



MAMMOTH TRUMPET

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Center for the Study of the First Americans
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Tusks Tell Tales of Ice Age Life and Environment



DANIEL C. FISHER/UM MUSEUM OF PALEONTOLOGY

Cara and Noah Fisher are well aware that tusks of mastodons and mammoths contain fascinating stories about life at the end of the Ice Age. Their father, Daniel C. Fisher of the University of Michigan Museum of Paleontology and Department of Geological Sciences, has been deciphering those stories for many years. When this picture was taken at the Buesching mastodon site near Fort Wayne, Ind., two years ago, Cara was 11 and Noah 7. What do America's elephants have to say about the initial peopling of the Americas? Our report begins on **page 4**.

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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JALISCO PROJECT SEARCHES FOR MEXICO'S FIRST HUMANS

Editor's Note: Desert playas in west-central Mexico have been yielding fragmentary remains of Ice Age animals and humans that appear very old. From the Chapala, Zacoalco, and Sayula playas of Jalisco state, mineralized bones have been making their way into museum collections for well over a century, and some of this evidence suggested a very early human presence in Mexico's interior plateau region. The Jalisco Early Man Project has been investigating this intriguing evidence for seven years. Generally project scientists have found the bones too mineralized to permit radiocarbon dating.

The late John E. Lodbell of the University of New Mexico gave a preliminary report on the work during the Society for American Archaeology meetings in 1998, including evidence of human modification on several animal

bones petrified with silica. Dr. Lodbell also reported that the tooth of a swamp deer yielded enough protein for dating, providing a radiocarbon date of 18,200 years. The project team hoped to similarly date a human tooth, but they have had no success. Joel Irish of the University of Alaska-Fairbanks reported to an American Association of Physical Anthropologists session in 1998 that human bones from the region represented three or more individuals. One of these had an extremely rugged cranium with massive supraorbital ridges and other attributes Dr. Irish and his colleagues said are unusual in the Americas.

In the following article, leaders of the project describe the latest phase of the investigation and plans for continuing research.

by Stanley D. Davis, Dept. of Anthropology, Texas A&M University, and Joel D. Irish, Dept. of Anthropology, University of Alaska-Fairbanks

QUESTIONS OF WHO were the First Americans, when they arrived, and where they lived have been a source of debate since scientists first observed flint tools in the Western Hemisphere. As one of those who contemplate the origins of the First Americans, the first author with several colleagues has

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Spirit Cave Man 'Unaffiliated Native American'

Federal Agency Makes Preliminary Ruling Under NAGPRA

The U.S. Bureau of Land Management (BLM) has made a preliminary determination that ancient human remains from Spirit Cave are Native American but cannot be culturally affiliated with the Fallon Paiute-Shoshone Tribe or with any other contemporary group. The remains, including Spirit Cave Man, a remarkably well preserved mummy discovered in 1940 and later determined to be more than 9,000 years old, will remain in federal ownership. ("Remarkable Discovery" **Mammoth Trumpet** 12:2)

"After more than four years of consultation with the tribe, analyzing the information and reviewing policy, I feel it's time to make this determination," said Bob Abbey, Nevada State Director for the BLM, in a mid-August news release. "Although this determination is disappointing to the tribes, I am committed to a continuing dialogue with them on this and any other issue that comes up as we continue to determine the affiliation of human remains from BLM-managed lands."

The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) requires federal agencies to inventory Native American human remains removed from public lands and housed in museums to determine if they are culturally affiliated with a contemporary Indian tribe.

Cultural affiliation means there is a relationship of shared group identity which can reasonably be traced historically or prehistorically between members of a present-day Indian tribe and an identifiable earlier group. Cultural affiliation is established when the preponderance of the evidence indicates a relationship. The kinds of evidence reviewed can be geographical, biological, archaeological, linguistic, or based on folklore, oral tradition, historical, other information and expert opinion.

Spirit Cave Man has been housed at

the Nevada State Museum for nearly 60 years. The mummy is of particular interest to scientists studying the initial colonization of the Americas, because radiometric dating on artifacts found with the mummy indicates he lived more than 9,000 years ago. A request by the Museum to conduct DNA analysis and radiocarbon dating on Spirit Cave Man and other sets of human remains from the Lahontan Basin was withdrawn earlier this year.

"The Secretary of the Interior is considering recommendations from the



The Spirit Cave mummy as it may have appeared when discovered.

DENISE SINS/NEVADA STATE MUSEUM

NAGPRA Review Committee on the disposition of remains like those from Spirit Cave that cannot be affiliated," said Abbey. "I am keenly aware of the cultural sensitivity of the materials from Spirit



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Cave and I have no intention of approving any research that involves invasive testing of the human remains until the Secretary acts."

An inventory of human remains in the BLM-managed collections at the Museum lists 145 sets of remains, representing at least 154 individuals. Three of these sets have been affiliated and two have been repatriated. An additional 35

sets may be reasonably affiliated and the BLM is in consultation with appropriate tribes on these remains. The BLM is working on determinations of affiliation for the other 107 sets. In addition, seven sets of remains, discovered on BLM-managed lands after 1990, have been repatriated.

The BLM said it would accept statements and evidence disputing the pre-

liminary determination until Oct. 2. The agency said it would evaluate additional evidence using the same process and criteria used in making the preliminary determination and could affirm the original determination or make a new determination.

The report and an executive summary on the evidence presented are available on the Internet at www.nv.blm.gov 

Brazilian Remains May Be Oldest Yet

Tooth from Cave Near Pedra Furada Yields ¹⁴C Date

A human tooth from one of the many archaeological sites in Brazil's Serra da Capivara National Park may be the oldest human remains yet recovered in the Americas. The tooth is more than 12,000 radiocarbon years old, according to the results of an AMS (accelerator mass spectrometer) assay recently announced by a team that includes Niède Guidon, longtime principal investigator of the area's archaeological sites, including the nearby Toca do Boqueirão Pedra Furada. Dr. Guidon is archaeologist at the Museum of American Peoples (or FUMDHAM, Fundação Museu do Homem Americano). FUMDHAM integrates research at several Brazilian and French universities with support from Brazil and the Brazilian state of Piauí.

Two teeth from a cave site known as Toca do Gordo do Garrincho were studied in Paris by Evelyne Peyre, from the Musée de l'Homme, and one was subsequently dated by Beta Analytic. The lab reported a conventional radiocarbon age of 12,170 ± 40 years, and calibrated the results with a 95-percent probability that the sample is between 15,245 and 14,690 calendar years old (Beta 136204). Such a date is likely to renew interest in the antiquity of the scores of archaeological sites in the area.

Guidon and colleagues, including Fábio Parenti, who completed a four-volume doctoral dissertation on the Pedra Furada site in 1993, have reported that


human occupation of the area dates to nearly 60,000 years ago, but North American archaeologists have been reluctant to accept the oldest dates as unequivocal evidence that people lived there that long ago. Guidon and her FUMDHAM team compiled a lengthy series of radiocarbon



dates from deposits at Pedra Furada, which they excavated from 1978 to 1988.

The recently dated tooth came from Toca do Gordo do Garrincho, a site that was initially excavated between 1990 and 1992. Work resumed there last March. The cave has yielded considerable faunal material, but human remains recovered there consist only of a fragment of cranium and two teeth, which Peyre and others described in a 1998 publication (see Suggested Readings). An article on the dating is being published in the jour-

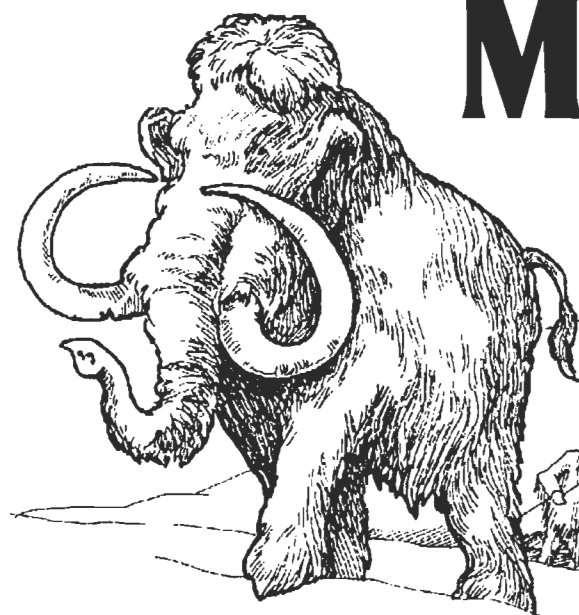
nal *Clio* by Guidon, Evelyne Peyre, Claude Guérin, and Yves Coppens.

Toca do Gordo do Garrincho and Pedra Furada are among more than 500 archaeological sites, most of which are known for their rock art, that have been found in the national park and a preservation area that extends in a 10-kilometer circle around the park. UNESCO, the United Nations Educational Scientific and Cultural Organization, has designated the area an international cultural preserve. 

SUGGESTED READINGS

ON Pedra Furada

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Mastodons and Mammoths

Yielding Clues to Early Americans

IF YOU THINK the only real evidence of the earliest Americans is the tools they left behind, Daniel C. Fisher would like to talk with you about mastodons and mammoths.

