Pondering the Pleistocene

Pleistocene animals seem firmly associated with the Peopling of the Americas, but scientists are continuing to study the contexts and question the timing of correlations between humans and animals such as this mammoth, part of a display at the new Beringia Centre in Whitehorse, Yukon (article page 12). A cave in northeastern Ohio is revealing remains of many Pleistocene animals in association with artifacts (article, page 1). Meanwhile, methods of dating traces left by those mammoth hunters known as Clovis are still being debated (article, page 16).

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.
OHIO CAVE, SEALED SINCE ICE AGE, YIELDS DATA ON PALEO-AMERICANS

Absence of Evidence Proves No Evidence of Absence

From a deeply buried cave in northwest Ohio, scientists have unearthed a treasure of Paleo-American artifacts and Ice Age fossils dating to almost 13,000 radiocarbon years ago. The apparent human occupation of such a cave came as a surprise to investigators.

Sheridan Cave is part of a cave system in Wyandot County that includes Hendricks Cave and Indian Trail Caverns. It is within the drainage basin of Lake Erie, which lies about 40 miles to the north. Topography is glaciated kame with numerous sinkholes and caves. The cave system was formed in a low ridge of Silurian dolomite—calcium-magnesium carbonate—a resistant reef of fossilized algae that rises about 50 feet above flat surrounding landscape. The area was repeatedly scoured by Pleistocene glaciation, and was deglaciated only about 14,100 years ago. These caves consist of a series of interconnected domes resembling "cabbage heads." The passage of Sheridan Cave is about 30 feet wide, 12 feet high and 800 feet long.

Kenneth B. Tankersley, an anthropologist at Kent State University and principal investigator for the Sheridan Cave project, says the site, discovered 30 feet below the surface, has produced more species from the late Pleistocene than most comparable sites in the United States of the Paleo-American era.

"This is an incredibly rich site," Dr. Tankersley said in a recent telephone interview. Investigators so far have identified several animals that now are either extinct or living in arctic areas. These include the short-faced bear (Arctodus simus), the giant, long-legged omnivore; stag-moose (Cervus scotti), an animal that resembled modern moose except for its forked antlers; giant beaver (Castoroides okloensis), an animal that reached up to nine feet in length; flat-headed peccary (Pitaysonus compressus), a wide-ranging American pig of the Pleistocene; and caribou (Rangifer tarandus). Other fauna identified include three species of vole, northern bog lemming, ermine, short-tailed mouse, pygmy shrew, porcupine, rabbit, turkey, fisher, and pine marten. There also are remains of fish, vertebrates and amphibians. Overall, the fossils suggest habitats near the cave included a continued on page 8

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CSFA Honors Stanaway for Leadership

Anne Stanaway, a documentary film maker with a deep interest in the peopling of the Americas, has been awarded the H. Marie Worthington Award for her tireless service to the Center for the Study of the First Americans over nearly a decade. The award, named in honor of Dr. Worthington, a leader in the study of earliest American prehistory, recognizes outstanding contributions to First Americans Studies.

As chair of the Center's Advisory Board, Stanaway, a resident of Boulder, Colorado, worked to establish closer relations between the CSFA and Oregon State University and better communications between the Board and CSFA staff. She toured early South American sites with CSFA scientists in 1988 and was active in the World Summit Conference on the Peopling of the Americas in 1989. She is best known to CSFA members for her production "Mammoth Meadow: An Archaeological Quest for the First Americans," which is available on videocassette through the CSFA (see order blank). Her personal contacts with financial supporters, scientists, administrators, and staff members have resulted in understandings and efficiencies that would not otherwise have been possible. Meeting at the University of Colorado in Boulder in October, the CSFA Board presented Stanaway the award stating: "By dint of her courage, her charm, her doggedness, her ability to motivate and to lead, she forged the Advisory Board into a positive force."

MAMMOTH TRUMPET

The Mammoth Trumpet (ISSN 8755-6898) is published quarterly by the Center for the Study of the First Americans, Department of Anthropology, Oregon State University, Corvallis, OR 97331-6210. Phone 541-737-4595. Periodical postage paid at Corvallis, OR 97333. e-mail: ahall@orst.edu.

POSTMASTER: Send address changes to: Mammoth Trumpet 620 Northwest Williams Drive, Corvallis, OR 97330

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The Center for the Study of the First Americans is a non-profit organization. Subscription to the Mammoth Trumpet is by membership in the Center.

NGS Supported Cave Work

The article "Ancient Alaskan Bones May Help to Prove Coast Migration Theory," (Mammoth Trumpet 12:4) neglected to mention that work on the Tongass Cave Project by Kevin Allred, Fred Grady, and Tim Heaton was supported by a grant from the National Geographic Society.
DICK REINHART

Engineer and archaeologist Richard E. Reinhardt, 74, a longtime member of the Center for the Study of the First Americans Advisory Board, died Oct. 3 at his home in Nevada, Ohio. His passing is a major loss to all of us involved with the Center.

Dick was an IBM executive who did not become involved in archaeology until he took early retirement. He was among the first CSFA Board members who was not an academic administrator, and his practical know-how has proven invaluable to the Center over the years.

"Dick's real forte was in the field," says CSFA Director Robson Bonnichsen. "He was my chief field foreman for many years, and he always helped set up and take down camps." His extensive background in engineering and management proved ideal for field archaeology. "He provided important glue that held programs together," Dr. Bonnichsen added, noting that Dick's friendships with volunteer team members drew many people back to CSFA projects year after year.

Marvin T. Beauty, chair of the CSFA Advisory Board, agreed: "The field program of the Center would not have operated one-fourth so well had not Dick been there training new volunteers, organizing equipment, getting everyone going in the morning, making sure the cook was doing a good job, building new tools and equipment, and relaxing with the crew after a hot day," he said.

Dick was born in Harpster, Ohio, and graduated in 1940 from Nevada High School. Before joining the Navy in 1943, he worked for Swan Rubber Company and soon became a machine operator, supervising two employees. After serving aboard the USS Renapp in the South Pacific, where he took part in nine major battles, he entered Ohio Northern University in Ada, Ohio, and studied engineering. In 1950 he joined the IBM Corporation as a field engineer.

In 1955 he transferred to IBM's development lab in Kingston, N.Y., working primarily in the development of large-scale computers and military units. He had secret clearance with U.S., French and British military and atomic-energy units. In 1971 he transferred to the IBM World Trade Corp in Nice, France, and in 1977 he returned to IBM USA as manager of its Electromagnetic Interference Group. Later that year he retired from the company and entered the State University of New York-New Paltz, to study archaeology and anthropology.

He participated in various digs in the Hudson Valley, and in 1980 he participated as a volunteer at Bonnichsen's Mono-Sierra Lake project and he continued on the project until 1984. In 1981 he entered SUNY-Albany, where he received his master's degree in 1983. He was with the scientific team that chose the Mammoth Mound site and worked with CSFA teams during every summer of work there. He continued to work at the Center's Montana sites through the summer of 1996. He took pride in Ohio's Paleo-American sites and would have been delighted to read our article in this issue on the Sheridan cave site, less than 20 miles from his hometown.

