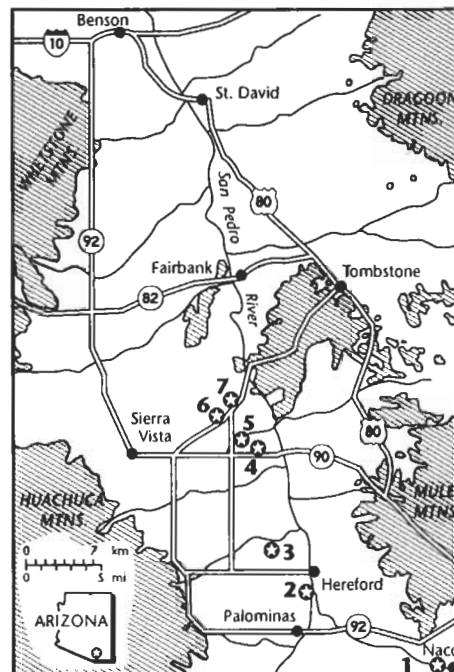
Considerable private financing presumably would be necessary to accomplish the proposal, though cost estimates are not yet available. The sites are on land administered by the Federal Bureau of Land Management, which has been the target of budget cuts in recent years.

"The Bureau and scientists are partnering to develop a private foundation to protect and enhance the cultural and natural resources at these sites," says Jesse June, BLM field manager. "Providing a quality and educational experience for all the public to enjoy is a critical aspect of this partnership."

C. Vance Haynes, the University of Arizona geoarchaeologist who conducted the Murray Springs excavation, doesn't believe the BLM can be expected to come up with the money to develop the area. Dr. Haynes, who is planning a book reporting on the findings of his own extensive research on the Clovis occupation of the San Pedro Valley, has provided the BLM with a detailed proposal for turning the sites into a public interpretive area.

"Excavation of the Murray Springs site from 1966 to 1971 exposed a mam-

Clovis and mammoth sites in the upper San Pedro Valley. 1, Naco, Leikem and Navarete; 2, Lehner; 3, Hargis bison; 4, Escapule and BLM mammoth; 5, Murray Springs; 6, Schaldack mammoths; 7, Donner mammoth.



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moth-kill area, a bison-kill area, and a Clovis hunter's camp with bones, stone tools and weapons, and thousands of flint flakes lying just as they had been left 13,000 years earlier," Haynes's proposal says.

"The sight of such a scene, unknown for 13 millennia, is an incredible experience, one that needs to be recreated so that others can appreciate the evidence." Haynes says that technology of soil cement and lithic casting now makes it possible to recreate the excavations "exactly as we exposed them 30 years ago."

Besides interesting scientists and the general public, Haynes says a well-executed public display of the sites would be a monument to pioneers in Paleoindian studies in Arizona including Emil W. Haury, E. B. Sayles, Ernst Antevs, William Walsey and John F. Lance.

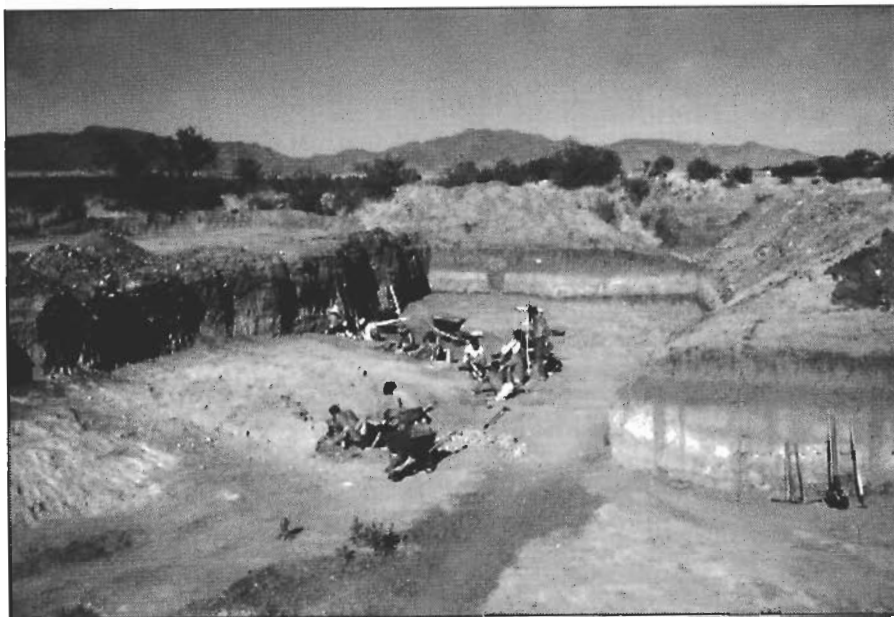
Haynes explains that in March 1966, he and Peter Mehrenger found that headward erosion of a desert arroyo known as Curry Draw had eaten into a grassy swale and exposed mammoth bones. The bones were immediately underlying a black organic layer like one discovered earlier at the Lehner site. That site, 12 miles up the San Pedro Valley, had been excavated by Emil Haury and an Arizona State Museum crew. It is named for its discoverer, rancher Ed Lehner.

At Murray Springs, Haynes and Mehrenger found the exposed strata were quite colorful—red alluvium overlain by green mud and white marl. Its Clovis horizon was buried by the black "mat," which was covered by gray silt and two layers of reddish brown alluvium.

Curry Draw, a dry wash that occasionally drains desert cloudbursts eastward into the San Pedro, forks into a north and a south branch at the Murray Springs site. Haynes and Mehrenger made their initial discovery near the head of the south branch. There, the mammoth-kill and bison-kill areas were excavated.

Haynes learned that Curry Draw started eroding vigorously early in this century, and he notes that each year erosion takes its toll on the site. A diversion trench now provides some protection to the site by deflecting most runoff into the north branch and away from the principal archaeological site. But he describes the diversion trench as a temporary solution, explaining that given typical erosional patterns, "the sharp bend eventually will cause a meander bend that will migrate down valley eating away the Clovis deposits." Thus Haynes says that the first priority for preserving the site must be to stabilize Curry Draw by placing a concrete structure at the bend to shunt storm waters into the north branch.

Permanently preventing erosion by cementing the walls of both the north and south branches of the draw would be very expensive, Haynes notes, if the job is done to museum-display standards, duplicating the natural stratigraphy. He suggests that an esthetic compromise would be to protect only the



C. VANCE HAYNES JR.

Arizona's Murray Springs site, west of the town of Sierra Vista, was a center of activity in 1969 when a crew was excavating the south arroyo's bison-kill area (above). Beside a Clovis-era watering hole, mammoth tracks (below) were found preserved in the 1960s by Haynes and his team, pictured in the background excavating mammoth bones. Haynes found evidence that a small group of mammoths had dug a shallow water hole here beside the bed of a drying creek.



C. VANCE HAYNES JR.



Workers (left) excavate mammoth bones at Murray Springs. No clovis artifacts were found in this particular area. Another Murray Springs worker (below) examines a pile of bifacial thinning flakes uncovered near a mammoth skeleton on the Clovis surface beneath the black "mat." In 1967, team member Cathy Ungar (opposite) excavates a bison skeleton.



BOTH PHOTOS: C. VANCE MAYNES JR.

Investigator Describes Site Formation

THE MURRAY SPRINGS SITE typifies a southwestern arroyo in that it is a vertical-sided gully that ends in a cul de sac, a headcut, where water pours over a vegetated lip and plunges vertically to a plunge pool a dozen feet or so below. Well exposed in the walls are the strata (like pages in a book of time) that record the last 50,000 years of earth history in the San Pedro Valley. Down near the floor of the arroyo is a layer of red sand and gravel (the Millville alluvium) resting upon an older deposit and overlain by green clay (the Sobaipuri mudstone) with bones and teeth of extinct horse, mammoth, camel, and bison, but no evidence of humans in this 30,000+ year-old layer. It is overlain by a white chalk (the Coro marl) that once was the bottom of an Ice Age lake that occupied Curry Draw between 26,000 and 15,000 years ago.

At a time after 15,000 years ago, the lake dried up and small spring-fed creeks found their way to the San Pedro across the now-dry lake beds as the water table dropped to its lowest level in 30,000 years. One of the creeks, Wolf Creek, a favorite watering place for mammoths, was nearly dry 13,000 years ago when a band of Clovis hunters found a small group of mammoths sucking muddy water from a shallow water hole. This hole, apparently dug by mammoths, was placed beside the creek bed where it concentrated the subsurface flow. The tracks of several mammoths were preserved around the well and in the coarse sand (Graveyard sand) of the creek bed. During the attack, a mammoth wounded by two Clovis points apparently escaped to die two miles away at the Escapule site. At Murray Springs, a young adult female lay dead on her left side only 40 feet from the water hole. Around her we found a Clovis point and the broken tips of three others along with other stone tools used for butchering the carcass and thousands of flint flakes from the sharpening of stone tools. One of the rear legs of Big Eloise, as the archaeological crew called her, was missing and the other had been dragged to a spot near the skull. Nearby a large bone spear shaft straightener lay where it had been stepped on and broken by a mammoth.

In order to cook and dry the several hundred pounds of meat, the hind quarter was taken in pieces to a temporary camp on a higher bench formed on the old lake beds and about 100 yards to the south. Here the men refurbished their spears and spear throwers while the women processed the meat, sun-drying some and roasting other pieces for a feast in celebration of a successful hunt.

