



MAMMOTH TRUMPET

Center for the Study of the First Americans
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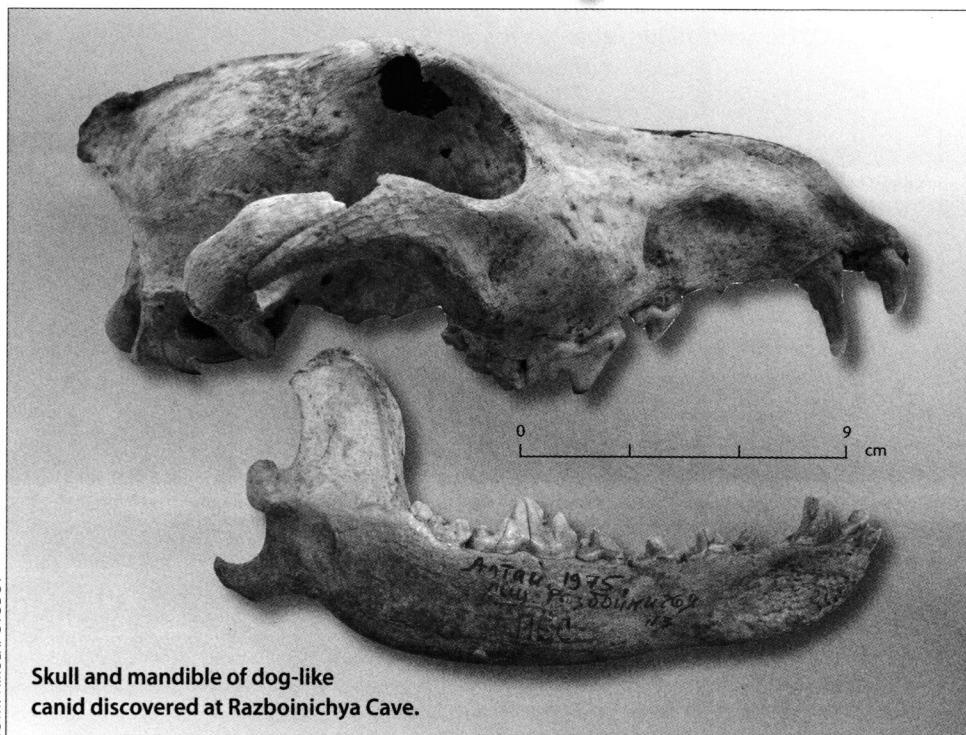
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Ancient Siberian Canid Skull Raises Questions



Skull and mandible of dog-like canid discovered at Razboinichya Cave.

BOTH: NIKOLAI OVODOV

WE DOTE ON DOGS. Gaze into the eyes of your favorite canine and you may find it hard to believe that your loving pet, be it beagle or borzoi or any other breed, is unquestionably a direct descendant of the gray wolf. Although geneticists have proved that fact

(MT 24-4, "Big Black Wolf"), we don't yet completely understand the evolutionary process that transformed wolf into dog. Thanks to the well-preserved skull and mandible of a dog-like canid discovered in the dark recesses of a cave in southern Siberia, however, we now have a clearer

INSIDE

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The Manis mastodon and other killed and butchered Pleistocene megafauna add up to a hefty database that begs us to rethink how the Americas were peopled.

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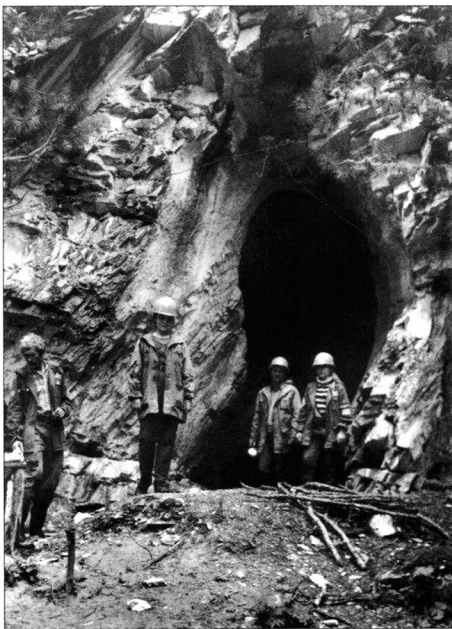
Western Stemmed Tradition points in dated contexts confirm the age of human coprolites for archaeologist Dennis Jenkins. WST points, he tells us, were being made before fluted-point makers appeared in Oregon and after they disappeared.

picture of transitional forms and the chronology of wolf-to-dog evolution.

Earliest dog-like canids

Fossil evidence of domestic dogs (*Canis familiaris*) dates almost exclusively from the late Glacial and early Holocene (ca. 14,000–9000 CALYBP). The few canid remains that predate the Last Glacial Maximum (26,500–19,000 CALYBP) are invariably so poorly preserved that it's impossible to identify features that distinguish transitional animals evolving from wolf to dog. Consequently scientists have been uncertain whether domestication began before the LGM.