"His practical enthusiasm, genial manner and long experience won't be replaceable," said Dr. Beauty, a soil scientist. "We will try to build on the base he laid."
Ancient Skeletons Could Hold Key to Medical Questions

S C I E N T I F I C I N V E S T I G A T I O N of Paleo-American skeletons has the potential to benefit the health of today’s Native Americans, says a medical researcher who has been examining the ancient settlement of western North America for clues to the origin of diabetes.

“Well-preserved Paleo-American skeletons are extremely rare,” says Dr. Michael Wendel, a researcher at Kaiser Permanente in Walnut Creek, Calif. “Data from each are priceless and could potentially benefit the health of American Indians today.”

He stressed the importance of permitting tests to provide information on the diet, health, and age at death of individual skeletons such as the Buhi Woman, discovered in Idaho in 1899 and reburied in 1991, Kennewick Man, discovered in 1996 and subject to continuing controversy, and the Spirit Cave Man, discovered in Nevada in 1940 and curated at the Nevada State Museum.

“Such data could contribute to our understanding of the etiology of non-insulin-dependent diabetes mellitus, a chronic disease that has recently become a widespread health problem among American Indians,” says Wendel, who has a Ph.D. in anthropology from the University of California at Berkeley. His dissertation was on Paleo-American settlement of southern California. He says that non-insulin-dependent diabetes mellitus is a heavy health burden for Native Americans, contributing to retinopathy, kidney disease, amputation, and complications in pregnancy.

Wendel cites statistics on a variety of diabetic complications suffered by Native groups. Non-insulin-dependent diabetes, he notes, ranks sixth as the underlying cause of death among Native Americans, and it contributes to mortality from several other causes of death including heart disease, cerebrovascular disease, pneumonia, and influenza. The age-adjusted diabetes-associated mortality rate among native groups is four times the rate for Euro-Americans. Europeans, Africans and Asians also are not as likely to have the disease as are descendants of prehistoric populations of Australia, Oceania and North America.

“Current data indicate that the presence of NIDDM (non-insulin-dependent diabetes mellitus) in American Indians is correlated with the time that their ancestors first migrated from Asia into North America,” Wendel told the Mammoth Trumpet. “NIDDM is most common today among American Indians who are descendants of the Amerind migration that is thought to have occurred about 12,000 years ago.” For example,
Those Rarest of Rare Treasures

Discovered in a gravel pit near Buhl, Idaho, in January 1989, the partial remains of an individual that has come to be known as the Buhl Woman were dated by accelerator mass spectrometry (AMS) to 10,675 ± 95 (Beta-43055 and ETH 2796) radiocarbon years before present. A physical anthropologist examined and measured the skeleton. In accord with Idaho state law, the Shoshone-Bannock Tribes took possession of the bones and reburied them on the Fort Hall Indian Reservation in December 1991 (Mammoth Trumpet 7:2 “Idaho Burial Suggests Life of Hardships”).

The skeleton now known as Kennewick Man, found alongside the Columbia River in July 1996 in Kennewick, Wash., was subjected to limited analysis before it was taken into custody by the U.S. Army Corps of Engineers (Mammoth Trumpet 12:1 “Discovery of Ancient Skeleton Raises Tough Questions”). A small sample of the bone subjected to AMS analysis yielded an unadjusted radiocarbon age of 8,410 ± 60 years (UCR 3478), or an adjusted age of about 9,300 years. The disposition of the skeleton remains in dispute.

Though housed at the Nevada State Museum since 1949, the skeleton now known as the Split Cave Man (Mammoth Trumpet 12:1 “A Remarkable Discovery” 1999) was subjected to radiocarbon analysis until the mid-1950s when samples of hair unexpectedly yielded AMS dates of about 9,300 years. Another Paleo-American skeleton in the Nevada State Museum collection, known as Wadiat’s Beach Man, has yielded AMS dates of 11,300 years BP (Beta 38354/ETH 6765) and 12,714 ± 77 years and 7,944 ± 84 years (AA-11868). The bones were reburied in the Southern Ute Tribe, and the U.S. Forest Service has declared Hourglass Cave a sacred site, closed to the public.

The scientific value and the rarity of Paleo-American skeletons have been reported in a number of Mammoth Trumpet articles in recent years: “A Database of Humanity’s Past” 12:1; “Ancient Peoples Do Not Fit into Today’s Categories” 12:3; and “As Science in…” 11:3.

Michael Wendover doing field work near a glacier.

Wendover said, "People of the Southwest, descendants of an early migration, have a much higher rate of diabetes than do Navajos people, who are believed to have come to the Americas much more recently.

"Variation in NIDDM rates between different Amerind tribes indicates that the susceptible genotype was actually selected in North America and is not due to a founder effect in the Amerind populations." Founder effect refers to a genetic trait, possibly unusual, present in a population of people that all descended from a founding population with that particular trait.

Non-insulin-dependent diabetes was largely unknown as adult-onset diabetes, because it primarily has affected older people. It can be triggered by a victim's diet and weight, and stress. Unlike victims of insulin-dependent diabetes, victims of NIDDM are capable of producing insulin and may be able to control the disease by changes in diet and lifestyle.

Scientists have long known that non-insulin-dependent diaetes runs in families, and Wendover notes that many researchers view the disease as a result of a "thrifty gene," which helped earlier generations through lean times. The thrifty gene hypothesis proposes that a genotype—the genetic constitution of an individual—that allowed survival during famines through efficient storage of fat, leads to obesity—and diabetes—in times of plenty.

Because populations in which non-insulin-dependent diabetes is now common inhabit different environments, Wendover says that it appears highly unlikely that a thrifty gene was an adaptation to any particular environment. "The NIDDM
Wendell's own research has shown that a thrifty gene could have been selected for during the settlement of Australia, North America and Oceania. "In each of these colonization events, extinction and unfamiliar foods evidently caused unusually frequent food shortages that selected the 'thrifty gene' in founding populations," he explained. "During the colonization of Australia and North America, hunter-gatherer populations needed to find new food resources at a time that a significant part of the available fauna was becoming extinct. Similarly, the settlement of Oceania by farming populations, the native food resources on each island were reduced or became extinct while introduced crops were being established to support the population. From Australia and Oceania to North America, food resources that were critical became scarce before alternative foods were available, and this led to frequent food shortages in founding populations."

Wendell says food shortages in Europe, Asia and Africa evidently were not as frequent as in Australia, the Americas and the Pacific Islands; hence there was not as strong a selection for the thrifty gene among African, European or Asian populations. "If the 'thrifty' diabetic genotype was in fact selected long ago in several populations in different parts of the world, why has diabetes emerged only recently as a major health problem?" Wendell asks. He suggests some likely reasons: changes in diet from foods high in fiber to calorie-dense, high-fat foods; decreases in expended energy; and a deficiency or excess of some micronutrient in the diet. Scientists have made many studies of the effects of diet and

**Reading Pathology and Genetics**

Remains of ancient people offer new lines of evidence in the campaign against disease. Medical anthropologists have generally relied upon studying people of the present and making inferences about their ancestors, based on genetic features of the modern people and what is known of their ancestors' culture and environment. This approach can tell us something about people of the past who have descendants today, but it offers little information about people of the past who left no descendants. Study of pathology expressed in the bones, teeth, and other fossilized remains is a way around this problem, and it is being supplemented, slowly, with genetic studies. Many genetic models of disease still depend on some degree upon conjecture, because the data linking genes and disease are still being discovered.