A few days later they packed up and moved south, checking out watering places for game animals. At Mammoth Kill Creek (the Lehner site), they successfully attacked a small herd of mammoths, but again one escaped only to die about 12 miles away (at Naco). From Mammoth Kill Creek, this band of first Arizonans may have moved farther south and into Mexico where they found new sources of flint. Eventually they returned to Murray Springs where they found a herd of large bison wallowing in a mud flat between Wolf Creek and the main branch. We call it Bison Kill Creek for the two dozen or so bison they brought down there. This time because of the large amount of meat, hide, and sinew to be processed, they occupied the hunting camp for several weeks before again heading south to Mammoth Kill Creek where they tracked and killed another mam-



C. VANCE HAYNES JR.

moth. Eventually they left the valley permanently, perhaps because the watering places dried up.

Soon after they left, the climate turned unusually cold, glacially cold, causing greatly reduced evaporation. This, along with more frequent and gentle rains, made the water table gen-

ture. In the very lowest areas of Curry Draw, black mat deposition gave way to calcium carbonate (chalk) deposition at the bottom of ponds. Today, streaks or stringers of black mat within the white marl are believed to represent low water phases during a climate fluctuating between varying degrees of wet and dry

cutbank of the south branch, recreating the archaeologically excavated areas in reinforced concrete and directing all discharge to the north branch.

"By reproducing the Clovis living floor in soil cement, the bones in bone-colored concrete, and the stone artifacts with epoxy replicas," says Haynes, "the site could be recreated just as it had been exposed by scientific excavation." He foresees properly formulated colored concrete, perhaps 10 inches thick and reinforced with steel, reproducing the walls of the archaeological excavations. Employing technology used to create artificial rapids for the last Olympic Games, the concrete would display the site's stratigraphic sequence.

Visitors would see the Murray Springs mammoth-kill area as a concrete box open on the arroyo side, without a lid. Walls and floor would reproduce the site

This cross section of the water hole shows a thin layer of black mat (arrow) overlaying depressions presumed to have been made by mammoths seeking water. Within weeks of the mammoth kill, the water table rose and pond carbonates covered the hole.



C. VANCE HAYNES JR.

tly rise. As the ground water merged with the low areas on the landscape it converted them to ponds and wet meadows (cienegas). Algal blooms formed a distinctive black deposit, the black mat (Clanton clay) that covered the Clovis occupation surfaces like a blanket laid over the valley floors a few weeks or months after the Clovis depart-

during a general cold spell known as the Younger Dryas climatic event of 13,000 to 12,000 years ago.

After this the climate got warmer and dryer and wind blown dust that accumulated over the valley sides washed into the low areas, burying the Clovis sites to depths of five feet or more with a cement-gray sandy silt (the Donnet silt). By about

8,000 years ago, the water table had fallen to a point where tributary valleys, now grassy swales, had become unstable and ripe for arroyo cutting. Rain-fall patterns had changed over time to less-frequent but more-violent storms, causing torrential downpours and flash floods. The grassy swales were entrenched and formed arroyos that cut through tens of feet of the older sediments until more resistant bedrock was encountered. Like layers in a cake, the ancient deposits were exposed to the view of Archaic people that roamed the Southwest 500 years or more after the Clovis folks had left. Parts of all of the San Pedro Clovis sites were washed away during this major episode of erosion known as the Altithermal Period.

As wetter times returned about 6,500 years ago, the more gentle rains allowed the deep channels to fill up with alluvium. Once again the Clovis sites were buried but this time with light and dark gray slope-washed sand and silt (the Weik alluvium). This cutting and filling occurred at least two more times, exposing parts of the Clovis site and reburying them with reddish brown alluvium (the Hargis and McCool deposits).

—C. Vance Haynes Jr.

(From proposal to Bureau of Land Management and others)



as Haynes and his team saw it during excavation. He says that the only maintenance required "would be an occasional hosing-off of dust and dirt tracked in by visitors." He envisions a drainage system outside of the box to carry away runoff water that might otherwise cause erosion along the sides of the walls.

"The same procedure needs to be done with the bison kill," says Haynes. The two display areas would be linked by filling in the parts of the arroyo that have eroded away since 1968. "The recreated cutbank would reveal the climatic history of the last 50,000 years in elegant stratigraphic detail by having on-site descriptions of each stratum, how each was created geologically, and how each reflects the paleoenvironment of the time it was deposited.

"The sudden extinction of the Pleistocene megafauna (mammoth, horse, camel, dire wolf, etc.) would be dramatically revealed by explaining that all were gone an instant before the black mat was deposited. A few bones exposed in the wall would give the visitor the profound, unforgettable feeling of discovery that Mehrenger and I experienced in 1966."

Haynes goes on to say that this preserved view of Curry Draw's headward erosion would be a dramatic example of the turn-of-the-century arroyo-cutting that has characterized the rangeland of the Southwest. "Sediments behind the soil cement would be preserved for fu-



C. VANCE HAYNES JR.

In 1966 the eroding side of the south arroyo revealed what was to become one of North America's most celebrated archaeological sites. A distinct band of Clanton Clay (known as the "black mat") is directly above the Clovis surface.

ture study, and future excavations would expose more of the Clovis occupation surface once new hypotheses have been formulated for testing."

Haynes says that the Murray Springs Clovis hunting camp, about 100 meters south of the south branch of Curry Draw, would be much easier to recreate than the kill areas because it is only a few inches below the modern surface and is situated on gray marl that could be readily recreated in gray concrete. However, a hunting camp display would require additional archaeological excavation in order to construct a continuous living floor. "In our excavations we left many areas unexcavated using a random distribution of test squares outside of the main concentration of artifacts," Haynes explains.

He suggests an interpretive center farther south on a terrace that overlooks the site. There he visualizes dioramas depicting the vegetation, climate, and fauna at the time of the Clovis occupation. "Signs and audio presentations could probe the

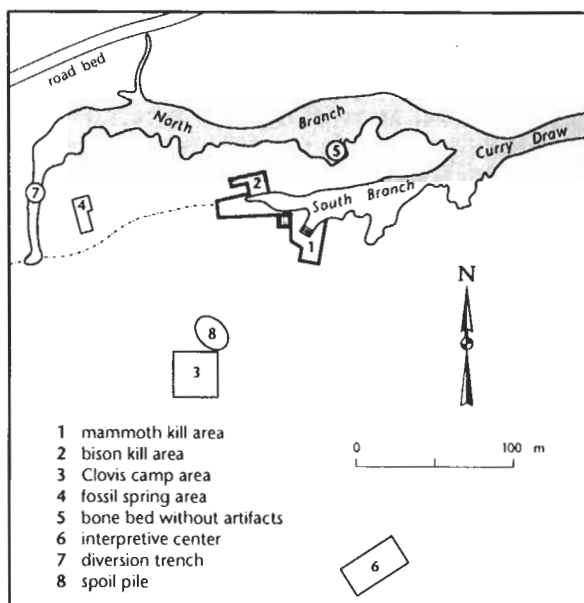
mystery of mammoth and other megafaunal extinction in the New World, a dramatic event in the deep history of the continent which coincides with ice age climate change and the first evidence of mammoth hunters."

After Murray Springs, Haynes would draw visitors to the Lehner site with reproductions of skeletons of several mammoths and smaller animals along with the 13 Clovis points and many butchering tools that were found in association. Erosion is not a concern at the Lehner site.

"Due to the foresight of Ed Lehner, the discharge of Lehner Arroyo has been diverted by a bulldozer trench," says Haynes. As a result, the site's main activity area is not in immediate danger. "Mr. Lehner protected the area at his own expense before donating the National Historic Site to the BLM."

Haynes suggests that visitors' Paleolithic experience in the San Pedro Valley could end about 12 miles farther southeast at the Naco mammoth site. There a display could include the single skeleton with five Clovis points in the rib cage and three others among the other bones. "A few steps to the east along the same side of Greenbush Draw would bring one to the Navarrete mammoth site where the tip of a probable Clovis point was found

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Map of the Murray Springs Clovis site. Proposed concrete recreations are shown in heavy black.



Excavation of the rockshelter area at Daisy Cave on an island in the Santa Barbara Channel presented special challenges to archaeologist Jon Erlandson and his team.

LIVING ON THE RIM

*California Island Cave
Offers Tantalizing Clues
to Paleoindian Life*



JON ERLANDSON

NOT LONG AFTER THE END of the last Ice Age, Paleoindian hunters arrived in boats on the rocky coast of Southern California's Channel Islands to hunt sea mammals, collect shellfish, and fish. Archaeologist Jon M. Erlandson says the hunters sought shelter in a cave on the island, a narrow fissure that is about 10 meters above the thundering sea at the base of an ancient cliff of erosion-resistant andesite.

Dr. Erlandson, of the University of Oregon's Department of Anthropology, has excavated bifacial projectile points, bone fishing points, shell beads, twined basketry that may have been sandal fragments, and 1,600 pieces of cordage from the site. Basketry and cordage dating from about 8,600 years ago to a maximum of about 10,000 years ago are twice as old as the

previously earliest-documented age of perishable woven material found along the Pacific Coast of North America.

The discoveries, Erlandson says, also make Daisy Cave the oldest site yet found along the Pacific Coast. It is situated in the Santa Barbara Channel area within the historical territory of the Chumash Indians.

The cave probably was formed during the Pleistocene by marine erosion, Erlandson said in an interview at his office in Eugene. Measuring about 11 meters long, 1.5 meters to 3 meters wide, with an outside rockshelter measuring about 4 meters deep by 5 meters wide, Daisy Cave is one of the few places on the island where people could have escaped the northwest winds that rake the Santa Barbara Channel Islands



for most of the year, he added. It also helps to explain evidence he has analyzed or found there during several field seasons showing what may have been repeated and extensive use of the cave and an associated shell midden from about 11,500 calendar years ago to as recently as 700 years ago.