In the 1970s, Nikolai Ovodov of the Institute of Archaeology and Ethnography SB RAS (Siberian Branch of the Russian Academy of Sciences) exploring Raz-



Razboinichya Cave, 1975.

boinichya Cave in the Altai Mountains of southern Siberia discovered a wide array of fossilized faunal remains and mummified animal tissue. A field station was built near the mouth of the cave, and Dr. Ovodov and his team continued their work, eventually recovering approximately 73,000 ancient animal bones. Interspersed with the bones of gray wolves was the skull of a dog-like canid with mandibles and most teeth intact.

"Ovodov meticulously excavated Razboinichya Cave for 10 years," says Russian geoarchaeologist Yaroslav Kuzmin, who continues to study the canid remains excavated by Ovodov. "His careful wet sieving of all the sediments is why such

excellent material was obtained, including the intact skull."

Razboinichya Cave is 90 m long. Its entrance is nearly horizontal, but inside it drops about 19 m into the main chamber 3 m high and 10 m wide topped with a loose layer of gray-brown loam. Below this are sediments rich with the fossilized bones of mammals and birds, small bits of charcoal, wood and bark, mollusk shells, and a few bones of reptiles, amphibians,

and fish. The most frequent inhabitants of the cave appear to have been cave hyenas, which probably used it as a den. Bones of fox, gray wolf, and brown bear were also discovered along with those of their likely prey—ibex and hares.

Missing link between gray wolves and domestic dogs?

Permafrost penetrating to the depths of the cave and non-acidic soil account



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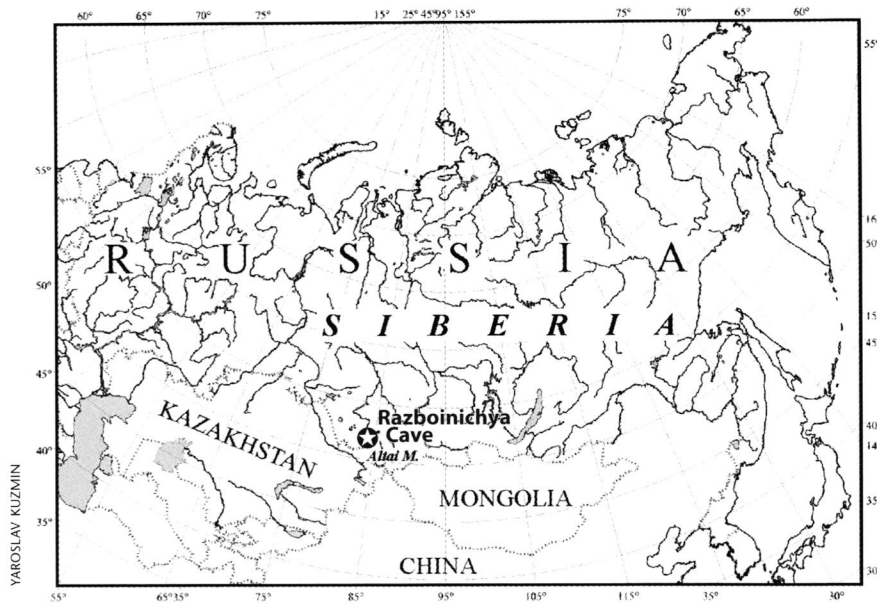
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Many years may pass between the time an important discovery is made and the acceptance of research results by the scientific community. To facilitate communication among all parties interested in staying abreast of breaking news in First Americans studies, the **Mammoth Trumpet**, a science news magazine, provides a forum for reporting and discussing new and potentially controversial information important to understanding the peopling of the Americas. We encourage submission of articles to the Managing Editor and letters to the Editor. Views published in the **Mammoth Trumpet** are the views of contributors, and do not reflect the views of the editor or **Center** personnel.

—Michael R. Waters, Director



for the remarkable degree of preservation of the cave's fossilized contents. Although no human remains were found, burnt bones and twigs in a layer with animal bones suggest a brief human occupation or occasional visits. Radiocarbon dating of the bones of a brown bear that lay in close proximity to the dog-like canid's skull yielded an initial result of 15,000 RCYBP (18,000 CALYBP), which piqued the interest of experts in animal genetics from the Institute of Evolutionary Anthropology in Germany, who approached Dr. Kuzmin with a proposal for further research.

Kuzmin and his colleagues collected samples of wolf bones and teeth from Paleolithic sites in Siberia for a study of wolf DNA. Among the wolf teeth were some specimens from Razboinichya Cave that had been recovered from the same layer as the dog-like skull. The resulting tests surprised Ovodov and Kuzmin: New radiocarbon dates were much older than they had suspected—48,000 RCYBP, or 52,000 CALYBP. Kuzmin was convinced that direct testing of the dog-like skull was needed using state-of-the-art methods. Not only does accelerator mass spectrometry (AMS) yield greater accuracy than 1970s-era radiocarbon-dating technology, it requires only a minuscule sample (1 gram instead of nearly half the specimen).

Kuzmin prepared a bone sample for colleague Dr. Gregory Hodgins of the Arizona Accelerator Mass Spectrometry Laboratory in Tucson. The results: 29,900 RCYBP, or 34,700 CALYBP. To ensure scientific accuracy, Ovodov and Kuzmin had the tests repeated by Dr. Thomas Higham at Oxford University and Dr. Johannes van der Plicht at the University of Groningen

in the Netherlands. In 2009, assembled results showed that the average AMS date for the Siberian canid skull was 30,000 RCYBP, or 33,000 CALYBP, making it one of the oldest dog-like canids ever identified and verifying that the canid roamed the Altai Mountains before the LGM.