A few success stories have been reported recently, as researchers are developing techniques to identify traces of diseases left in bones or in frozen human remains. Sometimes the genetic trace is the DNA left by the infectious agent or parasite. An example is the identification of DNA from the parasite that causes Chagas Disease in mammal tissue of people who lived in the Macarara Desert in Chile more than 4,000 years ago. This work by pathologists Martha L. Allison of the Medical College of Virginia, Arthur C. Autry-Finkle of the University of Minnesota at Duluth, and others, is reported in "Pathological Pathways" in the Aug. 30, 1997 Science News.

Other genetic traces that are being pursued are mutations in the skeletal remains of an individual that expresses the disease. Geneticist Douglas C. Wallace explains the potential for this line of evidence in an article, "Mitochondrial DNA and Aging and Disease" in the August, 1997 issue of Science. He notes that mitochondrial DNA (mtDNA) is passed from mother to child and that it is present in each cell. mtDNA has been found in multiple diseases, including Parkinson's Disease, Huntington's Disease, and diabetes.

Physical anthropologist Emile Safran, who specializes in genetics, has done long-term studies of genetic pathologies in peoples of Northern Canada. In her article "Non-Insulin Dependent Diabetes Mellitus Among Aboriginal North Americans," in the 1994 Annual Review of Anthropology (23:457-82), she reviewed some of the complexities of NIDDM that demonstrate why the etiology of the disease among Native American populations poses a significant challenge that requires looking at a number of populations in different climatic environments. Further, she notes, "The Aboriginal North American populations is immune from the ravages of this disease.""

Diabetes is one of the disorders often referred to as "Western diseases." Populations where life-styles have changed from active to sedentary at the same time that their daily caloric intake has increased have been dramatically affected in recent decades by NIDDM. While NIDDM poses a significant health risk to every ethnic group in the U.S. today, particularly high prevalence rates have been found in some Native American populations and some Pacific populations. Both biological and cultural factors appear to be involved in producing NIDDM, and the biological factors appear to include, but are not limited to, genes that make an individual susceptible to the disease under certain environmental conditions.
life-style on non-insulin-dependent diabetes, and Wendrow notes that it has been found that for diabetic Australian Aborigines, traditional diets and life-styes can improve the metabolism of carbohydrates and lipids. Also, he says studies among Pima peoples living in remote mountains of northwestern Mexico have shown that a traditional diet and life-style protects against diabetes.

Such research, Wendrow argues, offers great promise for uncovering the causes of non-insulin-dependent diabetes, though no effective prevention of the disease has been found. "The problem is that we know very little about the diet and life-style of Paleo-Americans and other founding populations over time. We need to know how early Paleo-Americans lived, what they ate, how diets and life-styles have changed over time, and how they have remained the same. It is possible that modern food-processing techniques are removing too much of the critical nutrient that was once part of the diet." As an example, Wendrow cites chromium picolinate, which has been found to significantly reduce the triglyceride levels in patients with NIDDM. High levels of triglycerides in the pancreas may coincide with the onset of non-insulin-dependent diabetes.

Further, he notes that grains, consumed in minimally processed forms, seem to reduce the incidence of diabetes. "What specific change in diet and life-style now triggers NIDDM?" he asks, referring to New World peoples that are suffering high rates of diabetes. "It could be a reduction in fiber, an increase in fats, a decrease in some micronutrient, or some complex interaction of life-style and a particular nutrient.

"Without more data on American Indian diets and life-styles that we have and how they can be altered to reflect what changed," he notes, "If Kennewick Man is truly more than 9,000 years old and if he belonged to a population that was ancestral to modern Native American peoples, Wendrow adds, "scientific analysis of this skeleton could provide data vital to diabetes research."

Wendrow says that a number of studies of Paleo-American skeletons are crucial. "The relationship to modern American Indians has been misunderstood through the use of metric measurements, dental characteristics and DNA analysis," he says, noting that the antiquity of an individual needs to be verified with radiocarbon dates, not simple radiocarbon dates, which could be in error. Because the material is so rare and precious, Paleo-American skeletons are radiocarbon dated with great prudence and care, because even with accelerator mass spectrometry, a bit of the bone is consumed with each test.

"Studies of stable isotopes and plant phytoliths from the skeleton could tell us what the individual was eating and in what proportions," he adds, noting that some skulls have been found to have been used to document how diets of Native American peoples have changed over time. "Perhaps we could identify one or two critical elements that were always present in the American Indian diet but were recently removed. These elements could then be tested in properly controlled intervention studies to reduce the prevalence of NIDDM in American Indians today."

Age at death and overall life-style of a Paleo-American also are of crucial interest. "How long did this person live?" Wendrow asks. "Is there any evidence of repeated dietary stress that might have selected for the 'thrifty gene' in his population?"

Further questions: how active was this person? How far did he or she range each year in search of food? Did he or she engage in any repetitive activities? Answers to these questions could have important implications for understanding the causes and beginnings of non-insulin-dependent diabetes in Native American populations.

"The Kennewick Man skeleton," says Wendrow, "could yield valuable information about diet and life-style that might be used to reduce the prevalence of NIDDM in American Indians. Much like vitamin C prevents scurvy and iodine prevents goiter, there may be a critical element missing from the diet that prevents NIDDM. He noted there might be other beneficial applications for data from the skeleton, citing autoimmune rheumatoid arthritis and autoimmune diabetes. American Indians have a high prevalence of autoimmune rheumatic arthritis, but virtually no autoimmune diabetes," and Wendrow suggests that skeletons of Paleo-Americans possibly could help explain why.

Even if Kennewick Man or another Paleo-American skeleton proves not to be ancestral to living Native Americans, Wendrow says the remains could be critical to diabetes research. "It would provide an opportunity to study the diets and life-styles of other early New World populations," he said, giving researchers a chance to compare the ancient person's diet and life-style with the adaptive patterns practiced by people who were the ancestors of living Native American peoples. "Were they the same or did they differ in important respects? Such comparative studies are often an important source of insights for solving research problems. In this particular situation, successful research results could improve the life expectancy and quality of life of millions of U.S. citizens," says Wendrow.
Sheriden Cave
continued from page 1

marshy pond, open woodland and a
grassy transitional zone.
Tankersley, a geoarchaeologist who
has much experience studying Paleo-
American sites and cave sites, was
started to learn that Sheriden’s fossil-
bearing Pleistocene deposits contained
artifacts. These include wood charcoal
and burned bone, chert debitage, a
flaked-stone side scraper, an end scraper,
a graver, and a bitace.
Perhaps more exciting, the cave de-
posits contained a carved, incised and
beveled bone point that Tankersley says
is comparable to similar objects recov-
ered from Nenana sites in Alaska and
from Clovis sites in Washington, Wyo-
ing, Arizona, New Mexico and Florida.
Although none of the artifacts was
found in situ, radiocarbon dates from
screened and floated material found in
association with the cultural material,
and documented in situ bones, range
from 12,611 ± 80 years B.P. (AA-21710 on
wood charcoal) to 12,973 ± 60 years B.P.
(CAMS-10349 on bone collagen from a
flat-headed projectile). Overall, Tankers-
ley said, investigators have dated radiocar-
bon dates on material associated with the
cave, including four dates ranging from
10,065 to 11,213 radiocarbon years ago