Although he has recovered one chert flake from 15,000-year-old cave sediments, Erlandson stops short of saying it demonstrates cave occupation of such antiquity. "That's a possibility," he said, "that requires further research."

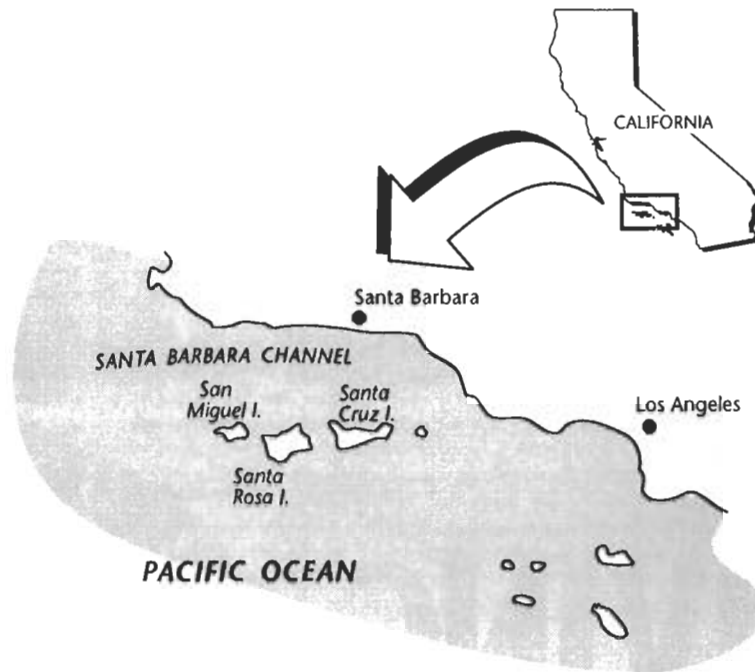
Discoveries from the cave, which is about 25 miles off the mainland, may have implications for the coastal-migration and early-entry theories of peopling of the Americas, but Erlandson is quick to say that Daisy Cave by itself doesn't confirm the hypothesis that the first Americans arrived by boat along the Pacific Coast.

"I just don't think most American archaeologists are going to accept that theory," says Erlandson, "until we find something older than 11,500 [radiocarbon] years old. But I am intrigued by what the site says about diversity of Paleoindian adaptations." He believes that the earliest occupation probably was ephemeral, but it confirms that people were on the Channel Islands at least by

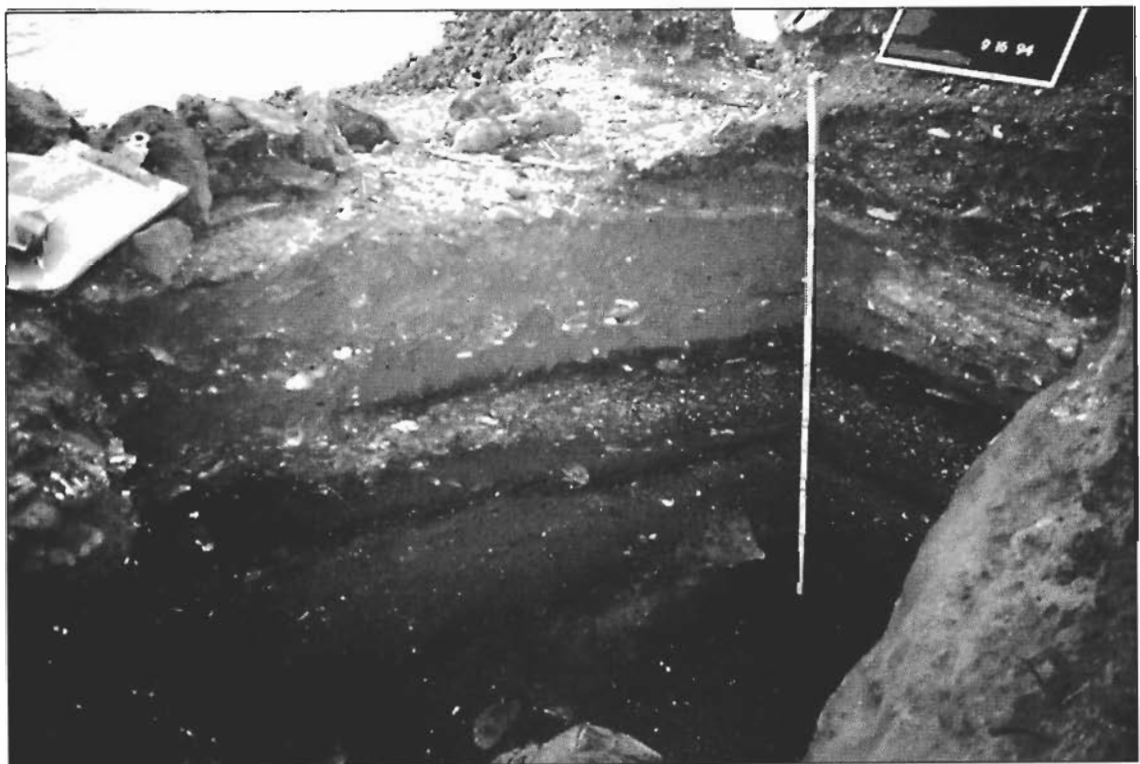
Folsom times (10,000 to 11,000 radiocarbon years ago), either as part of a seasonal round or as a more-or-less permanent island occupation. Material recovered from these levels of the cave consist mostly of a handful of stone tools and shellfish remains including abalones, mussels, and small turban snails.

Erlandson and colleagues described early excavations of Daisy Cave in a pa-

per published in 1996 in the journal *Radiocarbon*. The first digging likely occurred during the late 1880s when a ranching family found a human skull there. Then in 1919, an antiquarian known for ransacking Channel Island sites excavated further. The first well-documented, scientific excavation of the cave was done in 1967-68 by Charles Rozaire of the Los Angeles County Mu-



Rockshelter strata at Daisy Cave date from about 3,000 years ago (at the top, right) to about 11,500 years ago at the base of the excavation.





JOHN ERLANDSON

Erlandson uses tweezers and air blown through a straw to excavate cordage-bearing levels that date to around 9,000 years old.

seum of Natural History. That investigation recovered evidence indicating that the cave's occupation was only about 3,000 years old. In 1985–86, work by Daniel Guthrie of Claremont Colleges, Pandora Snethkamp of the University of California Santa Barbara, and Don Morris of the National Park Service, which manages the islands, yielded material—including dateable shell, primarily from column samples excavated in natural stratigraphic levels from sidewalls of earlier trenches—suggesting the cave may have been occupied at the end of the Pleistocene.

Erlandson, who did his doctoral work on the early peoples of coastal California, was lured to the Channel Islands in 1989 by the Park Service. He says he'd been "freezing my butt off" teaching in Fairbanks, Alaska, when the offer came. After touring the islands, and visiting Daisy Cave, he laid plans for further study. "I was particularly excited by the possibility that there were Paleoindian peoples there."

In 1991, Erlandson moved the 1985–86 column samples to the University of Oregon for detailed analysis. From 1992 to 1997, he conducted field research at the site. The work included the meticulous and stratigraphically controlled ex-

cavation of three test units outside the rockshelter as well as excavation deeper into stratified cave floor sediments within a pit Rozaire had dug.

The task was difficult and tedious because of the site's isolation, its relatively small size, the fragile materials he was uncovering, the use of the site as a nesting area by cormorants, and Park Service restrictions against the use of wheeled vehicles on the island.

"Logistically, we only have about one month each season to work the site because we have to wait for the end of the cormorant-nesting season," says Erlandson. "Getting supplies there is exhausting because we have to carry them all about three miles across the island each day, then hike back with samples. By the eighth or tenth day you are ready to collapse." Further, the site's narrow confines limit the number of people who can effectively work there at one time to only four or five.

Excavating meticulously in tightly stratified layers meant that members of Erlandson's team often found themselves on their knees using tweezers to remove larger sediments, and puffing gently through straws to blow finer material away from delicate fragments of cordage and basketry.

"We followed scores of pieces of cordage that way to make sure we didn't break them getting them out." The cordage had been woven of sea grasses. Erlandson said they discovered a mat of the material that at first appeared to be a net. On closer examination, it proved to be many small cut pieces suggesting the "trim ends" from net or basket making.

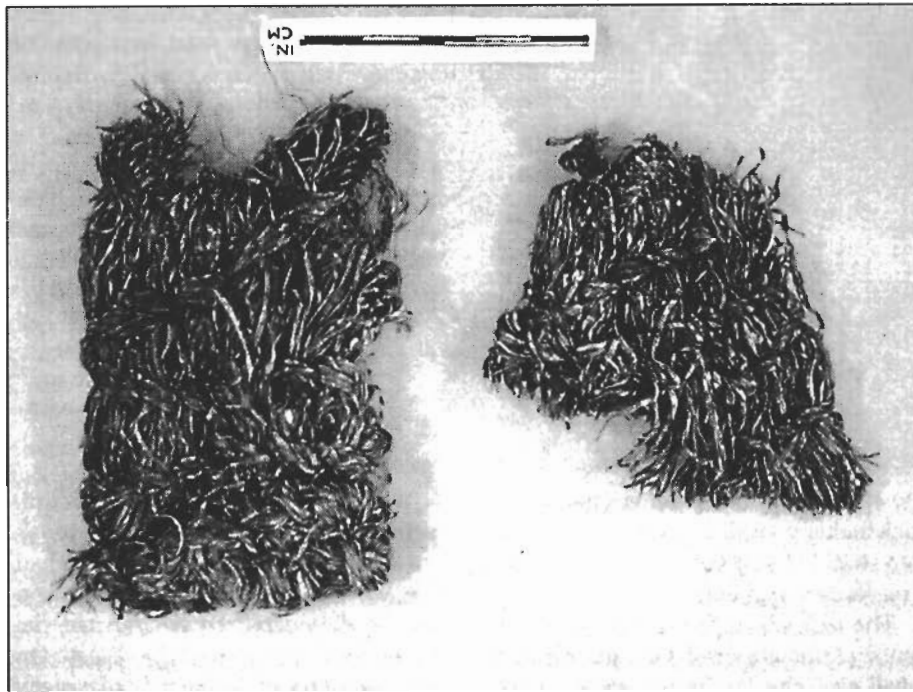
"There's no question about it," Erlandson said. "Daisy Cave gives up her secrets slowly." He's particularly excited to have basketry among those secrets. Rozaire and other early investigators excavated the vast majority of the site areas that contained such perishable artifacts. Erlandson found a small remnant of these deposits along the drip line of Daisy Cave. There, woven materials were preserved by seabird droppings and salt spray.