Susan Crockford from the University of Victoria in British Columbia, Canada, was also invited to participate in the study of this unprecedented find. A distinguished scholar in archaeozoology, Dr. Crockford had previously served as chairperson of the 1998 Symposium on dog archaeology and thus gave the team invaluable perspective.

Astonishing results

Crockford suggests that the head of the animal may have resembled that of a modern Samoyed. "The skull of the Razboinichya individual was not as large as that of the large male malamute in

our modern comparative collection," she explains. "Because we do not have associated limb bones, it is hard to suggest a height for the living animal. Wolves are, generally speaking, taller, leaner animals than most dogs with wolf-sized heads. I think a shoulder height of 23 to 25 inches could be in the ballpark, not an especially large animal compared to some modern breeds."

The scientists took careful measurements of the skull and compared the measurements with those of European late-Pleistocene wolves (considered likely ancestors to early dogs in northern Eurasia), Greenland dogs (used to represent fully domestic dogs of large size but unimproved type), and modern wolves from Europe and North America.

The skull of the Siberian canid, clearly differing from modern and archaic wolves, in general most closely resembles that of prehistoric Greenland dogs from 1,000 years ago. The skull is smaller than that of the smallest Paleolithic dog reported by Germonpre et al. in 2009 in an analysis of several canid skulls discov-



Ovodov with his faithful dog at the Razboinichya Cave field station, 1980s.

ered in Belgium, Ukraine, and Russia. Points of comparison emphasize basic skull size and shape, snout length and width, and tooth crowding. Ovodov, Crockford, and Kuzmin found that the Razboinichya Cave animal has a short, wide snout. The carnassial teeth, the fourth premolars used for crushing hard material, aren't markedly smaller than those of wolves, and the teeth don't show evidence of crowding. Slight wear on the teeth indicates that the Siberian canid was an adult at death. The skull,

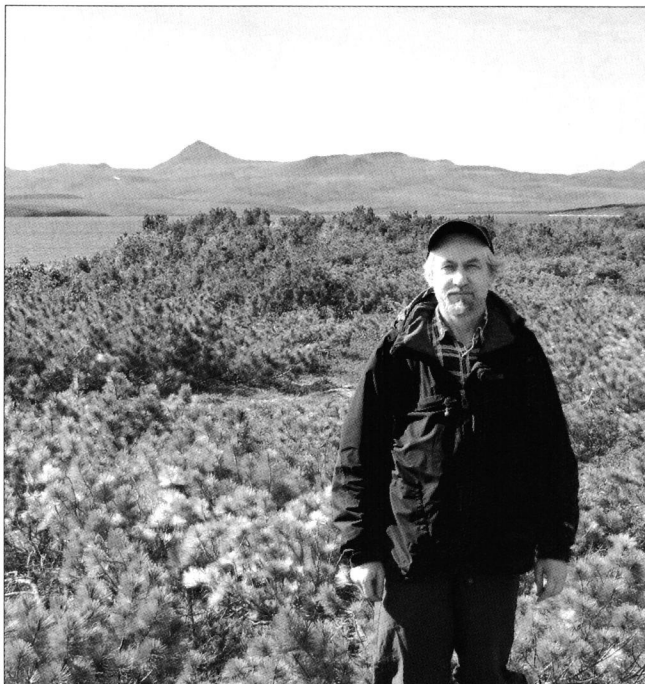
whose robust cranium and fairly well developed stop fall within the metric criteria of Neolithic and later dogs, led the scientists to conclude initially that it may represent an animal in the very early stages of domestication.

Nearby human occupations

"There were burnt twigs in the remote (and dark) part of the cave," Kuzmin explains, "which means that humans were familiar with the existence of Razboinichya Cave. Also, 2 km away is the well-known archaeological site of Kaminnaya Cave, which was perhaps occupied at that time. There are cultural layers in this cave that can be dated up to ca. 33,000 years ago."

Middle and Upper Paleolithic caves and open-air sites in the vicinity appear to have been occupied by relatively sedentary hunter-gatherers, who probably spent many

Kuzmin in Chukotka on the bank of Anadyr River, August 2009; in the background is the Raryktin Range. Of the Chukotkan summer (which is 2–3 months long), he says, "When there is no rain and wind, and crowds (!) of mosquitoes, it's very nice. But . . . as locals say, 'We have 12 months of winter, and the rest is summer!'"



YAROSLAV KUZMIN

months at a time in the area before the Last Glacial Maximum. Long-term occupancy is conducive to the domestication of wolves attracted by food scraps left at butchering sites. When the LGM began, these humans, having to range farther afield in search of food, necessarily became more mobile. Because year-round population of the area didn't resume until the end of the Ice Age, Crockford and Kuzmin conclude that the canid skull likely represents an evolutionary dead end. "That these transitional canids died out without issue," they say, "is something that may have happened many times before the Last Glacial Maximum."