Principal Investigator Kenneth B. Tankersley, right, is pictured in the Sheriden Cave
passage with Barbara Barrish of the Cleveland Museum of Natural History. Electric
floodlights allow team members to see what they are doing.

on material from an early-Holocene
sediment layer, which caps the layer
where the archaeological materials
were found. Flooding that occurred at
the beginning of the Holocene aided
understanding of cave deposits.
“After artifacts were deposited, the
cave was flooded and sealed,” says
Tankersley. “Therefore we know it was
occupied prior to those dates.” He notes
that the tight sediment seal also left
bone material well preserved. Investiga-
tors have recovered sediment samples
stratigraphically linked to the artifacts,
and these samples contain hair that
Tankersley hopes will provide a DNA link
with bone material in the cave.
The unexpected discoveries began in
1990 when landowner Richard Hendrickx
sought to expand an existing cultural
site system. Initially the entrance of
Sheriden Cave had appeared as a sink-
hole, an extensive, shallow circular de-
pression about 12 yards away from the
commercial entrance to Indian Trail Caves.
In July 1990, Hendrickx hired a
crane to excavate unconsolidated depos-
its from the depression. The deposits
proved to be cave-ponded sediments—
yellowish silt—rather than glacial drift.
At about 10 meters below the surface, the
evacuation broke through a cave passage
on the sinkhole’s west side.
Excavators lowered a small bulldozer
into the hole to open the passage, which
was partially filled with sediments. The
bulldozer soon encountered layers of
dark, organically rich cave deposits.
Workers, who found concentrations of
charcoal and bone in cave walls and

On a wooden platform over the Pleis-
tocene deposits, Carol Landefeld of Kent
State University lies on her side under
the sloping cave ceiling to excavate.
backfill, reported their discovery to the Ohio Historical Society, which notified H. Gregory McDonald, then curator of vertebrate paleontology at the Cincinnati Museum of Natural History. McDonald conducted a paleontological investigation until 1992. Under Kenneth M. Ford's direction, the museum continued to dig there through 1995.

A volunteer found what appeared to be a side scraper in 1991, but Tankersley felt confident that the cave could not have harbored human occupation. "I argued that there was just no precedent for this type of site," Tankersley said. "But I was wrong. There are a number of Floridan sites that set a precedent."

In 1995, Ford, now a doctoral student in paleontology at Michigan State University, discovered the carved bone tool in material from about 30 feet below the surface. Tankersley visited the site and saw chert debitage from a source 140 kilometers away. He applied for and received a grant from the National Science Foundation for salvage archaeology on the site during the 1996 field season.

Existence of Paleo-American material in the deeply buried cave has prompted Tankersley to reevaluate his thinking on human use of caves and the depth at which they might be found.

Collection and analysis is a slow process—and tricky during spring and fall baseball-sized rocks rain down.

particularly in eastern states. Tankersley said that, like many of his colleagues, he previously saw no evidence that humans had used these sorts of caves. He had spent much of his professional life looking without success for human occupation in other similar caves.

"It finally hit me that people have been right when they were saying that the archaeology for early peopling of the Americas is deeply buried, particularly in the East." How many archaeologists would be willing to dig through 30 feet of sterile sediment to find such an occupation, he asks, and what funding source would back such a project?

"This has been a sobering reminder that the absence of evidence is not evidence of absence, and that we can’t assume that if we don’t have any surface manifestation of human occupa-

An intriguing carbon concentration. Were carbonized plant materials burned here, or did the carbon migrate in from the surface? Arrow indicates where bone point was discovered.
tion that it doesn’t exist,” Tankersley said. “We have to look at this deeply buried context and we have to begin some systematic work to find these ancient deposits, particularly in the East. This cave is telling me that there are a lot of things that we don’t know. This site has given us a new place to look for evidence of people of the New World that we had pretty much written off.”

Tankersley believes Sheridan Cave is not a one-of-a-kind site. It is highly possible that other such sites exist, and researchers should begin a concentrated effort to find them. Deep sites such as Sheridan Cave also harbor a wealth of well-preserved environmental information capable of showing the environmental problems to which early people had to adapt. A better understanding of that early environment also leads to a more complete understanding of the cultures operating within it, Tankersley suggests.

In a joint project with the Cleveland Museum of Natural History, Tankersley undertook a systematic examination of the cave the bulldozer had opened. Now, although the antiquity of the site is firmly established, investigators still have much to do to flesh out the Sheridan Cave story in coming field seasons.

Tankersley says the interdisciplinary research team intends to focus on establishing a temporal and environmental framework for the archaeological record, more closely distinguishing between natural and biological processes and those resulting from human behavior, and more clearly determining what human behaviors left artifacts behind at the site.

Tankersley also seeks a more complete analysis of bone and hair recovered from the site. “The genetic possibilities offered by this site are exciting,” he says. More geochemical analysis remains to be done on sediment samples to pick out, for example, the location for burning of carbonized plant materials—to determine if it was burned where it was found or migrated to that layer from the surface. He also plans to examine the suspected hearth in more detail to firmly establish its identity and significance.

As part of continued analysis, scientists will study the taphonomic process of material movement to determine how the buried artifacts and material may have moved around within the sediment. “We know for a fact that the 12,011 B.P. date goes with the cultural occupation,” Tankersley said. “But we want to know if it is possible some of the artifacts are trickling down to deeper levels with some of the older dates.”

Tankersley also wants to see more detailed analysis of the flora, fauna and artifactual material to see how it all fits together so that consistencies and inconsistencies can be identified. Specialists also will prepare a three-dimensional map illustrating how the cave filled in.

Continued collection and analysis will be a slow process. Work at the site is complicated by the fact that the cave, closed since the last ice age, is rapidly deteriorating now that it has been exposed. Tankersley says that it is unsafe to be in there during spring and fall, because baseball-sized rocks rain down from the cave walls and ceilings.

Until scientists collect and analyze
Tankersley's team did a considerable excavation in front of the cave to analyze surface deposits.

Logic information, scientists know that the time period of occupation was a dry, karst environment, with available water being underground and not at the surface. Maybe they went in the cave seeking water—as were other animals. Or perhaps the cave could have been an overnight stopping spot on a hunting or foraging expedition, or maybe it was used to escape bad weather. Could it be that all the artifacts washed in from the surface? Because the cave apparently was enticing to animals and served as natural traps or dens for them, humans may also have entered to scavenge or hunt animals trapped, denning, or dying there.

Tankersley says Sheridan Cave serves to remind him that archaeologists should remain open-minded. "George Frison [retired University of Wyoming archaeologist] told me many times that we still do not have all the answers, and he is right. We still don't have all the answers."

—George Wizer
A FAMILY of woolly mammoths was sighted this past summer in the Yukon Territory near milepost 915 just outside the town of Whitehorse. Excited Alaska Highway motorists have observed the stolid creatures standing patiently in front of the newly opened Yukon Beringia Interpretive Centre.