Two woven basketry specimens from the site are similar to each other, being made with open simple twining and Z-twist wefts. (See **Mammoth Trumpet**, 12:2 "Archaeologists May Overlook Value of Fiber Artifacts.") Warps are bundles of sea grass strands approximately six to eight millimeters wide. Erlandson notes that twining techniques can produce containers, mats, bags, fish traps, cradles, hats, seed beaters and

cloth for blankets, sashes and various clothing items including the toe-flaps of sandals. Indeed, some of the material looks similar to that found in woven sandals from some Great Basin caves.

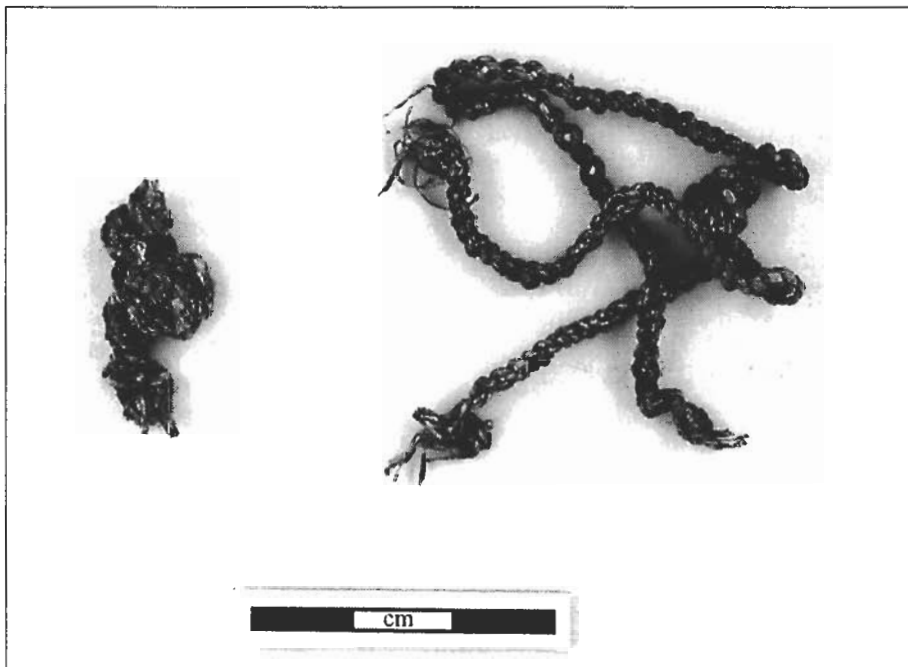
A series of eight samples of shell and charcoal in strata associated with basketry and cordage yielded radiocarbon dates ranging from 8,600 to 9,900 years old. The oldest uncorrected radiocarbon

date for the sequence came from a cordage-bearing layer. In that stratum a California mussel shell fragment yielded a radiocarbon age of $8,940 \pm 90$ radiocarbon years (Beta-49948), with a calibrated age range of 9,950 to 9,700 years ago. Fragmentary basketry evidence has been found in other Pacific Coast sites, but the oldest of these are dated to only 4,500 years ago, Erlandson said.



JON ERLANDSON

Above, these two woven basketry fragments, 8,500–9,000 years old, are made of sea grass. They probably were the toe flaps of children's sandals. Below, knotted sea-grass cordage from 9,000-year-old strata at Daisy Cave.



JON ERLANDSON

From Daisy Cave's deepest layers, Erlandson and his colleagues have recovered the chert flake and a mussel-shell bead. They have no satisfactory explanation for these artifacts. Further study is needed to ascertain their significance within the otherwise sterile stratum in which they were found.

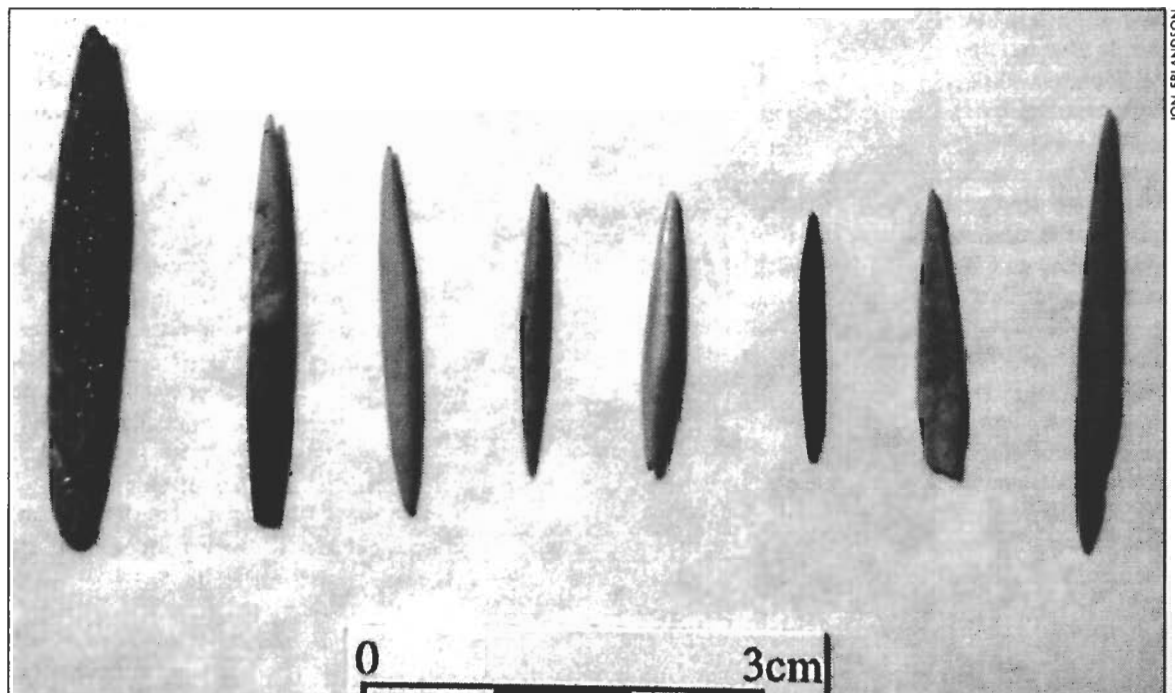
Overall, Erlandson has obtained more than 25 radiocarbon dates used in establishing temporal boundaries for various occupations of the site. Pollen samples from Daisy Cave's lower levels also hint at continuing ecological change. For example, it appears from those samples that prior to 12,000 years ago a pine forest grew outside the cave. The forest may have covered an extensive coastal plain that existed during the last Ice Age's lower sea levels.

Researchers also have found ancient charred debris that Erlandson first viewed as hearths. Now he suspects they are the result of wildfires outside the rockshelter and cave that smoldered their way into the cave. The burned debris itself must be viewed cautiously, Erlandson says, because ancient wood may account for some of the oldest dates received.

"You can still find 17,000-year-old Douglas fir trees on some of the islands eroding out of gullies," he said.

A comprehensive analysis of recently recovered faunal material remains to be done, Erlandson said, and contextual problems cloud the materials collected prior to the 1980s. But some extinct species have been found at the cave, such as a large deer mouse (*Peromyscus nesodytes*), a western spotted skunk (*Spilogale gracilis*), the ornate shrew (*Sorex ornatus*), a vampire bat (*Desmodus stocki*), and a flightless scoter (*Chendytes lawi*).

The thousands of pinnipeds on the island range from elephant seals to harbor seals, some so docile that it would be easy for hunters to approach and club them to death, Erlandson said. "Conceivably, early people were lured to the island by the pinnipeds." His data also suggest that fish "made a substantial contribution" to the diet of the early dwellers of Daisy Cave, an assumption supported by the fact that small bone gorges, or bipointed hooks, are the most common finished artifact researchers have recovered.