The lasting human-dog bond

Domestication was once thought to be a process that involved a deliberate act of selection by humans, but in recent

Crockford, 2011.



A. FREDERICK

years an alternative explanation has challenged this belief. Some now suggest that animals of their own volition may have colonized the environment used by man and evolved by natural

processes. This explanation better fits genetics evidence that domestication occurred repeatedly in different geographic sites and at different times. After initial natural evolutionary changes, humans may have intentionally further modified the species by selectively breeding animals suited for hunting, guarding, and herding.

Kuzmin and his colleagues suggest that the Siberian canid and other pre-LGM canids weren't able to form lasting lineages because of the immense ecological changes of the LGM. No dog-like remains have been discovered so far in central Europe and Siberia that date to pre-LGM times. Since wolves appear to have been attracted to permanent or semi-permanent settlements, dog lineages didn't reappear until the early Holocene, when they arose in Europe, the Middle East, and

China. Dogs then became a consistent component of human settlements and were even sometimes deliberately buried with humans.

"The fact that there were people living in the vicinity of Razboinichya Cave around the same time as the radiocarbon date of the skull led us to consider that the dog-like features (particularly the small size) of the animal might have been the result of the earliest stages of domestication," says Susan Crockford. "However, no dog-like canids have been found in any of the other cultural (archaeological) sites in the Altai region, so the animal may instead prove to be one anomalous individual among many typical wolves."

The team reports that "the two earliest dog-like canids from Western Europe (Goyet Cave, Belgium) and Siberia (Razboinichya Cave) were separated by thousands of kilometers and suggest that dog domestication was multi-regional and thus had no single place of origin (as some DNA data have suggested) and subsequent spread."

Thought-provoking conclusions

Crockford says that her research indicates "no evidence to support the notion that humans were directly responsible for domesticating wolves. Rather, wolves

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NOT TOO LONG AGO, most New World archaeologists believed that the Clovis culture was the earliest occupation of the Americas. Oh, there were always a few sites where the facts suggested otherwise, but such evidence was often explained away—or simply ignored in the rush to consensus. Over the past two decades, however, the Clovis-first concept has taken a beating. Conviction on the subject first softened to uncertainty, then eased back to ambiguity and, finally, substantial doubt as the evidence for earlier occupation of the New World mounted.

In the 21 October 2011 issue of *Science*, CSFA Director Mike

with the new calculations, and some still don't, but the Waters-Stafford research has helped usher the Clovis-first paradigm out the door. So has the meticulous work Waters has more recently undertaken at the Debra L. Friedkin site in Texas, potentially pushing the pre-Clovis occupation of the Lone Star State as far back as 15,500 CALYBP (**MT 27-2, -3**, "Buttermilk Creek").

Confirming Manis as a 14,000-year-old kill site presents some interesting possibilities that will certainly guide future research as scholars sail the uncharted waters of this phase of North American prehistory. Among other things, Manis may help disprove the famous overkill theory of megafauna

The Manis Mastodon in Context

A Glimpse into Pre-Clovis North America



DAVID OVERSTREET

Waters and ten colleagues struck a heavy blow for pre-Clovis with a detailed reevaluation of the Manis Mastodon site, a locality in Washington State that was excavated by Carl Gustafson in the 1970s. The Waters team demonstrated that a slender bone splinter imbedded in one of the mastodon's ribs was almost certainly a bone projectile point (**MT 27-2**, "Reconsidering the Manis Mastodon"). Even more telling, they proved that the site dates to almost 14,000 years ago—800 years before Clovis.

A quiet revolution

Dr. Waters is no stranger to controversy. In 2007, he and geochronologist Thomas Stafford shocked the archaeological world with an unexpected but well-supported recalculation of the age and duration of the Clovis culture (**MT 22-4**, "Clovis Dethroned"). Notwithstanding the fact that many of us had already become convinced by then that Clovis wasn't, in fact, America's earliest culture, the contraction of its reign to the astonishingly brief interval of 13,100–12,800 CALYBP provided a capstone that helped stabilize the growing pre-Clovis edifice. Not everyone agreed

Mammoth bone pile at the Hebior site (47KN265). Note the biface in situ at the center of the photo (arrow). Hebior dates to 12,000–12,500 RCYBP (about 14,000–14,500 CALYBP).

extinction. After all, if humans were hunting megafauna 1,000 years before Clovis, then a terminal Pleistocene "blitzkrieg" as human hunters swept across the continent for the first time can hardly be blamed for their demise.

Furthermore, Manis is distinctive in that no stone tools are directly associated with the mastodon kill, making it unlike many known and supposed pre-Clovis sites. This suggests the tantalizing possibility that the pre-Clovis peoples, while thin in numbers on the ground, were more culturally diverse than Clovis. Did the earliest North Americans derive from multiple origins, with each population bringing their own traditions from the Old World? Or might they have descended from a single population that had spread through the continent and adapted to local conditions long before the rise of Clovis technology smoothed out most regional variations?

It's impossible to say what it all means at this point, but it's going to be fun finding out.