Made of fiberglass and resin, the three lifesize castings depict a mama, papa, and baby mammoth, and are based upon actual Ice Age mammoths recovered by paleontologists and archaeologists. In its first four months after installation, the outdoor family diorama drew in more than 45,000 people to see the new museum’s exhibits, says Rob Conrad, Coordinator of the Beringia Centre.

"The mammoths are a big hit," says Jeff Hunston, director of the Heritage Branch of Tourism Yukon. "That was a wise stroke of genius to stick them out on our lawn because kids are drawn to them."

The mammoths were created by Research Casting International, of Oakville, Ontario, one of the few companies in the world specializing in reproductions of prehistoric animals. Owner Peter May explains that 90 percent of the work of making a mammoth is a Yukon specimen, complete with a broken tusk. The baby is modeled on Dima, a celebrated Siberian discovery.

seeking someone who knew how to make molds and casts, enjoyed camping and field work, and was mechanically inclined. The ad was for a paleo-technician at the Royal Ontario Museum. May got the job.

Over the years, as he became more experienced, he began to receive commissions to do dinosaur mounts that he initially worked on in his garage. This gradually evolved into his present-day mammoth business that has taken him all over the world.

continued on page 19
Colorful magazine a flagship for archaeological conservancy

As a lobbyist for the Society of American Archaeology during the 1970s, Mark Michel gained a keen interest in protecting and preserving the rapidly vanishing cultural heritage of the Americas. He also realized there was no organization mobilized to support archaeology the way groups such as the Nature Conservancy, the Sierra Club, or the Audubon Society support the environment—often by acquiring important or threatened natural areas.

Concerned about that void, Michel launched the Archaeological Conservancy in 1986. As 1997 draws to a close, he also stands at the helm of *American Archaeology*, the quarterly interest magazine of archaeology in the Americas. It serves as a flagship for conservancy programs and accomplishments, which have been considerable.

Backed by membership dues and corporate and private donations of land and money, the Albuquerque-based organization has so far identified and acquired approximately 150 archaeological sites as research preserves. The sites range from Colorado’s Lamb Springs Pleistocene bone bed near Denver to the 18th-century settlement of Old Mobile, the first capital of French Louisiana. Michel explained in a telephone interview. The Conservancy raised about $2,000,000 to acquire the Lamb Springs site; the DuPont company donated 31 acres for the Old Mobile site.

Both sites have been featured in the fledgling magazine *American Archaeology*, which Editor Bob Cristell says is devoted to the ambitious task of “showing the scope and breadth of American archaeology from Central America south to Canada” while illustrating Conservancy efforts to save America’s cultural heritage.

Modeling after *National Geographic*, the magazine seeks a balance between a writing style understandable by the layman and content designed to inform and educate readers with a minimum knowledge of, but substantial interest in, archaeological subjects. Readers of initial issues, for example, got spirtually yet informative stories on topics ranging from excavations at Old Mobile (Spring, 1997) through the continuing search for the First Americans, a history of maize farming in the Americas (Summer, 1997) to an introduction to Maya archaeology through exploration of the rise and fall of Xunantunich (Shoo-NAV-too-NEECH), an ancient Maya city in Belize (Fall, 1997).

Michel concedes the magazine is an expensive venture, costing about $25,000 an issue to publish. But private donors have guaranteed payment of publishing costs for five years, he added, at which time the magazine is expected to be a break-even proposition.

Less than one year old, the 32-page magazine, an outgrowth of a smaller and less published Conservancy newsletter, has exceeded expectations. Cristell said in a telephone interview. Beginning with an initial circulation of 12,000 to Conservancy members, the circulation after only three issues has increased by 70 percent to 22,000, according to Michel.

“I’m thrilled beyond my hopes,” he said of the magazine’s progress. With a sale price of $2.95, the magazine is now being tested marketed to the general public in a variety of bookstores and museums.

“We hope that it will soon be easily accessible and that people can pick up a copy anywhere across the United States,” said Cristell, who expects the magazine soon will jump to 40 pages, and be published six times a year. Although excited with his start-up effort as editor, Cristell is coming up within the organization to become senior editor and one of five regional directors for the Conservancy.

The new position makes him responsible for saving sites in the Conservancy’s Eastern region, which stretches northward from North Carolina. James Burroughs, formerly editor of an Atlanta-based magazine, is assuming Cristell’s duties as American Archaeology editor. Although the magazine operates with largely a one-person editorial staff, the Conservancy’s nine paid editors, including Michel, write and help produce it.

Michel says the system has its good and bad points.

“The only nice is that we are not primarily a magazine publisher and we are not pretending to be,” said Michel. “We are an organization that helps to publish a magazine. The bad part is that we only do it four times a year.” But that limitation is offset by the magazine’s fiscal subsidy for the first five years—atmospheric the financial instability faced by most magazine startup ventures relying on advertising revenue.

A part of the Archaeological Conservancy for more than one year, Cristell, a Yale graduate in religion and philosophy and former science editor continued on page 18.
Communication

Clovis Clarification: A Follow-up

by A. C. Roosevelt

The July 1996 issue of Mammoth Trumpet paraphrased our April 1996 article in Science, that ‘‘most dates for Clovis sites, by contrast to the dates on palm fruit pits from the earliest culture in the cave at Monte Alegre, Brazil, Roosevelt et al. 1996), have come from tests of combined wood charcoal samples.’’ In the October issue of the Trumpet, a correspondent wrote to suggest that most North American Clovis sites were dated using tooth or bone, not charcoal, and asked which Clovis sites were dated by charcoal. Clovis sites that he thought had been dated by tooth or bone were Clovis (Blackwater Draw Locality 1), Rawlins, Dorn, and Woffles.

However, the majority of dated samples from component of the High Plains Clovis culture were indeed charcoal, not bone or tooth, as the accompanying table of Clovis dates shows (sidebar). Of the 35 Clovis samples dated, 21

A. C. Roosevelt, Field Museum of Natural History, Chicago, and University of Illinois, Chicago; coauthors are Matthew O’Donnell, Field Museum; Ellen Quinn and Judy Kemp, University of Illinois; Christiane Lopes Machado, Field Museum; Maura Imazio da Silva, Universidade de Sao Paulo; and Marcondes Lira de Costa, Universidade Federal do Para Belem.

Famous Clovis Sites Neglected?

Three decades after initial discoveries at Arizona’s best-known Clovis sites, tight federal budgets have caused the sites to fall into neglect. Scientists, including the University of Arizona’s Paul Martin, have criticized the U.S. Bureau of Land Management for allowing the Lehner and Murray Springs sites to be eroded by wind and water. The former, on the ranch of Ed Lehner, yielded the first Clovis radiocarbon dates. Murray Springs is perhaps even better known for having yielded an unfossilized Clovis hunting camp in stratigraphic context that was described in detail by its principal investigator, C. Vance Haynes, University of Arizona geoarchaeologist.

Both Lehner and Murray Springs sites have been incorporated into the San Pedro Riparian National Conservation Area.

Visitors to the Murray Springs site east of Sierra Vista, Ariz., see the eroding banks of a dry wash. Scientists have urged federal land managers to divert water from desert cloud bursts away from the site. Excavations here from 1966 to 1991 revealed three major areas of Clovis activity including a mammoth kill and an associated campsite.