JON ERLANDSON

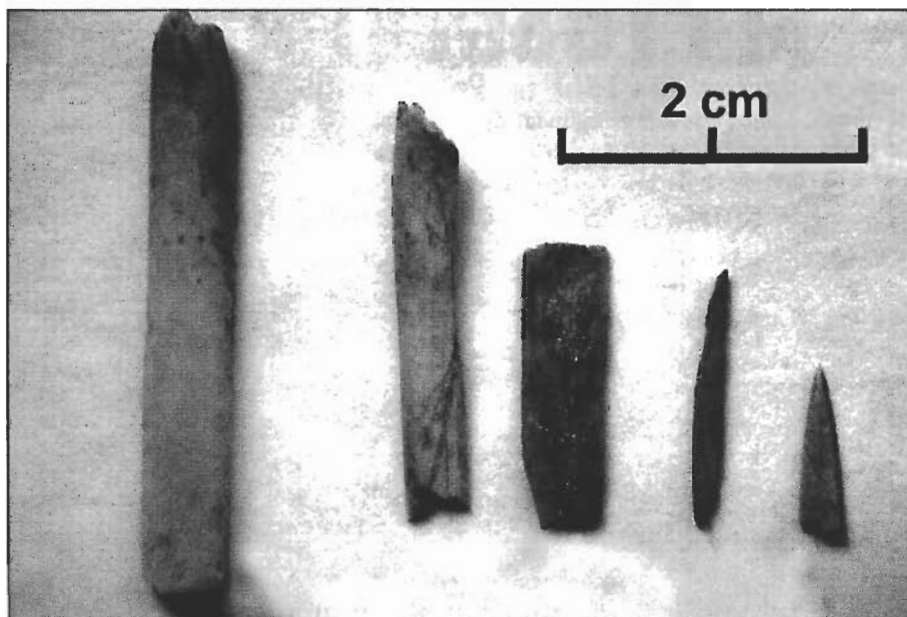
Left, Daisy Cave bone bipoints (fish gorges) date to between about 8,500 and 9,800 years ago. Below are examples of various stages in the production of bone fish gorges found at the cave.

Erlandson has largely completed his work at the site, but he hopes to return during the 1998 field season. In the meantime, a tremendous amount of work remains to be done in the lab, where the details about maritime peoples who occupied the islands for more than 11,000 years are gradually emerging.

He believes that people were there by at least 11,500 years ago, which would have required them to use relatively seaworthy watercraft to reach the islands, though then they would have been somewhat closer to the mainland. And these early residents must have relied heavily on marine resources to survive. Later occupations of the cave, known mostly from Rozaire's museum collections, left behind a variety of cultural material that includes circular shell fishhooks, a wide variety of beads and ornaments, a bone Pan pipe, fragments of a redwood plank boat and other materials common to Chumash craft production. Rozaire also recovered a "beadmaker's kit" containing Purple Olive shell bead blanks, shell fishhook blanks, chert bladelets and micro-blade drills used in the bead making process.

Erlandson says that the evidence unearthed provides some compelling "snapshots in time" of a unique culture and a maritime adaptation that has yet to be fully understood. 

—George Wisner



JON ERLANDSON


SUGGESTED READINGS

Connolly, Thomas J., Jon M. Erlandson, and Susan E. Norris 1995 Early Holocene Basketry and Cordage from Daisy Cave San Miguel Island, California. *American Antiquity* 60:2:309–318.

Erlandson, Jon M. 1988 Cultural Evolution and Paleogeography on the Santa Barbara Coast: A 9,600 Year

Carbon 14 Record From Southern California. *Radiocarbon* Vol. 30, No. 1:25–39.

Erlandson, Jon M., Douglas J. Kennett, B. Lynn Ingram, Daniel A. Guthrie, Don P. Morris, Mark A. Tveskov, G. James West, and Phillip L. Walker 1996 An Archaeological and Paleontological Chronology for Daisy Cave (CA-SMI-261), San Miguel Island, California. *Radiocarbon* Vol. 38, No. 2:355–373.

Moss, Madonna L. and Jon M. Erlandson 1995 Reflections on North American Pacific Coast Prehistory. *Journal of World Prehistory*, Vol 9, No. 1:1–45. 

Which are the casts and which is the real Gerzean knife? These characteristic tools, only a few millimeters thick, represent the high flintknapping skills of their makers, Egyptians who lived between 3,400 and 3,140 B.C. Though this side is pressure flaked for a rippled appearance, the opposite side is smoothly polished. The top one is the original artifact.



PETE BOSTROM

the Art

of Preserving Ancient Skills

Famous for his flawless replicas and detailed photographs of notable artifacts, Pete Bostrom hopes to protect the world's lithic heritage



PETE BOSTROM

IF YOU WERE TO VISIT the world's largest collection of stone-age-artifact master molds, you would have to travel through the southern Illinois cornfields to Troy, a town a few miles east of St. Louis, for it is there that Pete Bostrom, all by himself, operates his Lithic Casting Lab.

Known internationally in archaeological circles for the high quality of his replicas, Bostrom has devised many of his own methods in what has evolved into a complex multistep casting process that ultimately results in molds, master molds, and finished casts that look almost exactly like the original artifacts. Bostrom believes he is the world's only person doing this specialized craft as a full-time occupation.

The Lithic Casting Lab specializes in the replication of prehistoric stone artifacts for museum displays, teaching aids, reference collections, and for special situations such as casting repatriated arti-

Before taking the final photograph, Pete Bostrom adjusts one of the 540 artifacts he has assembled for his poster, *Artifacts of the World*.

facts before reburial and casting artifacts that will be damaged when samples are cut from them for thin-section or obsidian hydration dating analysis. Bostrom also casts artifacts that need to be examined under a scanning electron microscope but will not fit inside the instrument; selected areas for study can be cut from the cast and the artifact itself is left whole.

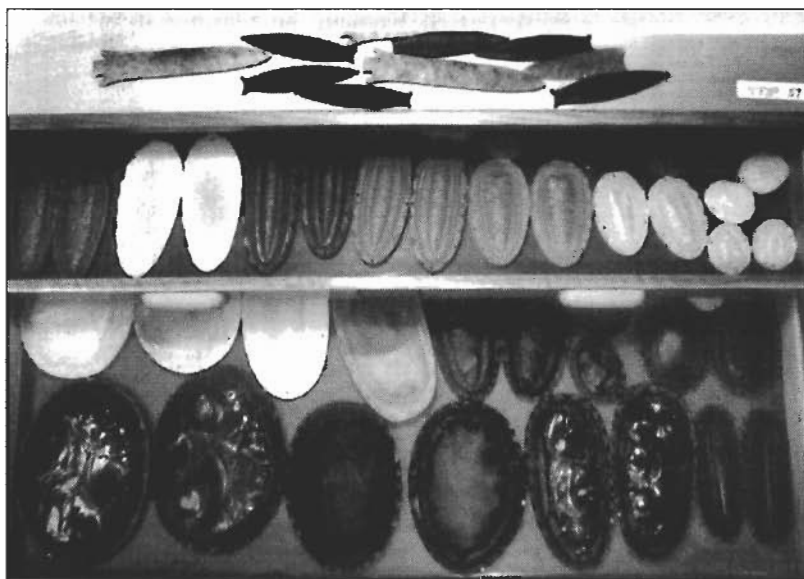
Learning how to maintain good edge detail and how to cast large items so that they are detailed and free of air bubbles has taken the 49-year-old Bostrom years of trial-and-error experimentation. He told the *Mammoth Trumpet* that he has never heard of anyone else doing some of the procedures that he

then keep the masters stored in his laboratory. Keeping masters is, in effect, an insurance policy in case something happens to the original artifact. In such cases his master molds become an invaluable set of reference materials. Bostrom notes that some artifacts he has cast have been repatriated to tribal groups who may choose not to make them available for scientific study. Also, some of the original artifacts have been broken or stolen since he made master molds from them.

It's an expensive and time-consuming process, but over the years he has cast hundreds of artifacts for many federal agencies including Bureau of Land Management, Bureau of Reclamation, Forest Service, National Park Service, and the Smithsonian Institution. He has also done casting projects for a large number of states, counties, museums, and universities. His casts inevitably cause excitement—and sales—among collectors, flintknappers and within the professional community. Currently he is so busy with special casting projects that he is not able to fill all the requests for casts.

Making the Master Mold

The process of making a typical cast begins when Bostrom embeds half of the artifact in clay. He tries to divide it in half in a way that seems most logical. For a bifacially flaked stone artifact, that usually means along the edge so that the edge becomes the seam of the mold. He uses a stereoscopic binocular microscope to help him align the clay and the artifact edge as perfectly as possible.



Above, several casts lay atop a cabinet of casts. Two open drawers are full of master molds; the one at the lower left, 10 inches long, was taken from the largest obsidian biface in the Fenn cache from Utah. Right, Bostrom's office at the Lithic Casting Lab displays many of his casts in lighted cases. The largest biface is 24 inches long.

does. Bostrom has learned how to cast epoxy thicker than manufacturers recommend. He is a laboratory craftsman who thinks the molding and casting skills he has learned should one day be passed on to apprentices. But he believes this can only happen if apprentices are supported by the scientific community or private interests.

Starting with an original artifact made from shell, bone, antler, stone, or ivory, Bostrom makes a mold of silicone rubber. From that mold he usually goes on to make epoxy impressions of the complete two-piece mold. This is called the master mold. After the original silicone mold wears out, duplicate molds can be taken from the master mold in about an hour. The process saves having to go back and mold the original artifact more than once. Without a master mold, only approximately 9 to 15 casts could be made from the first mold.

Theoretically, if only a few casts of the item are required, Bostrom can make them from the original silicone rubber mold. But he prefers to make a master mold for each artifact and



He then pours silicone rubber that contains a releasing agent (a mixture of paraffin and xylene) over the half of the artifact that is not embedded in the clay. After it cures, he peels off the rubber, places the artifact in the impression he has just made, and then applies some mold release on the silicone rubber so that the two halves won't stick together. He then pours the silicone rubber over the second half of the artifact. After the rubber cures, he peels it off the artifact, trims the molds, and cuts a few notches in them so that the sides fit together in tongue-and-groove fashion.

To make a cast, he pours epoxy resin into each half of the silicone rubber mold that he has just made. It may take one or two tries before he gets a close-to-perfect solid epoxy cast of the original artifact. On a microscopic level, the first three or four casts from the first mold are considered the highest quality casts. The surface detail, when studied under a scanning electron microscope, is virtually identical in every way to that of the original artifact.