Good company

Meadowcroft Rockshelter, Pennsylvania; **Cactus Hill**, Virginia; **Coats-Hines**, Tennessee; **Kenosha County**, Wisconsin; **Debra L. Friedkin**, Texas; **Paisley Caves**, Oregon; **Ayer Pond**, Washington. These localities represent just a cross section of pre-Clovis sites, and they're located all over North America. So Manis isn't entirely unique. But well-dated sites like Manis are still rare, and they're always controversial. Consider Paisley Caves, where coprolites containing human DNA have been dated to 14,200 CALYBP (**MT 25-4, 26-1**, "Paisley Caves"; this issue, "The Western Stemmed Tradition Points from Paisley Caves: Older than Clovis"). Whether those ancient feces are actually human or not has been hotly debated; some argue that they were deposited by canids that somehow came into contact with humans. This relatively minor detail

A curated mammoth bone from Mud Lake bearing cutmarks from stone tools.

aside, it's hard to deny that humans were present in pre-Clovis Oregon. Manis, located in nearby Washington and slightly younger, may represent a related population.

Ayer Pond, on Orcas Island in the Salish Sea dividing British Columbia and Washington, may also reflect the activities of a local pre-Clovis population. Manis itself lies near the southern coast of the sea, less than 90 km south of Ayer Pond, which was discovered in 2003 when workmen digging a backhoe trench uncovered a *Bison antiquus* bone pile preserved in wetland deposits (**MT 26-3**, "Pre-Clovis Butchers of *Bison antiquus*"). Like Manis, Ayer Pond was initially believed to be of paleontological interest only, since the bones date to 13,900 CALYBP. But a recent re-examination, published in *Quaternary International*, revealed conchoidal percussion and spiral fractures—hallmarks of human butchering (**MT 23-1**, "Early Mammoth Bone Flaking on the Great Plains").

Coats-Hines was discovered in 1977, when mastodon bones were exposed when constructing a golf course. Though it's located halfway across the continent in central Tennessee, Coats-Hines is remarkably similar to Manis in that it represents a multi-animal mastodon kill—this time with a few stone tools. The oldest mastodon remains there are at least as old as Manis. According to Ph.D. candidate Jesse Tune of Texas A&M University, who coauthored a report on Coats-Hines in the fall 2011 issue of *Ten-*

nessee Archaeology, "It's the only known site in the region that has provided evidence of humans directly interacting with, and preying on, extinct Pleistocene species such as the American mastodon." Since Paleoindian sites are fairly common in the region, this is especially noteworthy.

In Kenosha County, Wisconsin, David Overstreet, Director



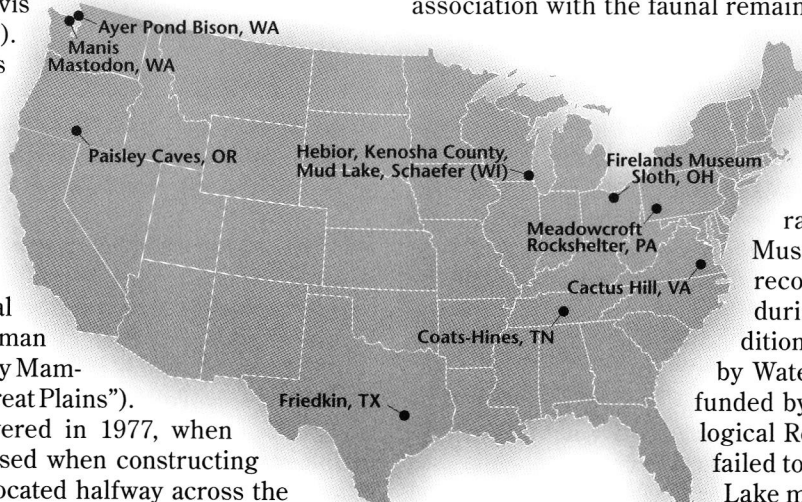
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of the Center for Cultural research at the College of Menominee Nation, and Dan Joyce, Curator of Archaeology at the Kenosha Public Museum, have identified three mammoth sites in locations that coincide with the southern margin of the continental ice sheet at the end of the Pleistocene. The mammoth sites—Hebior, Schaefer, and Mud Lake—yielded bones with clear butchering marks. At Hebior (excavated by Dr. Overstreet) and Schaefer (excavated by Dr. Joyce), definite but non-diagnostic stone tools were found in direct association with the faunal remains. The Schaefer site dates

to 14,200 CALYBP, the Hebior site to 14,800 CALYBP. Mud Lake, even older at about 15,500 CALYBP, is known primarily from bone samples curated at the Kenosha Public Museum, though Joyce's team recovered a tooth from the site during fieldwork in 1997. Additional field efforts conducted by Waters and Joyce in 2004–05, funded by the North Star Archaeological Research Program (CSFA), failed to locate the rest of the Mud Lake mammoth.

As with Manis, the bones at all three sites were preserved in wetland sediments associated with Pleistocene glacial processes.