More information about the late Pleistocene. Dr. Martin described the situation to a Tucson reporter who wrote about the controversy for the journal Science. “These sites are some of the most sacred in the New World, but they’re being left to the wind. They’re washing away in the rain.” It’s a matter of origins, mammoth kills, and “critical knowledge about early America,” Martin is quoted in the Aug. 31 Science article, “BLM Accused of Neglecting Clovis Sites.”

Visitors to the Murray Springs site can find a path and two wooden bridges over Curry Draw, a dry wash. And the BLM intends to install an interpretive kiosk and signage.
were charcoal, only 8 were bone or tusk. Lehner and Murray Springs are the best-known Clovis sites dated by charcoal. Lehner's 12 charcoal dates average 10,930 B.P. (uncalibrated weighted mean), and the 8 from Murray Springs average 10,900. The dates from these sites are on samples pooled from scattered charcoal flecks because no single pieces were large enough to date by conventional means. Samples from pooled small charcoal flecks have dating problems for several reasons. Small charcoal samples have much larger standard errors and are more vulnerable to contamination than large samples, which can be cleaned more rigorously and counted longer (Taylor 1987; Bowman 1990), because pooled flecks come from a wider area than discrete samples, they may include both pre- and post-

occupation materials. Also, wood charcoal is known to have inherent age that predates its use by humans (Bowman, 1990:15, 51). A tree is used for firewood many years after it begins to grow, and the interior parts of logs, with the oldest rings, tend to carbonize more readily than the younger, outer parts, which tend to ash. Only the outer sapwood gives accurate dates for the time of cutting, and it is rarely preserved. Jack Hofman of the University of Kansas has shown that charcoal from late-prehistoric plains sites can be around 300 year older than associated dates on well-

preserved bone (Holm 1993). Dry temperate areas tend to have longer-lived trees than moist, humid areas, where trees may survive only up to 50 years (Moore et al. 1988). Realistically, then, the dates on charcoal from Clovis sites will overestimate the sites' ages to some degree, but Clovis charcoal dates usually are quoted without any adjustment for inherent age. Short-lived parts of food plants, such as fruit, nuts, or tubers, will, in contrast, date close to the time they were eaten, unfortunately, are usually not recovered from high Plains Clovis sites. In theory, bones of animals used for food by Clovis people should be good sources for dating, but in practice, Clovis bone dating has been difficult because of poor preservation of the organic fractions. The mineral, or hydroxyapatite, portion can take up geological carbonate from the ground, and degraded organic fractions can combine with extraneous organic material, too (Taylor 1987; Bowman 1990). Dates on bone mineral and undiffer-

entiated bone organic material have been very variable and have very large errors, a major disappointment to Clovis archaeologists (Stewert 1992). Individual amino acids in well-preserved bone are thought to provide contamination-

free carbon, but they yield small cleaned carbon samples, and thus, large errors even when AMS-dated.

As a result, in contrast to the many dated charcoal samples, only eight bone or tusk samples from High Plains Clovis components have yielded Clovis-age dates. Three of these, from Dornoe, Colby, and Lang-Ferguson, Anzick, and Union Pacific Mammoth, gave widely varying dates on the differ-

dent bone components (Table A). Anzick's amino acid dates average 10,680 ± 50, and Dent's average 10,750 ± 40. Lange-

Ferguson's one bone date is 10,750 ± 330, compared with its charcoal date of 11,140 ± 140. Colby's mammoth-bone samples gave three dates—11,200 ± 220, 10,864 ± 141, and 8,719 ± 392—so that they cannot be weight-

averaged (averaged so that the dates with smaller errors are given more weight than those with larger errors). A single date of 11,280 ± 350 on tusk came from the UP mammoth, whose cultural origin is questioned.

Only two mammoth-bone samples from Dornoe were dated. All had large standard errors from 620 to 600, due to small sample size. Both samples were saturated with wate

Table A | Radiocarbon Dates from High Plains

<table>
<thead>
<tr>
<th>Component</th>
<th>Date (1σ)</th>
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<tbody>
<tr>
<td>Anzick Site</td>
<td>10,680 ± 50</td>
</tr>
<tr>
<td>Dental Site</td>
<td>10,750 ± 40</td>
</tr>
<tr>
<td>Lange-Ferguson</td>
<td>10,750 ± 330</td>
</tr>
<tr>
<td>Colby Site</td>
<td>11,200 ± 220</td>
</tr>
<tr>
<td>10,864 ± 141</td>
<td></td>
</tr>
<tr>
<td>8,719 ± 392</td>
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Weighted average: 11,300 ± 240
draining geological carbon sources, such as petroleum, but the small sample size precluded rigorous cleaning. The five Dometo dates ran on the bone samples averaged 11,210 ± 390 (on two unpolished extracts of bone) and 11,040 ± 220 (on three purified amino acid extracts). Two Clovis-range dates with large errors came from an 83cm stump in the vicinity of the archaeological site, but the tree was not associated with the archaeological deposit (Leonardy 1966:11-26; Taylor et al. 1996:517, note 1 of Table 1). (See Figure A.) The many trees preserved in the Dometo geological formation had a wide range of dates; that one happened to date close to Clovis is not actually evidence for the age of Clovis.

No bone or tusk samples from the Clovis site gave Clovis-age dates (Blackwater Draw Locality 1). The only bone date from the Clovis component was 6,370 ± 160 (A-536), on a mammoth rib. Nearly 5,000 years younger than the expected Clovis range, it was rejected (Haynes et al. 1967).

The site's only Clovis-age dates are three on naturally carbonized water plants from the pond strata into which the Clovis artifacts intruded (Table 1; Damon et al. 1966:100-101; Haynes and Agogino 1966; Hester et al. 1972:176, 225, Fig. 130). The plant samples were small, so the errors are large: 360 to 500 years. Since the pond plants were not culturally utilized carbon, they do not actually date human activities, especially as Clovis, whose numerous arsian springs mixed materials vertically. Possibly because of this:

3 The bones from Dometo were saturated with water draining a petroleum oil field and from an aquifer in earlier geological strata (Leonardy 1966:3-9).

Only A.481 of the Clovis dates was from a feature that contained Clovis artifacts, and their intrusion was disturbed strata at an arsian spring conduit (Haynes and Agogino 1966).

mixture, the dates, vertically separated from each other by several feet, were in reverse order, with the oldest being the one highest up in the stratigraphy (Figure B). Water plants in the Southern High Plains today incorporate older, geological carbon into their tissues (Damon et al. 1964: 93-98; see also Rowan 1990:26), so dates on waffle plants tend to overestimate the plant's age. According to the reports on the Clovis site, peehuman fossil bone and calcite as old as 15,000 radiocarbon years B.P. were mixed with Clovis cultural materials. Thus, peehuman carbon was abundantly available for uptake by the pond plants at the time.

In any case, the radiocarbon samples from Clovis had no relation to the human activities at the site but were merely plants that had grown in the pond into which the Clovis tools dropped. Not surprisingly, their dates average about 500 years earlier than the earliest dates on cultural materials from Clovis sites.