The Coloring Process

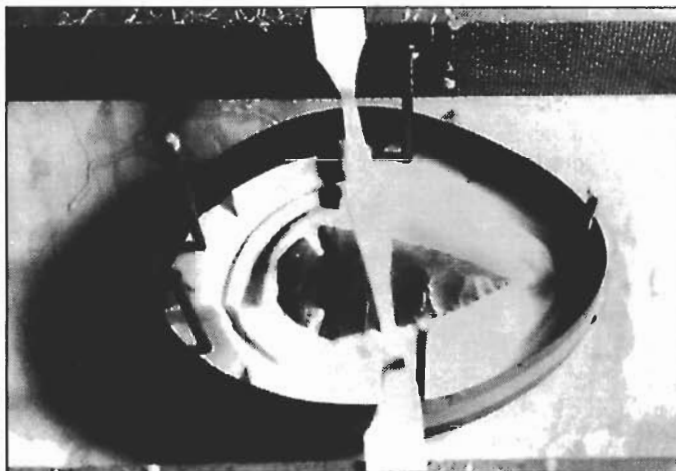
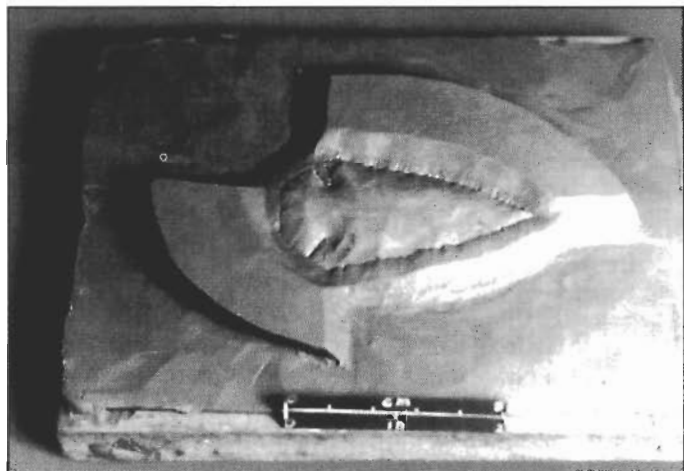
Coloring the casts so that they look like the original artifact requires a sequence of steps. "You have to color these casts

up when the epoxy resin is poured. Washes and stains can also be applied to the cast. Raw pigments can be applied to the cast and later wiped off. "Sometimes I'll use as many as six different techniques to color a cast," says Bostrom. "When the coloration builds up on the surface it begins to really look like the original."

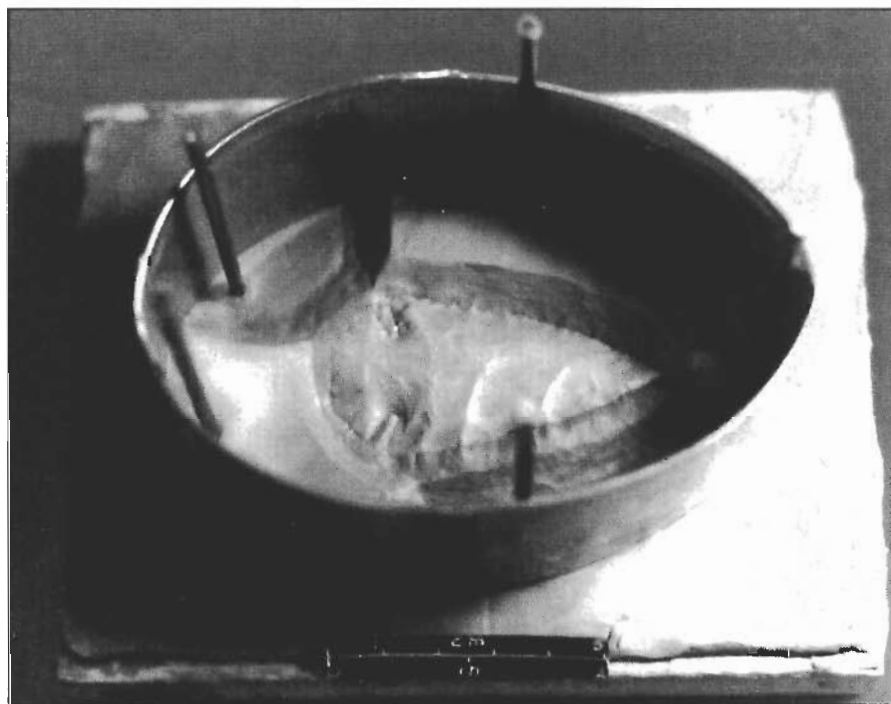
Depending upon whom the cast is being made for, Bostrom may also apply a cataloging number to it or place it in a plastic bag containing written background information.

From Tropical Fish to Lithics

Bostrom's interest in archaeology dates back to his childhood. He began surface-collecting for artifacts in Illinois in the early 1970s. After serving in Vietnam, he returned to his job at



ALL: PETE BOSTROM



Bostrom has positioned a St. Charles point in clay (above left) with the aid of a microscope prior to casting. Then farther along in the process (below left), the same point has a retaining wall around it ready for the silicone encapsulant to be poured in. Later in the molding process (above right), the second half of the mold is ready to be poured.

General Motors and in 1973 built a 70-foot by 26-foot building that he used to house breeding tanks for tropical fish. An influx of fish imported from Asia made fish breeding impractical, so he returned to his original interest—archaeology.

In the mid-1970s he visited and became friends with J. Allen Eichenberger of Saverton, Mo., who was well known for his casts of the Denver Series artifacts, sold at the Denver Museum of Natural History. Bostrom learned techniques from Eichen-

berger, then proceeded to invest in equipment such as vacuum chambers, low-temperature ovens, stirring machines, scales, and other equipment to help him as he worked to master the casting process.

according to the opacity of the stone," says Bostrom. "Some stones are slightly translucent on the edge, or they're completely opaque, or they're very translucent. And then you have to apply the different colors that make up the color of the stone."

The base color of the artifact is incorporated into the epoxy resin at the beginning of the casting process. Pigments can be applied to the surface of the mold or cast so that they are picked

Bostrom was employed for more than 21 years by General Motors, and it was only in 1987 that he took an opportunity to leave and begin to work full time casting artifacts.

Finding himself interacting daily with Old World and New World archaeologists, collectors, and flintknappers, Bostrom learned that these four groups often have conflicting points of view, but he says that each has something valuable to offer.

The most unusual cast that Bostrom ever did was a series of Bigfoot tracks that belonged to the Forest Service. In about 1985 he made molds of three plaster casts of large footprints discovered in Washington state that showed visible dermal ridges and sweat pores—one of the prints showed a flexible foot bending around a rock. Bostrom is amazed at the number of people he meets who have stories about Bigfoot. He says they make for great campfire conversation.

World Lithics Institute

Bostrom has accumulated thousands of master molds and casts of artifacts from cultures worldwide over a 20-year period. At least 46 Paleoindian sites are represented in the collection, including Mesa and Moose Creek, Alaska; Blackwater

Now concerned about preserving this material for the future, he has developed a proposal for what he is calling the World Lithics Institute, a non-profit, federal tax-exempt institution dedicated to casting and preserving replicas of arti-

Affiliated institutions might maintain regional collections of items representing many different cultures. These collections could be thought of as "lithic libraries" where students and scholars could touch and examine artifacts not nor-



PETE BOSTROM



PETE BOSTROM

Bostrom does most of the casting in the area of the lab shown above. The fume hood is to the left; a low-temperature oven can be seen inside it. Left, this is the area where Bostrom makes molds and mixes colors. Equipment includes a microscope, scale, low-temperature oven, and smaller apparatus needed to complete various processes. To the right of the picture are vacuum chambers and mixing machines.

mally accessible. At present, institutions and museums tend to have only casts of items they themselves have excavated and collected. Anyone wanting to see material from many different cultures now has to travel all around country in order to do so.

Bostrom believes one of the areas of greatest concern is the loss of repatriated artifacts. In 1991, he was able to cast four artifacts, three bone and one stone, associated with Idaho's 10,500-year-old Buhl Woman skeleton. "This was done within a 48-hour time frame," says Bostrom. "They were returned by overnight mail just before being handed over to tribal authorities." The skeleton and artifacts were buried. "Saving some of the more

Draw, Colby, Domebo and Drake in the West; Bostrom and Kimmswick in the Midwest; and Dutchess Quarry Rockshelter, Thunderbird and Vail in the East. He also has molds of artifacts from important Old World sites such as Abbeville in France, Kalambo Falls in Zambia, Mezirich in Ukraine, and Olduvai Gorge in Tanzania.

facts. In the past, whatever knowledge was gained about casting artifacts ended when that person retired or died. The proposed institute would teach casting and supply high-quality casts to anyone who would want them.

Bostrom envisions the World Lithics Institute as being able to provide large collections of lithics for people to study.



important artifacts like these through casting would be one of the goals of the World Lithics Institute," he adds. "Another would be to cast important artifacts inside countries such as China or Egypt that do not allow artifacts to leave their borders."

Though still in its conceptual stage, the World Lithics Institute already has three board members: Ken Tankersley of Kent State University, Jack Hoffman of the University of Kansas, and Adrien Hannus of Augustana College. Bostrom, as the proposed director of the institute, also thinks it would be a good idea to have a conference and bring in an international group of advisors.