Another noteworthy find is the Firelands Sloth. In 1998, the misidentified bones of a Jefferson's ground sloth (*Megalonyx jeffersonii*) were unearthed in the attic of the Firelands His-



torical Society Museum in Norwalk, Ohio. Later examination revealed distinct cutmarks on the left femur on the left femur made by stone tools (MT 28-1, "Pre-Clovis Butchered Ground Sloth in Ohio"). A bone sample dates it to 13,738–13,435 CALYBP—roughly 200–700 years before the Clovis era. Clearly, humans were butchering megafauna in north-central Ohio, as in Washington, Wisconsin, and Tennessee, well before Clovis appeared on the scene. Unfortunately, the provenience of the sloth is uncertain. Researchers have determined that it was recovered from a swamp in Huron County around the turn of the 20th century, but the discoverer died before he could reveal the exact location.

Protein harvesting

A factor that makes Manis so intriguing is that it apparently represents a very early kill site. But did hunters actually track down the mastodon and dispatch it using cooperative hunting methods . . . or did they just take advantage of an existing situation? Humans have a long tradition of scavenging animals that are freshly dead and of finishing off game rendered helpless in natural traps.

The Manis mastodon was an elderly specimen and may have been killed while life ebbed away. "It might even make *more* sense if the animal was lying on its side and someone came in and finished it off," Waters points out. Considering that the spot where the mastodon died was a glacial pond at the time, it's also possible it had become mired in mud and exhausted itself trying to escape—making it an easy target for any Paleoamerican hunter who happened along.

In their *Science* article, Waters et al. cite the Kenosha County sites as evidence of pre-Clovis hunting, but Dr. Overstreet isn't sure that's actually the case. "From the context we have at Schaefer, Hebior, and Mud Lake, I think you have to consider both hunting *and* scavenging," he says. "We don't have very compelling evidence that they were actually hunted. . . . In fact, I think the Wisconsin animals might have been scavenged." Indeed, Overstreet is skeptical of most of the evidence for early big-game hunting because

with few exceptions (notably the Naco mammoth in Arizona), there's little or no evidence that megamammals actually *were* hunted down and killed by those who butchered them. It pleases those enamored of romantic legends to steadfastly maintain that the First Americans earned their living solely by hunting big game.

The scavenging possibility throws new light on the blitzkrieg idea. Perhaps the earliest Americans went through a phase when scavenging or finishing off trapped megafauna was more common than actually hunting it. This doesn't necessarily invalidate a later overkill event as they adopted Clovis technology, but it's a possibility worth considering.

The path to Clovis

Based on our current understanding of the evidence, it appears that a sparse but diverse human population was scattered across North America for at least 1,000 years before the Clovis culture appeared. Although we need more data to be sure, the recent revelations at Manis, Coats-Hines, Friedkin,

Looking for the Mud Lake mammoth, 2005.

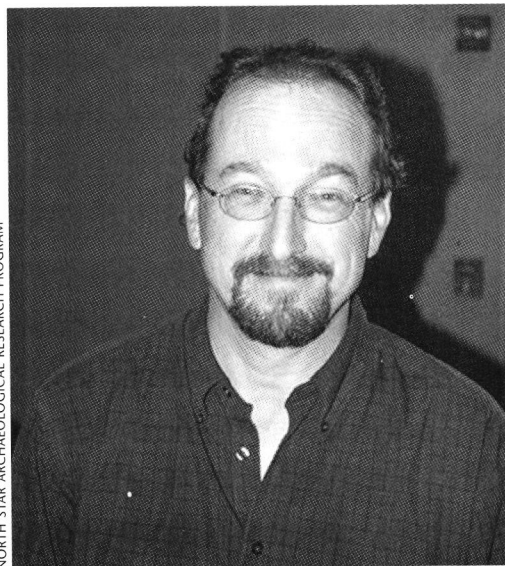


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Paisley Caves, Ayer Pond, and similar sites have contributed tipping evidence to older data from sites like Meadowcroft, Kenosha County, and Cactus Hill.

It's hard to say when humans initially colonized North America, though the first wave probably arrived after the Last Glacial

Maximum, no earlier than 16,000 years ago. The population seems to have remained relatively small and quiescent for centuries—possibly millennia—until Clovis exploded into prominence, leaving such an obvious mark on the archaeological record that earlier cultures were all but drowned in the data. In any case, the rapid diffusion of Clovis technology is one of the events that define prehistoric culture in the Americas, much like the later adopting of the bow and arrow. Both events happened overnight in historical



Joyce, excavator of the Schaefer mammoth.

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terms, redefining the lifestyle of existing cultures. "It was just a phenomenal idea," says Overstreet, "and there were probably already existing communications networks and exchange systems in place that would have allowed Clovis technology to spread very rapidly."

The sudden archaeological visibility of Clovis may be the result of a population explosion that followed in the wake of the technology. If that's true, then perhaps the combination of better tools and more hunters *did* drive some declining megafaunal species over the edge into extinction. That would mean it wasn't the initial "blitzkrieg" entry of humans into North America that killed off the megafauna, but rather a combination of ecological changes and new technology adopted by people who were already here.

The way forward

As with any other scientific model, the only way to confirm the existence of a pre-Clovis occupation of North America is to find and test new data to see how they affect our theoretical framework. So where can we locate the sites we need?