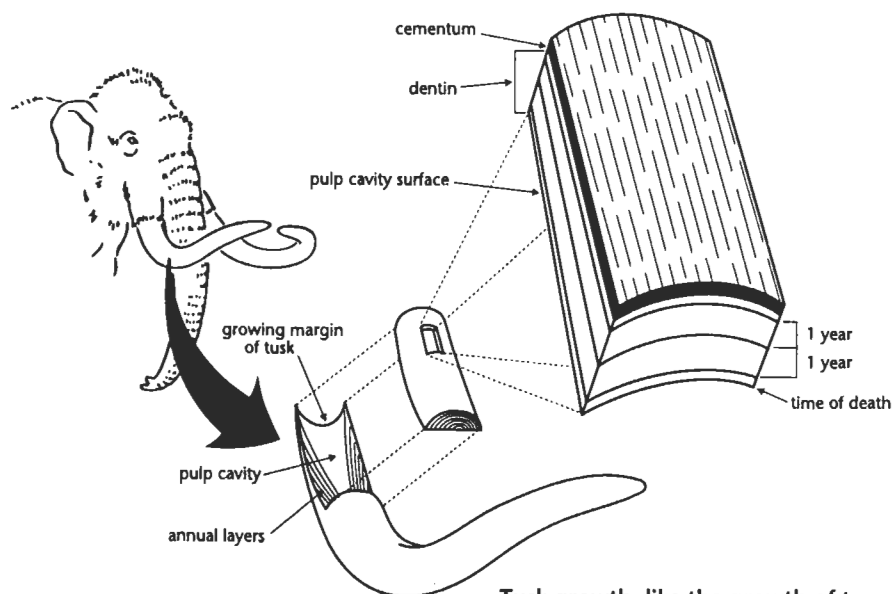
Dr. Fisher of the University of Michigan Museum of Paleontology and De-

partment of Geological Sciences has long been considered a foremost expert on the elephants of the North American mid-continent, and he has had direct involvement in the analysis of many mastodon and mammoth sites and the tusks, teeth and bones of many more of the extinct

animals. Over the years he has compiled a mammoth amount of data and developed an astounding degree of understanding about the lives and times of species that no American has seen for at least 10,000 years.

His research makes him confident there was an important relationship between America's Pleistocene people and the largest animals in their environment, and he argues that anyone interested in the peopling of the Americas needs to listen to the detailed story the animals have left behind. "The way these long-dead mammoths and mastodons speak most clearly," says Fisher, "is through their tusks." He studies tusks the way a jeweler might study a precious gem, the way a glaciologist might study a core of ancient ice, the way a dendrochronologist looks at tree rings, or the way a palynologist analyzes lake sediments.

"I don't want to overstate things, but the tusk record provides much more data than we have for most extinct species." Ultimately, these data indicate to Fisher that Americans hunted mammoths and mastodons throughout an extensive period of time, and that they probably did, indeed, bring about the extinction of these elephant relatives. But there are a



Tusk growth, like the growth of trees, produces annual rings, but it also records details on two additional, shorter time scales. All represent the complex interaction between environmental and physiological conditions that occurred during tusk formation.

AFTER DANIEL C. FISHER & BONNIE MILJOUR/UM MUSEUM OF PALEONTOLOGY

great many tiers of evidence to consider before one can reach that conclusion. Further, besides tusks, there are the other taphonomic data to consider—evidence left by bones.

"Many of us probably agree that mammoths and mastodons were somehow involved in human subsistence," says Fisher, but a great amount of meticulous scientific detective work is involved in determining how. Such detective work has been in progress for decades at many mammoth and mastodon sites, several of which have been reported on in the **Mammoth Trumpet** ("Clues to Paleoindian Survival," and additional articles, **MT** 6:4; "Worked Flint Found with Mastodon Bones," **MT** 8:4; "Mammoth Bones Recovered from Underwater Site," and "Associated Stones Suggest Meat Anchors," **MT** 7:1 and 8:4; and "Mammoth Was Butchered in Wisconsin," **MT** 8:1).

Fisher cites two mastodon sites, the Heisler site ("Butchering and Seasonal Mortality of Mastodons," **MT** 1:3) in southern Michigan and the Burning Tree site ("Evidence of Mastodont's Last Meal," **MT** 6:4) in central Ohio, as typical of many that provide clues to the interactions between these animals and humans. Besides paleontology, the information is coming from archaeozoology, taphonomy, geochemistry and other disciplines, and many similarities have been found from site to site.

At the Heisler site, a young male mastodon, about 17 years old, died in autumn after a summer marked by the first healthy growth of his tusks since he was evicted from his family unit ("Tale of the Tusk," page 6). His bones were preserved in an organic-rich marl that had been the bottom of small pond. They were found in five different clusters, some concentrated and others more diffuse. Each of the clusters had bones that would have gone together in life, but also bones from quite different anatomical regions. The skull, which Fisher notes was not excavated with shovels or trowels but literally "by hand," bore a distinctive pattern of transverse gouges that were unlike gnaw marks or naturally occurring scrape marks.

There was, in short, something decidedly unnatural about the site.

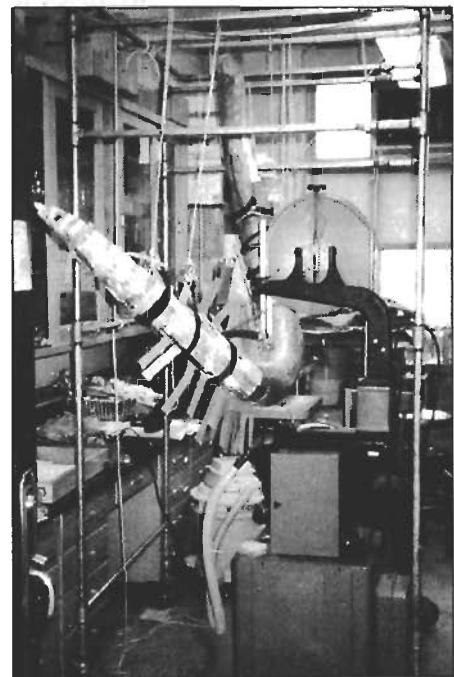
"Parallel patterns of damage among the clusters were notable," says Fisher.



SCOTT BELD/JM MUSEUM OF PALEONTOLOGY

Having brought the tusk of the Buesching mastodon into his lab in Ann Arbor, Fisher, above, carefully bisects it longitudinally to reveal its internal structure. Every few centimeters he must readjust the suspension so that the cut follows the gradual spiral of the tusk. Right, the tusk of a Michigan mammoth is suspended on Fisher's rolling scaffolding during a cut that took almost two weeks to complete (the freshly excavated Buesching mastodon tusk took less than three days to complete). The dryness of the mammoth tusk required consolidation with epoxy, but in both cases, Fisher was left with two complete halves of tusk, split down the center.

"Both scapulae were present, though in different clusters"; further, both shoulder-blade bones were missing the muscle attachment points known as metacromion processes. The two muscle-attach-



DANIEL C. FISHER/JM MUSEUM OF PALEONTOLOGY

ment regions were found together in another part of the pond. Similar intriguing patterns have been found in many other mastodon and mammoth sites.

At Heisler and other sites the heel bones (calcanea) of the animals have been found damaged in similar ways—

there are gouges in the area where the Achilles tendon was attached. First ribs, which would have been close to the hearts of the animals, tend to be damaged in similar ways at various sites. Foot bones at some of the sites, including Burning Tree, bore obvious cut marks,

but an even more common pattern is feet that are complete except that the ends of the toes are missing.

Perhaps such osteological patterns could be written off as mere curiosities if they were found only at a single site, but because Fisher and his colleagues have

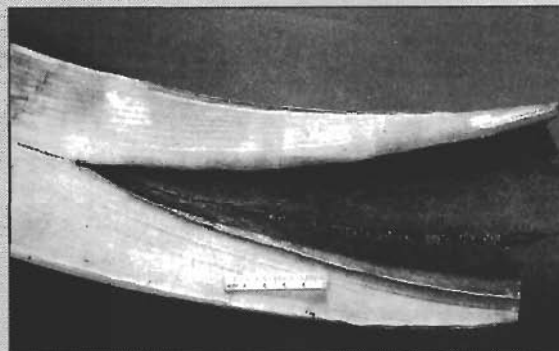
Tale of the Tusk

America's proboscideans, the mammoths and mastodons, have long been associated with the subsistence of early American peoples, but both made the crossing from Asia long before humans. The woolly mammoth depicted in the Mammoth Trumpet logo had a long history in Eurasia's high-latitude regions. "It dispersed into North America during the last glacial cycle and spread across the northern portion of this continent," says Daniel C. Fisher of the University of Michigan. "Mammoths found in most Clovis contexts," he says, "are Columbian Mammoths, the late-Pleistocene representative of the lineage of mammoths that crossed into North America almost two million years ago."