Protecting his master molds and photographic negatives is another concern. Part of the World Lithics Institute would include a fireproof room


PETE BOSTROM

Lithic Casting Lab probably has the largest collection of epoxy master molds of important stone age artifacts in the world. Here are just a few of the thousands of molds.


to house all these materials. "If lithic casting is to continue in any meaningful way it must be established within a not-for-profit, structured program," says Bostrom, who thinks support for a World Lithics Institute is similar to support received in the past for radiocarbon-dating labs or other valued technologies.

Photographing Lithics

Years ago Bostrom decided that he also needed to make a photographic record of some of the more uncommon artifacts that were coming through his laboratory. He has perfected a method for depicting both sides, as well as an edge view of an artifact, in a single photograph. Using a large-format camera, he takes a triple exposure on a 4-by-5 negative. He then transfers the image to a slide that presents the "impossible" perspective of all three views at once. He also uses an 8-by-10-inch camera when photographing artifacts.

Bostrom thinks his World Lithics Institute could use this type of photograph as a standard. Such photographs could also be placed on a Worldwide Web site where they could form a visual dictionary of lithic technology and artifacts of the world that could be available to anyone.

For his *Artifacts of the World* poster, which is about 25 inches by 39 inches, Bostrom spent two weeks laying out 540 artifacts on a black velvet background. He has also done the photography for three other posters including Clovis, early Paleoindian, and Mississippian artifacts. He sells his posters for well under \$20 each, including a detailed booklet that identifies and describes each artifact.

Bostrom wants *Mammoth Trumpet* readers to know that though he is too busy to fill all the orders for casts, he is able to sell his posters and a Clovis slide set. He can be contacted at the Lithics Casting Lab, 577 Troy-O'Fallon Road, Troy, IL 62294, phone 618-667-2447, fax 618-667-2296. 


PETE BOSTROM

Bostrom uses a large-format camera to make triple exposures that allow both sides as well as the edge of an artifact to be seen at once. This example depicts a Mayan projectile point about 3¾ inches long.

—Carol Ann Lysek

Great Lakes People

continued from page 1

Now, Overstreet suspects human association with two even-earlier mammoth sites in the Kenosha area, Mud Lake and Fenske. Stafford has dated bone of the Mud Lake mammoth at $13,440 \pm 60$ B.P. (CAMS 36643), and the Fenske mammoth at $13,470 \pm 50$ B.P. (CAMS 36642). Although various scientific analyses on materials from those sites are continuing, Mud Lake and Fenske mammoths may also bear evidence of butchery.

Taphonomist Eileen Johnson, curator of anthropology at the Museum of Texas Tech University in Lubbock, has been analyzing bone from four of the sites, Fenske, Mud Lake, Hebior, and Schaefer. When complete, her studies should provide scientists with more understanding of how the sites were formed and whether cuts on bones are likely to have been made by people wielding stone blades. Dr. Johnson's analyses are to include studies of cut marks using a scanning electron microscope. Richard Yerkes of Ohio State University is using that same technology to study wear patterns on stone tools from the Hebior and Schaefer sites.

Although he is still gathering evidence, Overstreet is confident that the people who made those cut marks on the bones and left their knives behind were the same people who created the type of stone tools known as Chesrow, a Paleoindian complex that takes its name from a site on the edge of Kenosha, Wis. (**Mammoth Trumpet** 10:2 "Ice Age Wisconsin People Left Unique Cultural Record"). He has identified more than 35 sites with Chesrow-complex artifacts.

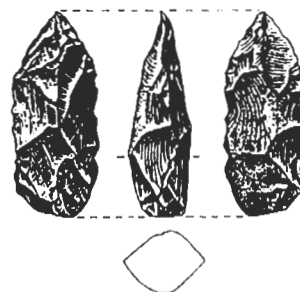
Overstreet believes the Lucas site, on the south edge of Kenosha, has the potential to unequivocally establish that Chesrow-complex people date back to 13,000 radiocarbon years ago. "It's a habitation area of some kind," he says of the Lucas site, which was accidentally unearthed in a natural area by trail bikers. Overstreet and his team were working at the Chesrow site, which is less than a mile away, and when they investigated Lucas, they discovered some waste flakes and the base of a Chesrow projectile point in sandy wheel ruts.



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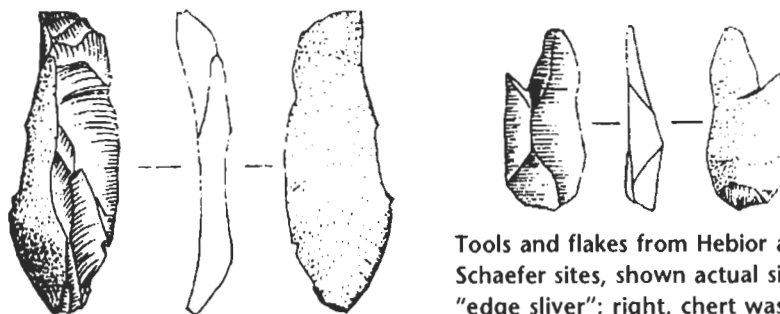
During excavation of the Hebior Mammoth near Kenosha, Wis., a projectile point (arrow) was discovered underneath a mammoth bone. Photo at left is a close-up of the in-situ association; the drawing depicts the projectile point (about 40 percent actual size).



"We went back the following year, put in a few units and came right down on this relatively densely occupied area," Overstreet, president of Great Lakes Archaeological Research Center, explained in a recent telephone interview from his office in Milwaukee. "It's a habitation area of some kind. We have only excavated around 60 square meters," which he calls a "small look at a fairly large site." The most intriguing part of the site is a small basin ringed by

a midden of calcined bone and broken tools. "There is a lot of evidence of burning. This summer we got into a small basin that was obviously thermally altered. The sands were highly discolored." That possible hearth yielded enough charcoal for some AMS radiocarbon dates, but the tests remain to be run.

An advantage of the Lucas site is a total lack of later occupations; its cultural level is buried by 20 to 30 centimeters of wind-



Tools and flakes from Hebior and Schaefer sites, shown actual size. Left, "edge sliver"; right, chert waste flake.



blown sand. Further, the site is in a state-owned nature area and surrounded by wet prairie. It is not threatened by development or looting, so the site offers scientists an opportunity to learn much more about the ancient people who lived along the glacial margins and left behind stone tools Overstreet has categorized as Chesrow complex.

"I need to get a handle on the chronology as well as do a little bit more work with the sediments before going out there and doing more extensive excavation," he says.

At one time, Overstreet had thought of Chesrow as a relatively short-term occupation. Additional evidence and the new dates have convinced him that although occupation of any one site might have been relatively brief, the people who made the complex probably were in the region for two thousand years as glacial ice advanced and ebbed.

If people—and apparently Chesrow people—were in the region for that long, it also seems that they must have ranged over an extensive territory. Overstreet says that glaciological evidence indicates that in the duration of human habitation, the glacial front melted back to expose Lake Michigan's outlet at Sault Sainte Marie and then advanced all the way southward approximately to today's location of Sheboygan or Milwaukee, ponding up glacial lake Chicago in the process. "People were moving over fairly vast territories. I mean Lake Michigan is several hundred miles long. People were living in this region during those changes."

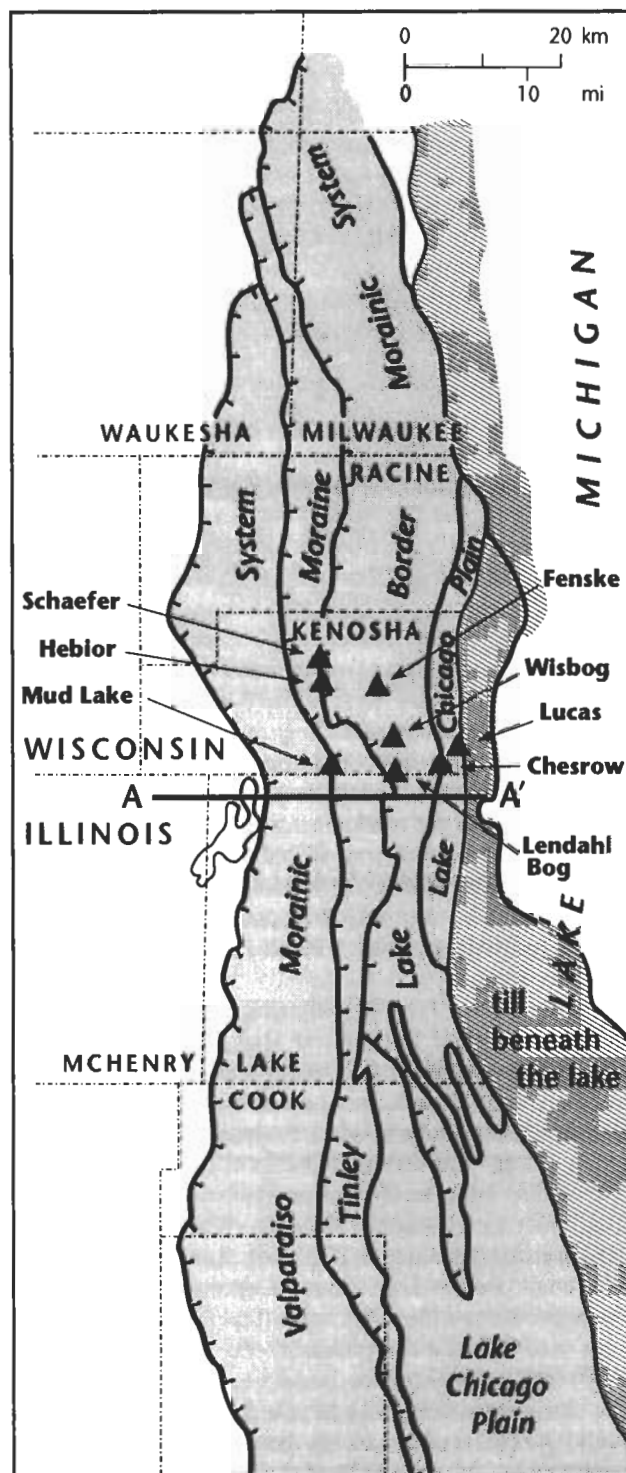
Owner Donates Site

Gordon W. Wanek has donated Fort Rock Cave, a well-known Paleo-American site in central Oregon, to the Archaeological Conservancy. The site, excavated in 1938 by Luther Cressman of the University of Oregon, yielded sandals woven of cordage made from sagebrush fiber radiocarbon dated at about 9,000 years old. Other dates obtained from Fort Rock Cave range back in time to about 13,000 years. Wanek, a resident of La Pine, Oregon, is a cattle rancher and developer.