The arid environment of Paisley Caves is one type of setting conducive to preserving a pre-Clovis site; a glacial-margin environ-

Tune at the Coats-Hines site, 2010. Coats-Hines dates to 12,050 RCYBP (c. 14,000 years CALYBP). ►

Overstreet at Thunder Bay, Ontario, 2012. ▼

ment is another. Ayer Pond, Manis, and the Kenosha County sites all formed in marshy outwash areas that offered excellent hunting for anyone who might have been present. Dr. Gustafson, who excavated Manis, suggests that pre-Clovis hunters in Washington practiced what modern hunters call "puddle-jumping," going from one pond to another until they found game. This would work whether they were hunting or scavenging.


Furthermore, a glacial wetland is an environment made to order for preserving organic remains, either by inundation in meltwater or burial by associated sediments. "The intramontaine lows are filled with the kinds of mucks and peats in which these bone piles are going to be preserved," says Overstreet about southeastern Wisconsin. This is also true of many areas in the Pacific Northwest, including the Olympic Peninsula in Washington State, where Manis is located.

Many of these hypothetical sites would be buried under meters of deposits, so excavation wouldn't be easy; but some candidates are easier to access. Regional archaeologists in both Washington State and southeastern Wisconsin, for example,

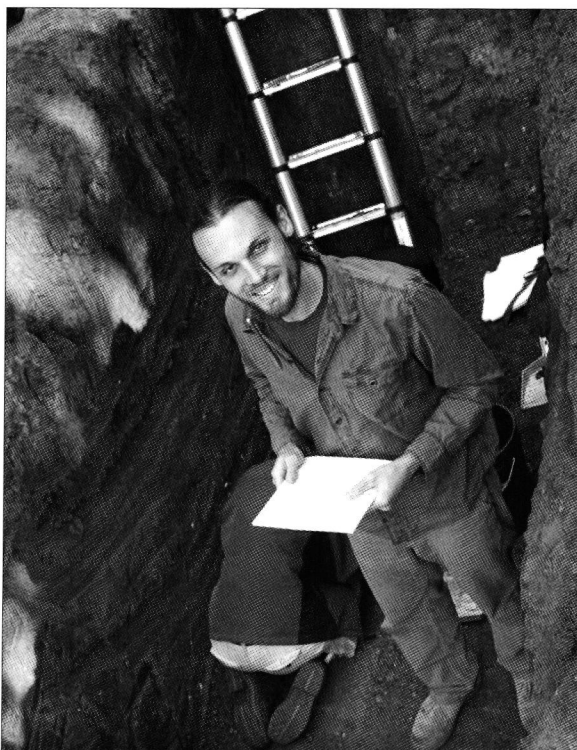
know of other local sites similar to Manis and the Kenosha County localities. The problem in most cases is persuading

landowners to agree to permit exploratory digging. This can be difficult indeed, but ultimately it's more a matter of diplomacy than of technical limitations. And even these obstacles can be overcome in large measure as technologies like remote sensing become more refined. "We're not there yet," says Overstreet, "but we're moving toward the point where we'll be able to answer the questions about the nature of these sites and how old they are."

Manis and its contemporaries are opening up a whole new branch of archaeological study. "These sites are forcing us to rethink how we've

interpreted the initial human migration into the Western Hemisphere," Jesse Tune notes. "They also show us that we're far from having all the answers—which makes this an exciting time to be a Paleoindian archaeologist." 

—Floyd Largent



JESSE TUNE



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Ancient Siberian Canid Skull


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domesticated themselves and then humans took advantage of the event. Humans played a part by creating a new habitat, transforming the landscape around their early settlements, and some wolves had attributes (e.g., curiosity, fearlessness) that made them able to operate in close proximity to humans. Thus, only a particular subset of wolves made up the founder population. Looking at the process this way means abandoning the old idea that the initial domestication of animals and plants was a human accomplishment."

"Early dog-like canid specimens," Crockford says, "have caused many scientists to rethink long-held assumptions about the domestication process and more particularly what criteria are sufficient to classify any one specimen as an early representative of a domestic animal. While some anthropologists still presume that ancient humans deliberately captured wild wolf pups with the intent to domesticate them as hunting companions, there is no evidence yet to support this explanation. Experimental evidence suggests that wolves almost certainly domesticated themselves—some wolves moved into the area around early settlements that people set up, attracted by the leftovers from hunting and butchering.

"What we don't know is whether a settlement occupied year-round was required or if a seasonal hunting camp would be enough to entice some wolves into the human fold without being killed. Human hunters that lived before and during the last Ice Age, and just after it, moved their camps around the landscape, but around 12,000 years ago, some groups established permanent villages. It may be that a seasonal hunting camp may have been enough for wolves to change in small ways (recognizable as an "incipient dog"), but a village set-

ting may have been required to produce a fully domestic dog."

The search for answers to the questions raised by the Razboinichya Cave skull is far from over. "Our current research continues the accumulation and assessment of data on the morphology of Pleistocene wolves in Eurasia," Kuzmin says. "A better understanding of the variability within wolves will make it easier to pinpoint when the earliest dog-like canids appeared in the fossil record. The geographic locations and chronological order of these discoveries," he adds, "enrich our understanding of human history and evolutionary processes. The fact that the Siberian canid is probably an early, disrupted lineage rather than the oldest ancestor of modern dogs in no way detracts from its historical or biological importance." 