Dr. Fisher reminds us that American mastodons were a more distant relative of modern elephants than any of the mammoths. Mastodons descended from an Old World ancestor that came into the Americas 15 million years ago. Their remains have been found across North and Central America, but mastodons are best known from discoveries in the Great Lakes region. Their teeth, as well as digestive-tract remains from a few well-preserved sites, make it clear that mammoths grazed on grasses while mastodons browsed on leaves, buds, twigs and other leafy vegetation. "Mastodons differed from mammoths in various ways," Fisher says, "but most aspects of their anatomy and behavior were very similar."

Discoveries of mastodon and mammoth sites have always excited laymen and scientists alike, and through tapho-

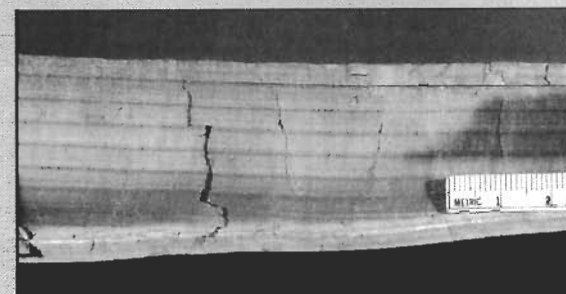
nomic analysis of the bones, teeth and tusks, as well as the sites themselves, scien-



tions involving climate, food resources, individual behavior and reproductive history." Fisher likes to show a diagram of a tusk cross section as he explains the wealth of information they can re-

The proximal end of the bisected tusk of the Powers mastodon excavated near Decatur, Mich., by Betsy Garland of Western Michigan University.

tists know a great deal about America's proboscideans. Because of careful collecting and cataloguing over many years, museums such as Fisher's have excellent comparative collections of mammoths and mastodons. And because today's living elephants are good analogs for America's extinct ones, many inferences can be drawn from evidence discovered in paleontological and archaeological sites.



About seven annual growth increments are visible in this tusk fragment broken when a backhoe encountered the Van Sickle mastodon. The final increment indicates the animal, found near Leeper, Mich., died in autumn.

"In elephants today," says Fisher, "as young males reach maturity they are kicked out of the matriarchal family unit in which they've been nurtured since birth. Some don't survive this period and most decline severely in nutritional condition, taking several years to recover fully." Life histories of Ice Age elephants were similar, and because tusks reveal the ages and sexes of animals found in sites, Fisher and his colleagues have accumulated many details of the life histories, and deaths, of mammoths and mastodons.

"Tusks form through a lifelong history of growth in response to complex interac-

veal. The tusk forms by deposition of dentin along the surface of a conical pulp cavity deep within the tusk socket, he says. "As successive layers of dentin are added, the whole structure is displaced outward." Layers that formed first were deposited about the time the mastodon or mammoth was born and these form the tusk's tip. Layers that

were formed last constitute the walls of the pulp cavity.

"If we are interested only in the end of life we can extract a block of material from the flank of the tusk base," he explains. To understand earlier periods in the animal's life, the researcher must examine samples of tusk nearer the tip. "An important part of this picture is that deposition of new material does not simply occur in a monotonous, undifferentiated sequence." Rather, growth produces a succession of regularly varying tusk structures and compositions.

The layers formed by tusk growth



documented them at many sites, after considering a range of possible mechanisms, both with and without human involvement, Fisher argues that butchering by humans offers the best explanation for many of the features observed. "Cutmarks and gouges on bones are in-

terpreted as produced inadvertently during disarticulation of a carcass into manageable units or during removal of meat from the bones." The transverse gouges on the skulls suggest that people had cut away the fatty tissue that occurs there (brain tissue would have required more

extensive breakage or entry through the base of the skull).

Bones aren't the only evidence. At Heisler, Fisher and colleagues found features that appear to have originated as lengths of mastodon intestine that had been filled with sand and gravel. Though

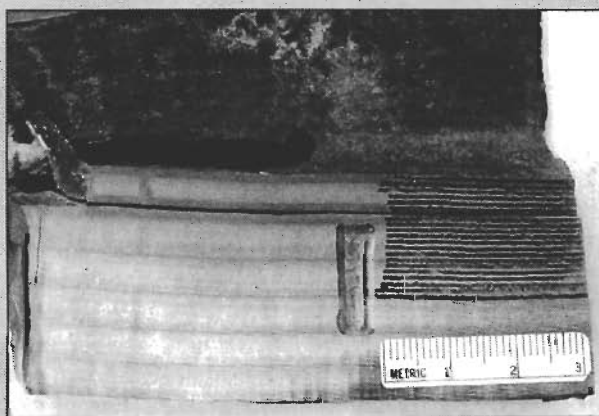
could be compared to tree rings, he says, except that the cycles are not only yearly ones. Instead, they reveal details on two additional, shorter time scales of the complex interaction between environmental and physiological conditions that occurred during tusk formation.

The largest scale does represent the annual cycle of seasons. These annual layers in tusks are subdivided on two finer scales, the smallest of which measures days, following the circadian day-night physiological cycle. There is an intermediate scale of tusk lamination that reflects periods comparable to weeks or simple multiples of weeks.

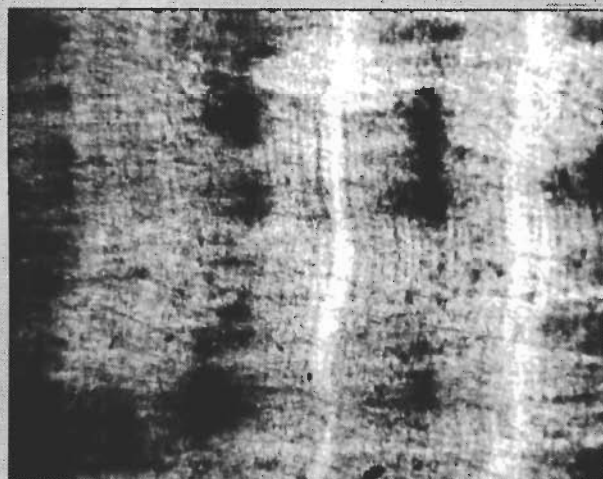
The layers can be examined microscopically and also chemically. For the most complete access to the internal structure of tusks, Fisher has developed a rolling scaffold to secure the tusks as he bisects them longitudinally with a band saw. Because of the curves and great size, it is not an easy task. "With a large, spirally curved tusk," he says, "the cut can take hours to days." The tusk, suspended from the scaffold, must be readjusted after every few centimeters of cut. But the results are rewarding—often spectacular, for after polishing, the cut inner surfaces can be breathtakingly beautiful. Annual increments are often easily traceable as dark-light couplets.

For more detail, he prepares transverse thin sections for microscopic examination. In the dentin of mastodon tusk there typically are about 26 intermediate layers within each annual layer,

and then there are about 14 of the finest increments within each of the intermediate-scale features. Mammoth tusks are similar, although they display about twice as many intermediate-scale features, each containing fewer of the smaller increments.



By measuring these tusk-development layers, Fisher obtains data that allow him to plot increment thickness against increment number or cumulative thickness, and the resulting data provide a profile of variation in the inferred growth rate that correlates with the dark-light couplets. Thicker increments in the lighter portions of the couplets indicate summers, and



thinner increments, typical of winters, usually occupy the dark portion of the annual couplet.


To test this interpretation, he samples specific lines and analyzes their composition. Analyses of the powdered tusk material from a series of increments provide information about compositional changes through time that can, for example, reveal aspects of diet, climate, or soil chemistry. Such information, he says, can indicate seasonal diet changes and perhaps even an annual migration.

A polished longitudinal section through a fragment of tusk from the Parker mastodon, found near Sunfield, Mich., is grooved where material was removed for compositional analysis. The narrow grooves above the centimeter scale represent arbitrary fractions, wider than the tusk's natural "intermediate" growth increments.

"Strong confirmation that the largest-scale dark-light couplets represent years comes from the oxygen isotope composition of tusk phosphate," says Fisher, explaining that at middle and high latitudes, well-documented atmospheric and earth-surface processes generate seasonal variation in oxygen-isotope composition of the precipitation. "This variation influences the water ingested by proboscideans and that in turn drives changes in body fluids and ultimately the oxygen isotope composition of mineralized tissues."

Life histories of long-dead members of extinct species are thus not lost for-

Transverse section of mastodon tusk shows four dark lines of the circadian or intermediate-scale increments, which are about 0.3 mm apart. Between them are fine, approximately daily increments. These features are finer in mammoth tusks.

ever, but instead are recorded in the tusks we discover at so many Pleistocene sites. 

ALL PHOTOS: DANIEL C. FISHER/AM MUSEUM OF PALEONTOLOGY

the intestines themselves were not preserved, their location was outlined by remnants of incompletely digested plant material complete with some of the original community of intestinal bacteria. Moreover, at Heisler there were two posts—small spruce trees with their top-most ends down—stuck into the pond sediment close to the bone clusters. Charcoal,

The proximal end (at extreme right) of the Buesching mastodon's tusk shows where it fit into the animal's tusk socket. In this external view the "gumline" is visible near the left, and annual increments show up as dark ridges representing "outcrops" of the late-winter portion of the seasonal growth rings.



DANIEL C. FISHER/UM MUSEUM OF PALEONTOLOGY

ordinarily not found in pond sediments, was found in association with some of the bones. Other sites, such as Burning Tree, also contained certain of these features.