Climate during the period probably was cool and moist, lacking the extreme cold of earlier times, but colder on average than it is today. Glaciologists disagree on the exact nature of the great Laurentian ice sheet. Some describe ice towering two miles in thickness, but others suggest that spreading lobes of the continental ice may have been relatively thin sheets.

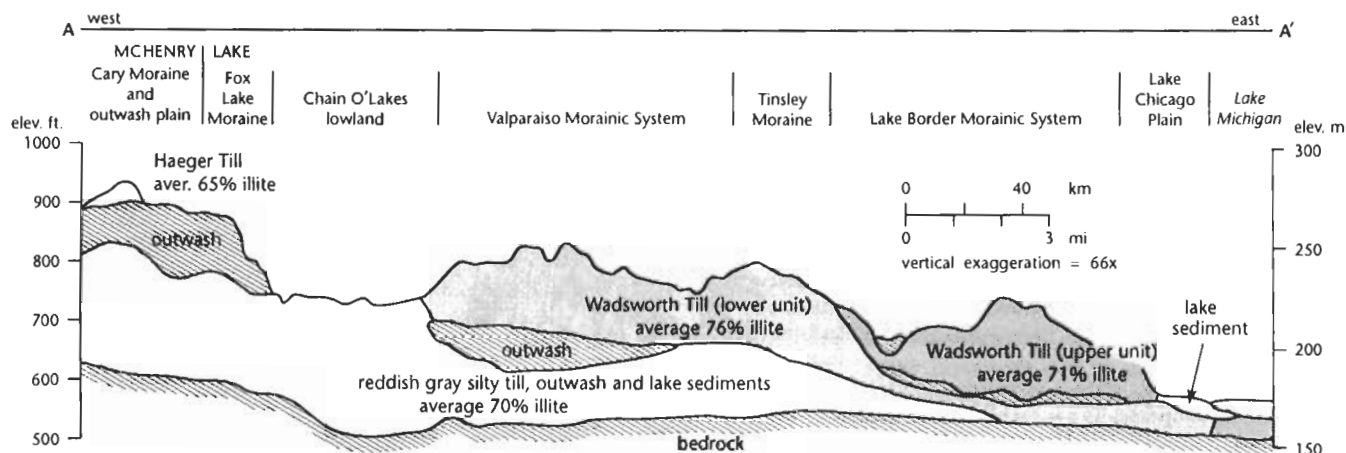
Whether miles or meters thick, the moving ice did flatten hills, lay down till fields, and leave behind kettle lakes and other features. Animals and people definitely were living in dynamic environments. Individual mammoth and mastodon sites Overstreet and his colleagues have investigated, however, give evidence that the animals died, and apparently were butchered, in relatively calm environments. The bones offer no evidence of being transported by moving water, and the way they were stacked or scattered about the individual sites suggests human involvement. In addition to apparent cut marks, which are still being analyzed, scientists have identified clear evidence of carnivore gnawing on mammoth bones. Evidence of trampling has been found on bones from at least two of the sites.

Though he initially believed the Chesrow complex represented a



Southeastern Wisconsin–northeast Illinois landforms and Chesrow sites (after Hansel, 1983).

relatively brief human occupation, Overstreet has no problem believing that it could have spanned two thousand years. "It wouldn't be problematical to talk about a Middle-Archaic occupation of a couple of thousand years based on the style of artifacts." He suggests that North American archaeologists have largely been missing a niche because conventional wisdom told them it should not be there. "In



Cross section of landform map on opposite page (after Hansel, 1983).

Europe there were specialized populations living in very cold, ice-marginal environments for tens of thousands of years." Why, he asks, shouldn't North America have had people living alongside glaciers for a few thousand years?

The newly confirmed antiquity of these Wisconsin mammoth sites explains another issue that had been puzzling Overstreet and his colleagues. Their previous investigations suggested that mammoths and mastodons were in the area at close to the same time. That seemed unlikely because mastodons were browsers with teeth for crushing bushes and tree branches, while mammoths were grazers with broad millstone teeth for processing grasses. Mastodons would have required wooded lands while mammoths would have required grassland-tundra (steppe) habitat.


New dates confirm that approximately 1,500 years separated the two species of elephants in southeastern Wisconsin and northeastern Illinois. "It now seems pretty clear that, at least in this locality, mammoths and mastodons are sequential," says Overstreet. "We're looking at a trajectory of environmental change."

The area's sites have provided scientists with much material to help understand the environmental change between the end of the Pleistocene and the beginning of the Holocene. Researchers have everything from Arctic beetles to nuts



A mammoth tusk, more than 11 feet long, is wrapped in preparation for removal from the Hebior site.

and twigs to study. "I think that's one of the most important things that we can offer," says Overstreet. "Most of the models about Pleistocene climate are not drawn from organic material, they're reconstructed from fossil pollen. We've got the fossil pollen, but we've also got the nut fragments, the seeds and the twigs and the buds and beetles."

All the clues, from distinctive stone tools and bones of gigantic mammals down to microscopic pollen grains, should help explain what happened in the span of two thousand years along the margins of a continental glacier. 

—Don Alan Hall

Replicated Hebior Mammoth skeleton stands on display outside the Museum of Natural History in San Diego.



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COMING CONFERENCES

April 1-4 Annual Meeting, American Association of Physical Anthropologists, Hilton Hotel, Salt Lake City.

Contact: Clark Spencer Larsen, Research Laboratories of Anthropology, Alumni Building, CB# 3120, The University of North Carolina, Chapel Hill, NC 27599-3120.

April 16-18 51st Annual Northwest Anthropological Conference, Holiday Inn, Missoula-Parkside, Montana.

Contact: Thomas A. Foor, Dept. of Anthropology, University of Montana, Missoula MT 59812.

May 5-10 31st Annual Meeting of the Canadian Archaeological Association, Harbour Towers Hotel, Victoria, British Columbia.

Contact: Bjorn Simonson, 250-715-1566.

Aug. 23-29 Eighth International Congress of the International Council for Archaeozoology (ICAZ '98), University of Victoria, Victoria, British Columbia.

Contact: Conference Management, Division of Continuing Studies, PO Box 3030, Victoria, BC, V8W 3N6.

e-mail: morourke@uvic.ca

<http://www.uvcs.uvic.ca/conference/admin.htm>

Sept. 3-6 Alta Conference on Rock Art II. Alta, North Norway.

Contact: Knut Helskog, Tromsø Museum, Tromsø U, 9037 Tromsø Norway. e-mail: knut@imv.uit.no

Sept. 5-7 15th Biennial Meeting of the American Quaternary Association, Hotel Krystal Vallarta, Puerto Vallarta, Mexico.

Contact: Socorro Lozano Garcia, Instituto de Geologia, Universidad Nacional Autonoma de Mexico, Ciudad Universitaria, Apartado Postal 70-296, 04510, Mexico DF Mexico. Fax 52-5-5500-6644. e-mail: AMQUAMEX@servidor.unam.mx


Oct. 1-4 10th Mogollon Archaeological Conference. Silver City, New Mexico.

Contact: Cynthia Ann Bettison, Western New Mexico University Museum, PO Box 680, Silver City NM 88061. 505-538-6386. e-mail: bettison@iron.wnmu.edu

Oct. 14-17 56th Annual Plains Anthropological Conference, Bismark, ND.

Contact: Fern Swenson, State Historical Society of North Dakota, 612 E. Blvd. Ave., Bismark ND 58505. 701-328-3675. e-mail: fswenson@ranch.state.nd.us

Nov. 2-8 IV Jornadas de Arqueología de la Patagonia, Río Gallegos, Argentina.

Contact: INAPL, 3 de Febrero 1370 (1426), Buenos Aires, Argentina. e-mail: rafa@bibapl.edu.ar 


Send conference notices to Mammoth Trumpet, 620 Northwest Witham Drive, Corvallis, OR 97330.

Arizona's Famous Clovis Sites

continued from page 6

with a few mammoth bones that had washed out of the bank," says Haynes. He explains that Fred Navarrete and his son Mark found the Naco site in 1952. "A third of a mile farther on in the north bank of Greenbrush Draw is where another mammoth skeleton, the Leikem mammoth, was found in probable association with a Clovis point," says Haynes.

He suggests that after Naco, visitors might enjoy the evening

in the historic town of Bisbee and on the following day visit Tombstone on the way to the ruins of the 1776-1780 Spanish presidio of Santa Cruz de Terrenate. Further, Haynes notes, Coronado National Monument is only 15 miles from the Lehner site. Set in a canyon on the eastern slope of the Huachuca Mountains, it commemorates the Coronado Expedition of 1540, believed to have entered what is now Arizona by way of the San Pedro Valley. "It is possible, therefore, to experience 13,000 years of prehistory and nearly half a millennium of history in a day or two in the San Pedro Valley," Haynes concludes. 

—Don Alan Hall