The Rawlins and Soilie sites, cited in the Mammoth, Trumpet as Clovis sites dated by bone or tusk, are not actually considered Clovis occupation sites. Rawlins, for example, had an adult male mammoth skeleton without cultural remains: "The Rawlins Mammoth (Mccrrow 1981) in southern Wyoming... [is] of the right age but there is a question of human association" (Tristan 1991:139).

The Clovis cultural component at the Agate Basin locality, the Sheman site in Wyoming, lacks Clovis-age radiocarbon dates entirely. The only date from that component was a bone that yielded a post-fossil age estimate of 10,030 ± 280 (RL-1263). Because charcoal dates associated with bone are often several hundred years earlier than the bone, it has been said that Clovis bone dates are usually "too young" (Haynes 1986:1123).

"Brown clay inlier"
1992). However, subtracting a hundred or so years for charcoal's inherent age typically brings the charcoal dates in line with the amino acid bone dates.

Even before adjustment for inherent age, the majority of the 48 Clovis- radiocarbon dates fall later than 11,000. Only eight were 11,200 or earlier, and only three were earlier than 11,200. Significantly, all Clovis dates 11,000 and earlier were on the doubtful materials: carbon with inherent age, non-cultural carbon, and/or small carbon samples with large errors of 450 to 600 years. Of the nine ages that have documented proveniences for dated samples, only three—Donehoo, Clovis, and Lehner—have samples dated 11,000 B.P. or earlier, and these earlier dates all have very large errors and/or probable old-carbon effects. Thus, at present it is difficult to make a strong case for dating the culture much before 11,000 years ago.

Since High Plains Clovis components have so many dates, in the same range as Folsom components, a similar procedure has been to drop the later Clovis dates and the earlier Folsom dates to eliminate the overlap. However, it's been long pointed out by radiocarbon specialists that individual radiocarbon analyses are extremely uncertain, points not in time, so overlap is expected of the dates of successive cultural occupations (Bowman 1990). Also, plateaus in carbon isotope curves are possible cause for the extensive overlap of the dates of the Great Plains Paleoindian cultures. Along with the problems of small samples and large standard errors, these phenomena prevent statistical separation of the age of Clovis and Folsom (Taylor 1992). Although the transition from Clovis to Folsom might have occurred within a period of 100 years or less, the most recent definitive conclusion is: "In our view, the existing corpus of Clovis and Folsom radiocarbon age-estimates does not have the precision required to test this assertion" (Taylor et al. 1996:524).

The problems of precisely dating Clovis are relevant to cross-regional relationships of Paleoindian cultures (Roose et al. 1997; Roosevelt and Coplin 1996). Comparing dates with other regions are usually made on the basis of the defined Clovis range of 11,200-10,000 (Haynes 1992) or even on a Clovis age as early as 11,500 (Haynes 1987; Gibbons 1956). However, these ranges are based on questionable dates run early in the history of radiocarbon dating. The fact that no Clovis date series with documented cultural proveniences averages earlier than 11,000 usually is not taken into consideration in comparisons with other regions. Using a defined age range of Clovis for Clovis rather than the means of actual Clovis dates exaggerates the age of Clovis in comparison to more recently discovered cultures that have large suites of dates with small standard errors, run on large samples of short-lived materials from localised cultural features. The geographical directions of cultural diffusion or migration thus become confused. As Vance Haynes has written, "Large standard deviations, inherent ages in wood charcoal dates, and a notoriously poor record for bone dating at most (North American) sites make attempts to construct isochrons of geographic movements (time-space relationships) for a particular cultural complex highly questionable" (1992:94).

The dating problems of the Clovis High Plains culture have inspired truly innovative research in the past and presumably will inspire more in the future. E. E. Taylor and colleagues at UC-Riverside and Thomas Stafford and his team are working on improving the accuracy of dates on small samples and standarisation of collection and recording of samples is improving. Also, for now, the actual age of Clovis needs to be taken into account in comparative research on the peopling of the Americas.

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COMING CONFERENCES

e-mail: meetings@saa.org.

March 26–28 Annual Meeting, Southern Anthropological Society, Wilmington, NC.
Contact: Jim Sabela, University of North Carolina-Wilmington.
e-mail: sbabela@uncw.edu.

March 31–April 1 Annual Meeting, Human Biology Association, Hilton Hotel, Salt Lake City.
Contact: Michael Crawford, Department of Anthropology, University of Kansas, Lawrence KS 66045-2110.
e-mail: crawford@kuhshb.ukans.edu

April 1–4 Annual Meeting, American Association of Physical Anthropologists, Hilton Hotel, Salt Lake City.
Contact: Clark Spencer Laien, Research Laboratories of Archeology, 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-Fairfield, MT.
Contact: Thomas A. Forb, Dept. of Anthropology, University of Montana, Missoula MT 59812.

Contact: Ron Sirotnick, 250-715-1566.

Aug. 23–29 Eighth International Congress of the International Council for Archaeology (ICAZ '98), University of Victoria, Victoria, British Columbia.
Contact: Conference Management, Division of Continuing Studies, PO Box 3030, Victoria, BC, V8W 3N6.
e-mail: minutes@uvic.ca http://www.uvic.ca/cference/admin.htm

Contact: Knut Hovhagen, Tromsø Museum, Tromsø 9037 Tromsø Norway. e-mail: knoth@imu.uio.no

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

So far readers have reacted positively to the magazine, says Crissel. “We expected to get some pretty negative reactions from archaeologists, but we really didn’t get any. Archaeologists always talk about the need to educate the public on archaeology, something to get them interested in saving sites and finding and helping research. That’s what we are doing.” Conservancy members also are pleased with the fact that the magazine represents the organization’s interests and efforts, he added.

Those efforts, he said, are largely aimed at recruiting supporters of archaeological resource preservation, which he sees as a vital enterprise. “Archaeology is often the only clue to the people who came before us,” Michel said. “Unless we preserve these real sensitive sites they will be lost forever under malls or lost completely so all the clues they can give us about past cultures will be lost.”

He suggests that we in the 21st century are not necessarily that unique. Perhaps we can better understand the similarities with past civilizations, we save, and study, the remaining evidence of their passing.

“We have much in common, more than we want to believe, with people who may have lived 10,000 years ago and it is important for us to save all the sites that can give us more and more of that hidden knowledge,” says Crissel. “Many people just don’t realize that taking away a single artifact, an arrowhead for example, can be detrimental. It’s like taking away a part from a puzzle.”

That’s why educating the public to the rich cultural diversity of the Americas—and drumming up support to save it—will remain the central goal for American Archaeology, Crissel and Michel emphasized.

George Winters
Mammuths

continued from page 12

How to Make a Mammoth

As May explained to the Mammoth Trumpet, the casting process begins with the mold. Research Casting has entered into agreements with a number of North American museums that allow the company to use molds that the paleontologists' departments of these museums have made from fossil material.

In the case of the Beringia Center mammoths, the molds came from the Canadian Museum of Nature in Ottawa, which exhibits a similar grouping of cast mammoths on the grounds of the museum. The Beringia Center mammoths are reproductions of those already at the Canadian Museum of Nature.

The cast for each mammoth is made by spraying layers of a mixture of ultraviolet-resistant polyester resin mixed with a catalyst and chopped fiberglass into each mold. The resin has a built-in expansion and contraction factor that enables it to cope with temperatures from 48 to 200 degrees F. May says it's the same kind of technology used to build yachts and sailboats.