"Along with coauthors such as Brad Lepper, I've argued that sites such as Burning Tree and Heisler represent hunted, killed and butchered animals transported in the largest manageable pieces to a pond and submerged for storage and later recovery," says Fisher. In addition to the patterns of the bones, Fisher has detailed information from his analysis of the tusks. He knows, for example, that many of these elephants died in autumn.

Frozen ponds would have preserved the meat and protected it from predators. Posts marked the location of the meat caches, and associated charcoal suggests a fire on the frozen pond surface, perhaps at the time of recovery and use of the stored meat. Carcass parts that were recovered, stripped of their meat, and abandoned on the ice surface (where they were sometimes later gnawed by carnivores), evidently melted through the ice and today form diffuse clusters of bone in the pond sediments. Some concentrated bone clusters may never have been recovered.

"Yes, I considered the idea that these animals became mired in pond or bog sediments," says Fisher. "But a wide

range of evidence involving radiocarbon dates and associated stratigraphy, the clustered, non-anatomical patterns of bone distribution, and patterns such as the absence of toes, seem completely inconsistent with entrapment." He says he is open to other explanations for the for-

posts seem to be an indication of human intention to return to the point of bone deposition in the pond. Burned wood in conjunction with the diffuse bone scatter suggests recovery at a time when ice was present, allowing a fire on the pond's surface. The sand-filled intes-

mation of such sites, but mechanisms focusing on carnivore gnawing, ice damage, fluvial transport, trampling, and other factors, don't explain the most distinctive aspects of the many intriguing mastodon and mammoth sites in the Great Lakes region.

To Fisher, the explanation for these mastodon and mammoth sites involves interaction between human subsistence activities and proboscidean biology. "Young but mature males are overrepresented at these sites because they were solitary and easier to hunt than members of matriarchal units," he begins, and goes on to suggest that hunting took place in the autumn because the animals were in the best condition then, because it was critically important for people to store food for the coming winter, and because pond storage worked best during the cold months. "Bone modification observed at the sites," he says, "represents an effective strategy of carcass reduction." Carcass processing prior to

tines are makeshift anchors for keeping unrecovered carcass parts from drifting ashore if they remained in the pond until spring, when intramuscular accumulation of carbon dioxide typically causes flotation."



DANIEL C. FISHER/UM MUSEUM OF PALEONTOLOGY

A tusk is uncovered at the Buesching mastodon site near Fort Wayne, Ind.

storage was minimized, both to save time and to enhance preservation of the meat. More extensive processing was deferred until the time of recovery and use of this stored resource. "The vertical

Is it possible that Pleistocene-era people cached meat in ponds? "This business of storing, or caching meat in a pond, is admittedly hard for some people to get their heads around—not to men-

tion their mouths," Fisher said, explaining his evidence to a large audience at the Clovis and Beyond Conference in Santa Fe last year. "It turns out better than it sounds. A few years ago the death of a friend's draft horse provided an opportunity to experiment." He showed a slide depicting the placement of one of the legs of the butchered horse into a hole that had been chopped in the ice of a shallow pond. "In a similar fashion we stored all 1400 pounds of that particular animal."

"Later that winter, we removed some of the meat from the pond and found it a bit discolored on the outside but perfectly sound on the inside. I know," he says. "I ate it."

By spring the horse meat experiment might have appeared less successful, as bloated meat masses floated on the surface. However, Fisher discovered that



G. R. Smith, left, and Fisher push the forelimb of a horse into a hole chopped in the ice of a pond. By April, the pond-stored horse meat was floating in the pond, but Fisher found that it yielded tasty steaks pictured at the right.

the meat had been colonized by lactobacilli, which produced carbon dioxide that caused the tethered meat masses to float to the surface. The lactobacilli maintained a strongly acidic environment within the meat mass, and that protected the meat from pathogenic bacteria. It remained safe for human consumption — "and palatable, despite its strong smell and flavor."

Many mastodon and mammoth sites in the Great Lakes region, then, may be explained as meat caches, but what can they tell us about the ultimate disappearance of proboscideans from North America? Plenty, thanks to data gathered by Fisher's research on these animals, data derived in no small part from tusks. He

gets excited about tusks, which actually are highly specialized incisor teeth, because they embody so much information, not only about the animal, but about its environment. He has studied tusks of mammoths and mastodons dating from far into the Pleistocene down almost to the time of their extinctions. Can this information answer the puzzling questions about the peopling of the Americas or the extinction of the mammoths and mastodons? Fisher believes the evidence is compelling.

What clues do data from tusks reveal about the animals' extinction? "If deterioration in climate or food resources was the main stress on proboscidean populations toward the end of the Pleistocene," Fisher argues, "we would expect growth rates, even tusk growth rates, and reproductive life histories to respond. Age of



BOTH PHOTOS: DANIEL C. FISHER/UM MUSEUM OF PALEONTOLOGY

maturation should increase and growth rates should decrease."


However, he continues, the hunting-induced mortality of young and mature adults suggested by his meat-storage interpretations should produce a quite different effect—a decreased age of maturation and an *increased* growth rate. "That's what we might expect if over-hunting were the cause."

Fisher says that it seems that rates of tusk growth in mammoths were higher at the end of the Pleistocene than they had been for tens of thousands of years. Further, there is an indication that toward the time of their extinction, the animals matured earlier. This evidence supports over-hunting as a major force, he argues.

"Early Americans needn't have been full-time big-game specialists to have had a critical impact on proboscidean populations," Fisher argues. Even if they only killed mammoths and mastodons on a seasonal basis to insure their own survival in winter, the impact may have been significant. He notes that the value of such a stored resource would have made such large prey attractive to people even as numbers of the animals dwindled.

"Initially, most of the predation focused on mature males, the easiest to hunt and coincidentally the ones whose deaths would be least likely to generate an immediate population crash. Nonetheless," he concludes, "the changing age- and sex-dependent odds of mortality shifted the balance of influences on proboscidean life history that had been

achieved in earlier times, even before human immigration. This adaptive response may have helped, but it was not enough. The beginning of predation on calves and mother-calf pairs, for which we have very preliminary but tantalizing evidence, intensified matters."

Fisher's scenario does not resemble a "blitzkrieg" of bloodthirsty hunters invading a virginal continent. "The whole process didn't conclude in a decade or in a century or even two, but stretched out over millennia," he argues. "The environment was changing too, but in ways the proboscideans were fully capable of accommodating, judging from their patterns of tusk growth." 

—Don Alan Hall



RICHARD BOISVERT

Patricia Tucker, a Littleton, N.H., high school teacher, admires the striped Munsungun point she discovered during her first field excavation.

SCRAP

Spells 'RESCUE' For Science

DIGGING 100 METERS from the main excavation block at the Nevers site in Jefferson, N.H., Patricia Tucker uncovered a stone tool in situ. A new volunteer with the New Hampshire State Conservation and Rescue Archaeology Program, Tucker was excited about her first field excavation. She picked up the artifact and called to Paul Bock, her field supervisor who sat nearby on an overturned bucket documenting their finds, "What material is this flake made of?"

"Where did you find that?" asked Bock, a professional archaeologist and seasoned volunteer. He knew it was the base of a fluted projectile point.

"Right here," she said, pointing to the ground.

"Put it back," he said gently.

Tucker had found the first fluted point of the 1998 season. The Barnes-type point was dubbed the "Bacon Point." The dusky red Munsungun chert was lined with cream-colored bands as if it were a strip of bacon.

A small group of volunteers observed a moment of silence to appreciate the magnitude of the find, then one let out a loud whoop. The rest of the field school volunteers ran over along with Richard Boisvert, New Hampshire's deputy state archaeologist who facilitates the volunteer program. Dr. Boisvert measured and recorded the artifact's height, elevation, and its precise geographic coordinates. He works for the Department of Cultural Resources, part of the New Hampshire Division of Historical Resources. His duties include identifying, evaluating, and protecting cultural resources, assisting the public with preservation activities, and facilitating the State Conservation and Rescue Archaeology Program, known as SCRAP. The program, started nearly 20 years ago, encompasses archaeological research and an avocational archaeology certification. Boisvert, responsible for the program since 1987, trains and certifies volunteers in the technical skills of archaeology. "It's real archaeology," he says, noting the volunteers become well-trained archaeological field and laboratory technicians.

Field school volunteers participate in site excavations as well as surveys, testing, scientific recording, lab analysis, research design, public presentations and publications. They catalog collections found during field schools or donated to the state. Specific projects include dating sites based on pottery collec-



tions, reviewing data from test pits to determine what they have learned, where to proceed, and how to develop better field research questions. They also survey sites to record the size and nature of the resources so that if threats arise—construction or natural erosion—the sites can be excavated.

The program's mission is to provide quality education to students and the public while carrying out professional archaeological research in New Hampshire. The primary focus is the archaeological record of pre-contact cultures.

"It's truly a public education program," Boisvert says. "We emphasize professional archaeology being done properly. We carry out the highest standards of archaeological research and ethical treatment of research designs. It's a cooperative venture where volunteers help choose what we do and conduct fundamental research."

did recognize it," she says, adding that the training was very helpful.

Field school participants undergo instruction on the basics of archaeological field recovery and recording, identifying artifacts, fundamentals of artifact cleaning and cataloguing, and archaeological ethics. Instruction is based on hands-on participation, typically with more experienced crew members working with beginners. A field lab is operated concurrently with field excavations so that volunteers experience both finding and processing artifacts. The initial training program is supplemented with lectures by Boisvert or visiting colleagues, as well as field trips. Boisvert has conducted workshops on photographing artifacts in the field and on lithic technology—how to analyze stone tools and the residue from their manufacture. The field school offers two-week sessions for a total of six weeks each summer. There also are one-

Noting the hands-on training he received, Bock says, "The methodology and training are excellent."

Doug Dickinson, owner/operator of Archmat, an archaeological supply firm he started with Boisvert's encouragement, and a program volunteer since 1989, credits Boisvert's leadership style. "In a typical excavation, Dick has a hierarchy of knowledgeable and thoroughly trained people who give balance to the process," Dickinson says. Boisvert lets people who have experience and knowledge "help him run the show. He's open, flexible, and supportive."

According to Sarah Dunham, a volunteer who continued to work as Boisvert's lab manager before returning to college, Boisvert is the "backbone" of the State Conservation and Rescue Archaeology Program community. "Once Dick is completely convinced that an individual is willing to work and is dedicated to ar-

New Hampshire Teaches Volunteers How to Do Professional-quality Archaeology

Boisvert accomplishes the work through individualized training, workshops, regularly scheduled laboratory sessions, and annual summer field schools. The field schools are designed to instruct avocational archaeologists, community volunteers, and students seeking academic credit at Plymouth State College, which serves as the academic host for the program.

The volunteers are a diverse group ranging from college students to people from innumerable professions. Retirees and avocational archaeologists typically constitute two-thirds of the field crews. Most volunteers are intrigued by archaeology and want to become personally involved. Some know only what they've absorbed by watching National Geographic and NOVA specials; others have extensive fieldwork experience.

Arletta Paul, currently the eldest volunteer at age 74, recalls asking Boisvert at her field school in 1988, "How will I know if I found something?" He assured her that she would know. "Sure enough, I

week field projects in May and October. Volunteers attending field schools are obligated to a two-week commitment, but once involved, many stay longer. Boisvert lets people follow their own inclinations. Some excavate, others work in the lab, and some do both. More than a third of the volunteers return year after year, and some move on to become professional archaeologists working for cultural resource management firms.

"It's clearly not our intent to train field technicians for contract firms," Boisvert says, "but quite a number of people have done that. And they tend to come back and help out when I need it."

Colleagues, students, and SCRAP volunteers agree Boisvert has enticed numerous talented people into the field of archaeology.

"Encountering Dick [Boisvert] totally changed my life," says Steven Bayly. "Dick took the time with me to de-mystify the whole archaeology thing. I never realized just ordinary people did archaeology."

chaeology, he goes about wielding his influence to make sure that person has every opportunity within and beyond SCRAP open to them. He believes in people before they believe in themselves."

Though Boisvert prefers to avoid center stage, his colleagues say he is a positive force in the field of archaeology. Robert Goodby, an assistant anthropology professor at Franklin Pierce College and co-principal investigator for Victoria Bunker Inc., a cultural resource management firm in Alton, N.H., credits Boisvert with bringing "a lot of energy into what he does and involving hundreds of people in archaeology from all walks of life—from students to senior citizens."

"I taught a seminar on New England's prehistory and fed my students into Dick's field school," Goodby said. "They came back after a summer with Dick all fired up and ready to do archaeology. I think Dick is arguably the best thing to happen to archaeology in New Hampshire. He's brought a lot of talented

people into this field. They develop their skills and go off on their own."

Boisvert makes light of such praise by joking that he "exploits people," but he notes that the thousands of hours donated yearly by volunteers allow a substantial amount of archaeological work to be done. Volunteers, he says, do a large majority of the off-season lab work—washing the rocky debris they call kibble because it resembles dog food, searching for small stone flakes or other artifacts, and cataloguing discoveries. On Wednesday evenings at the lab, thousands of two-quart bags of kibble from summer field schools are cleaned and catalogued. It is tedious work washing and drying the material and then searching for minute flakes chipped from stones during the toolmaking process. To break the tedium, to bring purpose to the work, Boisvert reminds the volunteers that the

artifacts exist because people left them behind. He reminds them to take time to wonder: Why is this arrowhead here? Who might have made it and why? What might the knapper have been thinking at the time?

Some SCRAP volunteers put together museum exhibits, detailed displays with artifacts and photographs. Recalling an exhibit for the Libby Museum in Wolfeboro, N.H., Boisvert says, "They generated a nice exhibit. The artifacts were not tied up hostage to a board. It showed all different kinds of material culture through time in the region."

Perhaps one of the most ambitious SCRAP projects was the immersion of an entire elementary school into a week of Paleoindian study. Iris Baird of Lancaster, N.H., a volunteer who was a retired teacher, worked with the staff of the Jefferson Elementary School culminat-

ing in an archaeology day during which students visited a Paleoindian excavation site, observed a flintknapper at work, and participated in a simulated dig. The children learned that archaeology is much more than digging. To document the experience, the school's staff and students produced a Power Point presentation and 64-page book, *History in the Making—A Paleo-Indian Celebration*, that they presented to the community. "The goodwill and appreciation for archaeology that were generated from this event are invaluable and could not have been obtained except through the involvement of the diverse membership of the SCRAP field school participants," Dunham wrote in a recent paper for the New Hampshire Archaeological Society.

"Thank goodness for it," Victoria Bunker says of SCRAP. The owner and principal investigator of a cultural resource management firm says, "It's integral. It's necessary." Dr. Bunker worked as the SCRAP prehistoric-sites archaeologist from 1981 to 1987 in conjunction with Faith Harrington, the historic-sites ar-

SCRAP volunteers excavate at the Gault site in Texas. Fifteen of the New Hampshire volunteers spent a week's vacation time last March at Gault, where they earned the respect of Texas archaeologist Michael B. Collins, one of the principal investigators of the Gault Clovis site.



RICHARD BOISVERT

chaeologist. "In the big rubric of public education and awareness it serves a huge function. I think it heightens awareness and sensitivity of archaeology."

From the old days, when the State Conservation and Rescue Archaeology Program worked jointly through the New

shire Archeological Society. Bouras applies the awareness he has learned to help others become aware, and his work has extended beyond New Hampshire's borders. Bouras was one of 15 volunteers who spent a week's vacation time at their own expense working in Texas at the

The volunteers, says Michael B. Collins, of the Texas Archaeological Research Laboratory at the University of Texas and a principal investigator of the Gault site, "were so good that I enthusiastically invited them to come back to Texas anytime they want to."



RICHARD BOISVERT

This class photo taken during a 1998 field school session illustrates the diversity of SCRAP field school participants. Individuals mentioned in the article include Paul Bock, back row, second from left; Ed Bouras, front row, seated far left; Richard Boisvert, front row, seated second from left; Steve Bayly, back row, fourth from left; Arletta Paul, standing on Bayley's left and wearing wide-brimmed hat; Ann Pilkovsky, in sunglasses and hat, peering over Bayley's shoulder; Sarah Dunham, back row, left of stadia rod; and Doug Dickinson, extreme right, back row.

Hampshire Preservation Office with The New Hampshire Historical Society, Bunker recalls two women who "met the ideal." After learning the basic skills such as site mapping and recording, they returned to their hometown and became advisors to the local Conservation Commission. They became the community watchdogs, says Bunker.

Ed Bouras, who joined the SCRAP team as an avocational in 1992, says a sense of community is the fabric that holds the volunteers together. Bouras has participated in field schools, worked as a contract archaeologist, and now has turned his volunteerism toward the New Hamp-

Gault Clovis site. "It was an immensely successful experience," he says, but not just because of the Gault site's cultural materials ("Texas Site Suggests Link with European Upper Paleolithic," *Mammoth Trumpet* 15:1). "Those were some of the most difficult digging conditions I have encountered," he said. "We accumulated about a 70-hour work week in tough weather—and this was vacation! Through it all we were almost insanely happy to be there. Why?" Bouras says it was because they had created a "tight community" within which they were able to transcend negativity, complaining, and one-upmanship.

SCRAP has a core group of people like Ann Pilkovsky, who has volunteered since 1991. She is responsible for 30 sites around Ossipee Lake, N.H., and she is so intimately involved with the area she says she often gets a feeling there's an artifact ready to be found so she stops whatever she's doing and goes over to look. She always finds something. Pilkovsky, a retired teacher, knows her stuff. Her field book is filled with notes describing her finds: "14,879 hornfels flakes, 211 ceramic sherds, 10 tools, 11 biface fragments, 792 bone, 93 quartz, 12 chert, 275 turtle." The list is from a few one-meter-square units she and her field partner, Arletta Paul, excavated. Pilkovsky calls herself an avocationalist, yet she spouts off archaeological names for the various spear points she found at Ossipee Lake.