Separate castings are made of the tusks and attached to the main body. Two 3/4-inch layers of the resin-fiberglass mixture usually provide sufficient thickness. The hollow castings are supported by an inner steel-pipe superstructure that extends down the legs.

Steel base plates are anchored into the ground, and then concrete pads are poured around them. "The steel pipes coming out of the legs are then welded to the steel base plates. Upon completion, none of the steel is visible because the pipes and a lawn provide a landscaped grass setting." The larger mammoths weigh 800 to 1,000 pounds each, says May.

The castings were made at the Research Casting facility in Ontario and trucked to the Yukon. When the male mammoth was found to be too big to fit in the truck, the front legs were cut off and hauled separately. The legs were reassembled at the site by technicians wearing hoods and air-supplied respirators, who crawled inside the belly of the mammoth. Once the seams were complete, they had to exit down through the legs. May says this was the hardest and most dangerous part of the job.

The Installation

Panoramic found the installation process at the Beringia Centre quite interesting, said Conrad. He noted that some Yukon residents have their own business on mammoth ivory that they have recovered for themselves. Several folk pragmatically passed to Peter May that they had mammoth tusks bigger than the ones on the mammoth replicas.

 Appearing ready to trample parked tourist vehicles, this bull mammoth could not find much steppe vegetation for grazing around Whitehorse.

Research Casting, a 10-year-old company, has done commissions for the British Museum of Natural History in London, the National Museum in Tokyo, Universal Studios and Walt Disney Imagineering in California and many other museums worldwide.

May speaks with pride of the display they did for the American Museum of Natural History in New York. A rearing, five-story tall Barosaurus is defending its youngster from an attacking Allosaurus. He says the display represents the tallest free-standing dinosaur mount in the world. In regards to cost, $1,000 per foot is a good ballpark figure, says May.

Asked if he thought of his work as art, May says that when he was in art school he was told that art is 95 percent technical and only 5 percent art, meaning that you couldn't create anything unless you knew how to do it (had the technical expertise). The models that they make involve a great deal of technical expertise. As for the art, he thinks that there is too, in the animals they build.

May says his favorite part of the whole process is the installation. That's where the public gets to see what they've done. He said the installation often draws a crowd of hundreds, and when they're all done the crowd applauds. He likes to think of how these technical models become something very special in the eyes of the children who see them in a museum after they leave his shop.

Each member of the Beringia Interpretive Centre woolly mammoth family is based upon a specific historic specimen. The large male was modeled on the Hebor Mammoth from a site near Kenai, Alaska. (Mammoth Trumpet 10.2: "Ice-Age Wisconsin People Left Unique Cultural Record"). It is known to date to about 12,500 radiocarbon years ago, and is considered the largest specimen ever recovered, measuring four meters at the shoulder. It was found in association with three stone tools attributed to Chel¬ row-complex people. Visitors have the 5 1/2-foot-long tail and a full body cast of this animal standing in front of the museum and a skeletal version of the same animal is inside the museum building. (Other replicas of the Hebor Mammoth have been on display at museums in the United States.)

The female mammoth, which has a realistic broken tusk, is based on the Whitehorse Mammoth from the Old Crow Valley. The fossil bones are dated at about 30,000 years old.

The baby woolly mammoth was found preserved in the permafrost on a tribu¬ tary of the Kolyma River in northeastern Siberia in 1977. Given the name Dima, the baby animal weighed about 100 kilograms and had chestnut-colored hair. Dima died about 40,000 years ago. Its internal organs are very similar in those of living elephants, but its ears are only one-tenth the size of those of an African elephant of similar age (7 to 8 months), according to Dr. C. R. Burlington, Curator of Quaternary Paleobiology at the Canadian Museum of Nature. (Mammoth Trumpet 13.3: "Mammoth Trumpet 10.2: "Ice-Age Wisconsin People Left Unique Cultural Record"").

Carol Ann Lysek
New Books


Here is a comprehensive guide to one method of non-invasive archaeological exploration. The book is tailored to archaeologists who are wary of using high-tech instruments. The authors describe the system and the methods of using it. Ground-penetrating radar, they explain, "involves the transmission of high-frequency electromagnetic radio (radar) pulses into the earth and measuring the time elapsed between transmission, reflection off a buried discontinuity, and reception back at a surface radar antenna." Reflections occur where there are changes in electrical properties in the soil, variations in water content, lithologic changes, changes in bulk density, at interfaces between archaeological features and surrounding sediment, and void spaces.

The book explains practical technicalities such as differences between systems with low-frequency antennas, which can penetrate deeply, and high-frequency antennas, which have much higher resolution. It covers practicalities including data collection, data processing, synthetic modeling, time-depth analyses, and mapping buried surfaces.


Subtitled "Analyzing Power and Prestige," this book presents a synthesis of a great deal of archaeological work on gender. Anyone who thinks gender in archaeology simply refers to both sexes being involved in field work is only a couple of decades behind the times. "In this book," Nelson begins, "I argue that a gendered archaeology is an improved archaeology, one that helps expose the ways in which an emphasis on power and prestige has obscured gender in the past and one that makes possible a less distorted view. I also suggest that gendered power imbalances in the present among living archaeologists still contribute to obscuring parts of the archaeological record."

After exploring "power and prestige" issues, Nelson goes on to examine the interpretation of gender in the past, studies of human origins, and the analyses of division of labor, families, and communities. "Gendered archaeology," the author concludes, "is a more nuanced one, asking new questions, finding new data, and partitioning the old data in new ways."


This book describes 163 sites where the soils and rocks of Tennessee yield the bones of ancient animals—at least 345 species of them ranging in age from 380 million to 10,000 years ago. It reflects a continuing effort, which began in the 1820s, to assess vertebrate populations that at one time or another were tied to the topography of Tennessee. It is a concise history of vertebrate paleontology of Tennessee, discusses ancient geography and illustrates distribution of fossils through time and topography. The book is available through the Division of Geology, 401 Church Street 13th Floor, Nashville TN 37243-0445. Checks should be made to the Tennessee Dept. of Enviro- nment and Conservation.


Novelist Sue Harrison (Mammoth Trumpet 102 "The Novel Approach") puts readers into the hearts and souls of early Holocene people on the coast of Alaska. She vividly illustrates gender issues in a Paleo-American setting because she creates complex family lives with strict customs, pride, jealous- ousy, revenge and many other emotions within her characters. This novel follows her first series of stories "Ivy Courer Trilogy," consisting of Mother Earth Father Sky, My Sister the Moon, and Brother Wind. All are set on Aleutian Islands or nearby coastal Alaska and make use of much archaeo- logical and ethnographic data. Though life more than 6,000 years ago was harsh and often brutal, Harrison believes ancient humans were as multi-faceted and thoughtful as we are today.

Many authors, including Jean Auel and Elizabeth Marshall Thomas, have built on archaeological and anthropological data to produce novels set in the distant past, and none brings artifacts to life any more vividly than Sue Harrison. It's impos- sible for a reader not to empathize with her protagonists, or not to appreciate how human genes may have flowed at the fringes of the New World. —DAH