Sometimes Pilkovsky reminds Boisvert of her skill at identifying artifacts. "He'll kill me," she says, laughing as she
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Update


The Search for Hyperdisease

Mammalogist Ross D. E. MacPhee and his colleagues are progressing in their search for evidence that a lethal disease brought about the extinctions of large mammals at the close of the Pleistocene ("Explaining Pleistocene Extinctions," **Mammoth Trumpet** 14:1). Molecular biologist Alex Greenwood, who joined the American Museum of Natural History to work with samples of mammoth tissue that Dr. MacPhee collected, has been successful in extracting nuclear DNA from some of the material. More significantly, Dr. Greenwood reported to the 5th International Ancient DNA Conference in England in July that he also has been able to isolate from nuclear DNA of several mammoth samples partial sequences of endogenous retroviruses. These are formed when a retrovirus invades the germ line cells, which are cells that form eggs or sperm, and these retroviruses become part of the host's DNA. That scientific feat in itself may not directly bear on MacPhee's quest, but it's a significant milestone in their search for the hypothetical plague they suspect was responsible for driving to extinction mammoths, mastodons, giant ground sloths and other Pleistocene megafauna.

Finding evidence of such a pathogen in mammoth tissue will be difficult, possibly much harder than extracting single-copy nuclear DNA. To exist for Greenwood to find, the pathogen surely would have had to heavily infect its host and invade the bone tissue the team is examining thousands of years later. As *Science* quoted Greenwood in its coverage of the conference: "It is mostly a matter of luck. You have to find an infected individual who had a high enough viral load that is detectable" ([July 28]289:530-531).


MacPhee and his team have recovered nuclear DNA from samples of mammoth from Alaska and Siberia that range in age from 26,000 years to 4,500 years old, thus bracketing the time they assume the first humans arrived. If they find evidence of pathogens in samples dating to a time after the arrival of hu-

mans, but none in older samples, it will be evidence that people or their companions may have carried a deadly plague that drove the megafauna to extinction. The team published the nuclear DNA sequences last November in the journal *Molecular Biology and Evolution*.

MacPhee's hyperdisease hypothesis became the third explanation for the disappearance of Pleistocene megafauna. The other two are climate change and overkill by the first human hunters. 

Institute Develops Web Channel For Anthropological Education

The Archaeological Legacy Institute, a non-profit organization based in Eugene, Ore., has announced it now can offer free on-demand viewing of the first of a series of films on archaeology and indigenous peoples from its Web site (www.archaeologychannel.org). This first video, available initially only at the 56k connection speed (low bandwidth for dial-up modems) in Real Player format, is called *Ocmulgee: Mysteries of the Mounds*. It concerns an important Mississippian mound site in Georgia. The institute expects to add more videos and greater bandwidth (100k and 300k) in both Real Player and Windows Media Player versions.

According to Rick Pettigrew, President and Executive Director, Archaeological Legacy Institute was founded to address a range of problems facing archaeology today. He believes that although archaeology is popular and frequently in the news, a serious gap exists between the promise of archaeology on the one hand and the realities of its performance and popular perception on the other. He expects that the institute's program will increase public understanding of the field and what it can contribute to solving contemporary problems. Interested persons are invited to contact him at the Web site above and learn more about how they might submit materials or in other ways use the institute's services. 

COMING CONFERENCES

Oct. 5-7 27th Great Basin Anthropological Conference, Ogden, Utah.

Contact: Steven Simms, GBAC Chair, Anthropology, Utah State University, Logan UT 84322-0730. 435-797-1277; ssimms@hass.usu.edu (www.hass.usu.edu/~gbac2000).

Nov. 8-12 33rd Annual Chacmool Conference, Calgary, Alberta.

"Art for Archaeology's Sake: Material Culture and Style across the Disciplines." Contact: Marc Zender or Calla McNamee, Dept. of Archaeology, University of Calgary, Calgary, Alberta T2N 1N4.

Nov. 27-30 II Congreso de Arqueología de la Region Pampeana Argentina, Mar del Plata, Province de Buenos Aires, Argentina.

Contact: Organizers, Casilla de Correo 3, Sucursal 1 (7600) Mar del Plata, Provincia de Buenos Aires, Argentina. carp2000@mdp.edu.ar www.mdp.edu.ar/seminarios/arqueologia

Dec. 4-7 La Colonización del Sur de America Durante la Transición Pleistoceno/Holoceno, La Plata, Buenos Aires, Argentina.

Contact: Laura Miotti, Museo de La Plata, Paseo del Bosque s/n, (1900) La Plata Argentina, miotti@netverk.com.ar; lmotti@museo.fcnym.unip.edu.ar

March 28-31 2001, 70th Annual Meeting, American Association of Physical Anthropologists, Westin Crown Center, Kansas City, MO.

Contact: David Frayer or Sandra Gray, Dept. of Anthropology, 622 Fraser Hall, University of Kansas, Lawrence, KS 66045-2110; Frayer@ukans.edu or sgray@kuhub.cc.ukans.edu

April 18-22 2001, 66th Annual Meeting, Society for American Archaeology, New Orleans Marriott, New Orleans, LA.

Information: <http://www.saa.org/Meetings/index.html>
Slawkowska 17, 31-016, Krakow, Poland,
bochenski@isez.pan.krakow.pl; <http://www.isez.pan.krakow.pl>

Send conference notices to Mammoth Trumpet, CSFA, 355 Weniger Hall, Oregon State University, Corvallis, OR 97331



Americans Have Long Fascination With Prehistoric **BEASTS**

by Gordon Sayre, Associate Professor of English, University of Oregon

INTERACTIONS BETWEEN HUMANS AND MAMMOTHS have fascinated not only scientists but creative writers and political leaders. Long before the novels of Jean Auel, mammoths found roles in literature. As a *Mammoth Trumpet* subscriber and a specialist in colonial American literature, I became interested in how Americans of the 1700s and 1800s interpreted the first findings of fossil mammoth bones. At a time when archaeology was just beginning and the true age of the earth was scarcely guessed at, these fossils inspired creative speculation. Paleontology first rose to prominence in American history when Thomas Jefferson wrote in *Notes on the State of Virginia* (1787) that "the mammoth, or big buffalo, as called by the Indians, must certainly have been the largest" animal on the continent. The future President compiled a list of the quadrupeds of Europe and America, with sizes and weights, in an effort to refute the notorious theory of the French naturalist Buffon, which held that the American continents had emerged more recently than Eurasia from a primordial ooze or universal deluge, that America was immature and unable to support large animals. Jefferson put the mammoth at the head of his list of American fauna, and he believed that it still survived.

America west of the Appalachians was little known in the 1780s, and bones of giant creatures had been among the most notable findings of early explorers of the Ohio Valley. In 1739 the Baron de Longueuil, later Governor of New France, found molar teeth, a femur, and a tusk near Big Bone Lick in modern Kentucky. He took them to Paris where they attracted the attention of Buffon's collaborator Daubenton, a co-defendant in Jefferson's suit on behalf of American nature. Because Buffon had also claimed that Native Americans "lacked ardor for their female," Jefferson felt compelled to defend America's collective fertility and virility, and the mammoth, like a big car, could only help a man's self-image. He concluded: "To whatever animal we ascribe these remains, it is certain such a one has existed in America, and that it has been the largest of all terrestrial beings. It should have sufficed to have rescued the earth it inhabited, and the atmosphere it breathed, from the imputation of im-

tence in the conception and nourishment of animal life on a large scale." Jefferson's political foes mocked his interest in fossils, however, particularly in 1808 when explorer William Clark brought over 300 of them from the Big Bone Lick and the President spread them out on the White House floor.

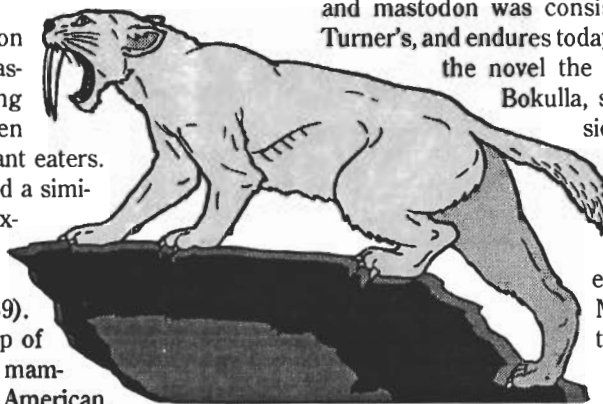
Even though they noted its similarity to elephants, eighteenth-century naturalists believed that the mammoth was carnivorous. George Turner, in a paper read at the American Philosophical Society in 1797, offered support for this idea based on his "personal acquaintance with the Great-Bone Lick." Of "the bones of the buffalo and smaller animals" found in one stratum of the site, "almost every bone of any length had received a fracture, occasioned, most likely, by the teeth of the mammoth, while in the act of feeding on his prey." Turner supposed that "Nature had allotted to the Mammoth the beasts of the forest for his food" and "as the immense volume of the creature would unfit him for coursing after his prey through thickets and woods," he imagined a stealthy mammoth approaching the lick, and, catlike, leaping upon its prey. In Turner's logic, size implied power implied domination, height=might=right. Such assumptions necessarily led to an image of a fearsome beast akin to the wolf: "With the agility and ferocity of the tiger; with a body of unequaled magnitude and strength, it is possible the mammoth may have been at once the terror of the forest and of man!—And may not the human race have made the extirpation of this terrific disturber a common cause?"

The most successful early American paleontologist was Charles Willson Peale, a Philadelphia portrait painter and founder of the nation's first museum. In 1801 he traveled to Shawangunk, New York, following news that a farmer had found on his land the bones of a giant creature. Peale excavated enough bones to reconstruct two full skeletons of what he called a mastodon, distinct from European mammoths. These were the first extinct animals displayed in the manner that so many dinosaurs are in museums today. He sent one mastodon with his son Rembrandt on a tour to Europe. The Peale family's



excavation brought the mammoth fully into the American imagination by making it visible to a nonscientific, even illiterate public, and by emphasizing its fearsome side. It was displayed with tusks curving downwards as weapons to skewer prey.

Much of the popular sensation over dinosaurs, as in the film "Jurassic Park," comes from portraying them as hostile monsters, even though most were slow-moving plant eaters. Portrayals of the mastodon followed a similar pattern, one that reached an extreme in a novel by Cornelius Mathews entitled *Behemoth: A Legend of the Mound Builders* (1839). Mathews took the then-logical step of combining current ideas about the mammoth with another popular myth of American




prehistory, that of the Mound Builders. After all, during the years that the Big Bone Lick was revealing fossils of giant animals, mysterious earthworks were found nearby. Today we know that these had been built by the Adena and Hopewell cultures between roughly 900 B.C. and A.D. 1200. But Mathews and his contemporaries had no reason not to believe that mammoths had lived alongside the Mound Builders, whom they imagined as an advanced civilization quite different from the contemporary American Indians. Some had supposed that the earthen embankments of the Hopewell culture were fortifications built to repel an invasion by ancestors of the Indians; Mathews proposed instead that the invader was the mastodon.

Like Jefferson, Mathews cited as proof Algonquian Indian stories of giant animals that had lived in ancient times, what he termed "vivid and traditionary descriptions of the mighty herd of brutes which had once tyrannized over the earth," monsters that were vanquished by a "majestic race of heroes." The epic

mastodon that Mathews named "Behemoth" took on proportions far larger even than fossils had suggested, and the Mound Builders hunted it not for food, but in a desperate struggle to avoid being trampled to extinction. This conflict between man and mastodon was consistent with scientific accounts like Turner's, and endures today in the Overkill theory. At the end of

the novel the Mound Builders, led by the hero Bokulla, succeed at besieging Behemoth inside a natural corral ringed by steep mountains, and the monster dies wedged in a narrow canyon, a fate which seems designed to preserve its bones for future discovery. But in spite of their victory, the Mound Builders are so traumatized that their civilization declines toward its own demise. Mathews's novel offered answers to the still-vexing

questions of why both the mammoth and its human hunters disappeared during America's prehistory. 

SUGGESTED READINGS

ON the mammoth in American history

Lankford, George E. 1980 Pleistocene Animals in Folk Memory, *Journal of American Folklore* 93:293-304.

Semonin, Paul 2000 *American Monster: How the Nation's First Prehistoric Creature Became a Symbol of National Identity*. New York University Press.

Simpson, George Gaylord 1946 The Discovery of Fossil Vertebrates in North America, *Journal of Paleontology* 17(1):26-38.

Turner, George 1799 Memoir on the Extraneous Fossils, denominated mammoth Bones: principally designed to show, that they are the remains of more than one species of non-descript Animals. *Transactions of the American Philosophical Society* 4:510-518.

SCRAP Spells 'Rescue' for Science


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agrees to tell a story about Boisvert. She was digging and found an artifact in the wall of her pit. According to site protocol, the artifact wasn't technically in her unit so she couldn't retrieve it. But she was sure it was something, and called to Boisvert who came to look. "'Ah, it's nothing but a piece of rocky shatter,'" Pilkovsky says, recalling Boisvert's response. She remained suspicious and continued digging.

"It was an accident," she explained, with a gleam in her eye. "I was using a trowel. I have big hands. I accidentally hit that and of course it fell out of the wall. I picked up a fluted point fragment and threw it to Boisvert and said, 'Do you want to see some rocky shatter?'"

Boisvert organized this past summer's six-week field school in Ossipee, N.H., where the teams surveyed a rare environmental zone—a remnant scrub oak and pitch pine forest of 3,000 to 4,000 acres. Field school volunteers also worked in the Ossipee Mountains looking for a source of hornfels, a tool stone used

9,000 to 500 years ago. Boisvert calls hornfels a "weird" stone because it is sedimentary, metamorphic, *and* igneous. The stone starts as volcanic ash (the igneous phase) that is lifted into the air and settles in layers in the caldera of a volcano, where it subsequently lithifies (the sedimentary phase), then undergoes a heating process by subsequent eruptions of the volcano that further alters its mineralogy (the metamorphic phase). Boisvert wanted to find where the raw material came from.

Generally the number of SCRAP volunteers fluctuates from 40 to 70 during the summer; this summer's field school had 45 participants. Sweating and working elbow to elbow in a pit in the hot sun with blackflies biting your neck, it's easy for volunteers' tempers to fray, but Boisvert manages the people component. "He walks a thin line between being in charge of the crew and being part of the crew," Bayly says. He's known for his ability to listen, to mediate, and to make decisions. The SCRAP program—designed to educate the public, train in archaeological methods, provide rescue and salvage operations, and give hands-on experience in the field and lab—is clearly a success. 

—Nancy Eichhorn



Jalisco Project

continued from page 1

spent the last seven years working (with very limited budgets) in the state of Jalisco, Mexico. This region has, over the past few decades, produced a significant number and variety of late-Pleistocene faunal and mineralized human remains, in addition to fluted points similar to those recognized in the United States as Clovis.

We have concentrated our efforts in the Chapala, Zacoalco, and Sayula Basins of Jalisco, employing a holistic approach in our pursuit of the questions concerning the first inhabitants of the Americas. Our investigations have, to this point, focused on reviewing all previous work, studying archaeological and paleontological collections, and conducting preliminary reconnaissance surveys to locate sites that may hold key archaeological

and paleontological answers about the oldest inhabitants.

One of our primary objectives is to gain an understanding of the geomorphological features of the three basins—the landforms and the processes that formed them, and their development through time. Our ultimate goal is to find the earliest human occupations of the region and to show relationships between the processes of geomorphology, biophysical environment, human communities and their socioeconomic systems.

The core members of the Jalisco Early Man Project are Dr. Stanley D. Davis,

Texas A&M University archaeologist and project director; Dr. Joel D. Irish, University of Alaska–Fairbanks bioarchaeologist; Dr. Lee Nordt, Baylor University geoarchaeologist; Dr. Craig Gerlach, University of Alaska–Fairbanks archaeologist; Dr. Richard G. Holloway, Flagstaff, Ariz., palynologist; Prof. Frederico A. Solorzano, University of Guadalajara and the Museo de Paleontología de Guadalajara, paleontologist; Ms. Debra E. Dandridge, Texas A&M University archaeologist; and Prof. Otto B. Schondube, State Archaeologist, Jalisco, Mexico, Museo Regional de Guadalajara.

Articulated remains of a mastodon are excavated from fluvial sediments exposed by receding Lake Chapala. Bones were only partially mineralized, indicating the animal may be late-Pleistocene in age. An intriguing bony growth on two adjoining vertebrae seems to indicate an injury such as an embedded projectile point. The excavation was under the direction of paleontologist Frederico A. Solorzano of the University of Guadalajara and the Museo de Paleontología de Guadalajara, and Jalisco State Archaeologist Otto B. Schondube of the Museo Regional de Guadalajara. Here museum curator Javier Juarez Woo (wearing white hat) talks with workers.



JOEL D. IRISH

The team's investigations located a number of rockshelters for future investigation.

The largest of the shelters, known locally as the Cave of the Sleeping Old Ones, is eroded into volcanic breccia approximately 50 meters above the playa floor. This shelter has an interior chamber measuring about 42 square meters with an entrance about half that big.



JOEL D. IRISH

The premature death in August 1999 of Dr. John (Jack) E. Lobdell, an original member of our research team, was a shock to us and a major setback to the project. He is deeply missed.

Continuing investigations were conducted during May 2000 by Davis, Irish, Dandridge, Solorzano, Denver archaeologist Tony Baker, and Joshua Reuther and Joe Hickman, two students from the University of Alaska-Fairbanks. Our objectives were to: 1) relocate and record a possible Pleistocene rock glyph site depicting camelids, 2) conduct surveys within the Zacoalco Playa region to relocate a possible Clovis-age site where two obsidian paleo-points were previously found, 3) relocate and map rockshelter and cave sites within the Sayula Playa area, 4) select the most promising shelters and excavate test units to determine depth, type, and concentration of cultural and paleontological strata, and 5) investigate paleontological sites (Pleistocene-age bone beds) near the city of Ocotlán, north of Lake Chapala.

Upon our arrival in Jalisco this year, we consulted with Schondube and Solorzano concerning their efforts to excavate a mastodon, possibly of late-Pleistocene

age. The articulated remains had been exposed recently in fluvial sediments of receding Lake Chapala. Our interest in the mastodon was piqued by the fact that the remains were only partially mineralized, and further titillated on discovering an unusually large bony growth on two adjoining vertebrae. At present, it hasn't been determined what caused this pathology, although some type of traumatic injury—possibly an embedded projectile

This point fragment of non-local gray chert was found by Jalisco State Archaeologist Otto B. Schondube. Team members estimate that it had been at least 6mm thick. This 3.4-cm section of a lateral edge reveals pressure flaking and grinding.

as one wishes, but despite some minor setbacks, a number of our objectives were met this year. We were unsuccessful in relocating the rock glyph panel, but were able to narrow the search area for later investigation. Two freshwater springs, located along the western slope



JOEL D. IRISH

point with subsequent infection and bony reaction—cannot be ruled out. We will know more when the remains are cleaned, conserved, and X-rayed. The mastodon's remains are curated at the new Museo de Paleontología de Guadalajara, which the city of Guadalajara built for Prof. Solorzano in recognition of his lifetime of paleontological work in Jalisco.

Investigations are never as productive

of the San Marcos Mountains on the east side of Zacoalco, hold promise for future surveys. We conducted a limited reconnaissance in the area of the fluted points and briefly studied a third fluted-point fragment previously collected by Schondube. This latter specimen, made from a non-local gray chert, was estimated to have been at least 6 mm thick; a 3.4-cm section of a remaining lateral edge shows

pressure flaking and grinding. A 1.0-cm-wide fragment of the slightly concave base was also blunted by grinding.

Much of our time was devoted to reconnaissance of the Sayula Basin. A number of rockshelters were located that have potential for further investigations. The largest of the shelters is eroded into volcanic breccias approximately 50 meters above the playa floor. This shelter, known locally as the cave of the Sleeping Old Ones, has an interior chamber measuring about 42 square meters with an entrance of 20 square meters. Unfortunately, we were unable to conduct subsurface testing in any of the shelters; that work will be undertaken next spring.

Lastly, we have been fortunate to have help from a local land owner in locating

present surface. We recovered several fragmented horse bones. One of the specimens exhibited three distinct cut marks. On this trip we revisited the site to evaluate its condition and to identify exposed remains. We were unable, due to time constraints, to excavate any test units, but were able to view and identify many exposed fossils. The team identified remains of deer, horse, anteater, and catfish. An additional bone concentration

field near Ocotlán. It is situated on a Pleistocene terrace associated with the Rio Grande de Santiago, the outflow from Lake Chapala, which runs through the city. Again, horse and bison are represented along with camel. All three sites contain remains of animals likely used as food by early hunters and gatherers. At present, it is theorized that the two borrow-pit bone beds are associated with sediments along the shallow lake edge.

Members of the May 2000 team inspect a Pleistocene faunal deposit near Lake Chapala. Although they did not have time to excavate any test units, they found and identified many exposed fossils. On a previous trip, team members investigated a borrow pit excavated into fluvial sediments associated with the lake levels of the Pleistocene-Holocene transition. The excavation exposed a 50-by-100-meter concentration of mineralized Pleistocene faunal remains from two to three meters below the present surface. One horse bone exhibited three distinct cut marks.




JOEL D. IRISH

Pleistocene-age bone beds. During a previous trip we investigated a borrow pit that was excavated into fluvial sediments associated with the Pleistocene/Holocene lake level (Lake Chapala). The excavation exposed a 50-by-100-meter concentration of mineralized Pleistocene faunal remains two to three meters below the

was located in a second pit south of the first. This exposed bone level, measuring 100 by 100 meters, was also within Pleistocene-Holocene lake sediments. These mineralized remains, dark brown to black in color, consist of bison, mammoth, and horse.

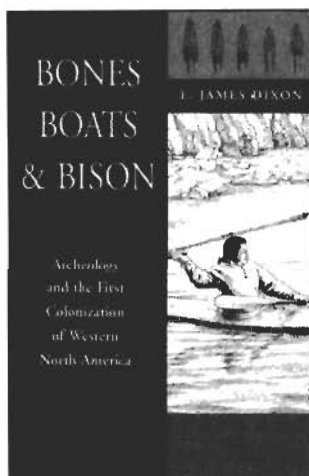
A third site was identified in a plowed

Continued research in the area appears promising. Our objectives for spring 2001 are to test both the rockshelters and bone bed sites. If time permits we will continue surveys in hopes of locating both the camelid petroglyphs and the Clovis-age sites near Zacualco Playa. 

New Books

Bones, Boats & Bison: Archeology and the First Colonization of Western North America, by E. James Dixon, University of New Mexico Press, 1999. 322 9½ by 6½-inch pages, \$49.95 (hardcover), \$24.95 (softcover).

Dixon, Curator of Archaeology at the Denver Museum of Natural History, presents a picture of human settlement of the Americas that should be familiar to **Mammoth Trumpet** readers. In an easy-to-read synthesis of research, Dixon evaluates many of the oldest archaeological sites in the Americas and argues for a relatively late settlement—about 13,500 radiocarbon years ago—by way of the Northwest Coast. After reviewing the early milestones of Paleoindian archaeology, the book describes the basic theories of colonization. Though discussions of the sites are necessarily brief and many old sites are not mentioned, the book brings together much of the existing background information relating to the peopling of the Americas. There are chapters on sites south of the border, physical anthropology, archaeological theory and interpretation, and the archaeology of the West's regions.



The Amateur Archaeologist in the Great Basin by L. J. Ettinger, available from Ettinger Publications, 1991 Saddleback Rd., Reno, NV 89511 (Phone 775-847-9303), 2000. 116 6 by 9-inch pages. Softcover. \$14 plus \$2 shipping and handling.

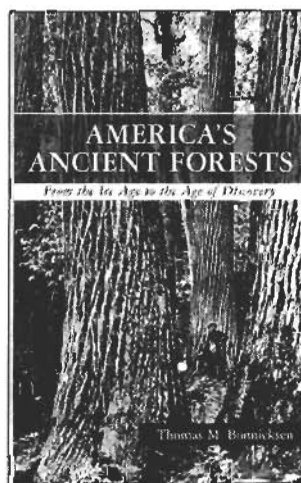
Geologist and lawyer Len Ettinger says he became seriously interested in archaeology relatively recently and this book is the result. He describes it as "a basic guide in eight chapters with a glossary and a list of references. The central theme is that there still are favorable geographic environments in which to find surface artifacts left by the early occupants of the Great Basin." It discusses how these favored environments have changed over the past 12,000 years. Calling the record of human presence in the Great Basin a puzzle with many incomplete chapters, he notes that some of the pieces have been found and documented by professionals. "Other pieces have been vandalized, picked up or dug up and removed by collectors without documentation. These are lost forever and leave voids in the puzzle." He urges collectors to donate or loan their collections to state museums or else to photograph them and furnish images to museums. The book includes a summary of state and federal law that applies to archaeology in the Great Basin.

Folsom Lithic Technology, Daniel S. Amick, editor, International Monographs in Prehistory Archaeological Series 12, P.O. Box 1266, Ann Arbor, MI, 48102-1266, 1999. 220 pages with 77 illustrations and 36 tables. \$65 (hardcover) \$35 (softcover) plus \$3.50 postage and handling.

The papers included in this book use comparative methods to identify patterns of lithic assemblage structure and variation that may provide insights into Folsom Technology. Studies consider several aspects of Folsom technology including tool manufacture and reduction-system modeling, studies of variation in raw materials, use wear, technological variation in weaponry assemblages, and the organization of technology. They contribute to a growing understanding of the patterns and processes in Folsom technology and the causes of diversity within Folsom lithic assemblages.

America's Ancient Forests: From the Ice Age to the Age of Discovery, by Thomas M. Bonnicksen, John Wiley & Sons, Inc., 2000. 304 9½ by 6½-inch pages. \$75 hardcover.

Here is a book by a forester that will be of interest to many



Mammoth Trumpet readers because it takes the big-picture view of United States forests that extends into the Pleistocene. It considers the Ice Age, Ice Age forests, the origins of modern forests, and human interactions—from Paleo-American time to the era of European conquest and settlement. The concluding chapters examine regional forests of the U.S. ranging from "the Spanish Explorer's Forests," from Southern pines westward to Coast redwoods, "Forests of the Colonies," and "the Trapper's Forests."

Geoarchaeology of the Great Plains, edited by Rolfe D. Mandel, University of Oklahoma Press, 2000. 336 pages, 45 illustrations, 12 maps, 3 tables. \$29.95 softcover. Add \$4 shipping and Handling, UO Press, 4100 28th Ave. NW, Norman, OK 73069.

Contributors to this book are John Albanese, Joe Allen Artz, E. Arthur Bettis III, C. Reid Ferring, Vance T. Holliday, David W. May, and Mandel. It traces the history of all major projects, researchers, theoretical developments, and sites contributing to the geoarchaeological knowledge of the Great Plains. 