—Martha Deeringer



The Samoyed breed resembles the Siberian canid in skull morphology. This Samoyed, Rex of White Way, set the world record February 22, 1954, in weight pulling in West Yellowstone, Montana, by pulling 1,870 pounds. Rex (1946–57) was famous for mountain rescues.

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Suggested Readings

Crockford, S. J., and Y. Kuzmin. "Comments on Germonpre Et Al. Journal of Archaeological Science 36, 2009 "Fossil Dogs and Wolves from Paleolithic Sites in Belgium, the Ukraine and Russia." *Journal of Archaeological Science* 39 (2012):2797–2801.

Germonpre, M., M. Laznickova-Galetova, and M. V. Sablin. "Palaeolithic Dog Skulls at the Gravettian Predmosti Site, the Czech Republic." *Journal of Archaeological Science* (2011)39:184–202.

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reiter, M. Stiller, and V. R. Despres. "Fossil Dogs and Wolves from Palaeolithic Site in Belgium, the Ukraine and Russia: Osteometry, Ancient DNA and Stable Isotopes." *Journal of Archaeological Science* (2008) 36:473–90.

Kuzmin, Y. "The Oldest Asian Dog." *Science in Siberia, Weekly Newspaper of the Siberian Branch of the Russian Academy of Sciences* (4 August, 2011). <http://www.sbras.ru/HBC/article.phtml?nid=600&id=17>

Ovodov, N., S. J. Crockford, Y. Kuzmin, T. F. G. Higham, G. W. L. Hodgins, and J. Van Der Plicht. "A 33,000-Year-Old Incipient Dog from the Altai Mountains of Siberia: Evidence of the Earliest Domestication Disrupted by the Last Glacial Maximum." *PLoS ONE* 6(7) (2011). e22821; <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0022821>

The BIG Picture!

Here is what's waiting for you in Santa Fe—the complete slate of speakers and their presentations, and the inventory of the once-in-a-decade display of artifacts. Be there!

Thursday, October 17

8:00–8:30 Conference Introduction

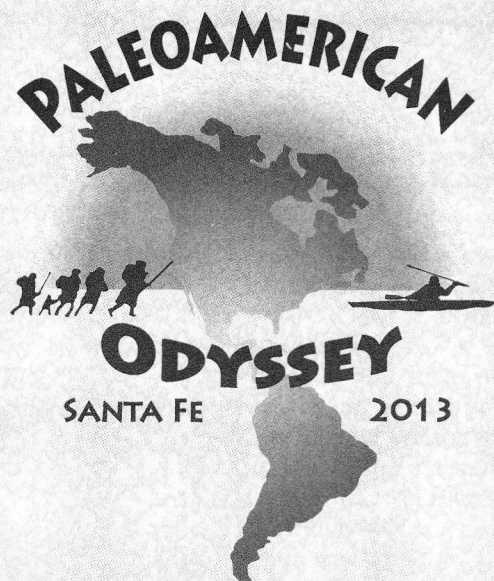
The Archaeology of Late-Pleistocene Beringia

- 8:30–9:00 Yana RHS site, earliest occupation of Siberia *Vladimir Pitulko, Pavel Nikolskiy, Aleksandr Basilyan, and Elena Pavlova*
- 9:00–9:30 Human technological and behavioral adaptation to landscape changes before, during, and after the Last Glacial Maximum in Japan *Masami Izuho*
- 9:30–10:00 Late-Pleistocene Siberia: Setting the stage for the peopling of the Americas *Kelly Graf*
- 10:00–10:30 Break
- 10:30–11:00 Technology and economy among the earliest prehistoric foragers in interior eastern Beringia *Ben Potter, Chuck Holmes, and David Yesner*
- 11:00–11:30 Biface traditions in Alaska and their role in the peopling of the Americas *Ted Goebel, Jeff Rasic, and Heather Smith*
- 11:30–12:00 Discussion—Q&A period with all presenters
- 12:00–1:00 Lunch



Late-Pleistocene Migration Routes and the Origins of the First Americans

- 1:00–1:30 After Clovis—First collapsed: Reimagining the peopling of the Americas *Jon M. Erlandson*
- 1:30–2:00 Searching for Pleistocene-age submerged archaeological sites along western North America's Pacific Coast: Current research and future needs *Quentin Mackie, Loren G. Davis, Daryl Fedje, Duncan McLaren and Amy E. Gusick*



- 2:00–2:30 The Chesapeake bifaces: Evidence for an LGM occupation of the mid-Atlantic region of North America? *Dennis Stanford, Darrin Lowery, Margaret Jodry, Bruce Bradley, Marvin Kay, and Robert J. Speakman*
- 2:30–3:00 Vectors, vestiges, and Valhallas? Rethinking the Corridor *John W. Ives and Duane Froese*
- 3:00–3:30 Break
- 3:30–4:00 Three-stage colonization model for the peopling of the Americas *Connie Mulligan and Andrew Kitchen*
- 4:00–4:30 A genomic sequence of a Clovis individual *Eske Willerslev*
- 4:30–5:00 The initial human colonization and settlement of interior North America *David G. Anderson*
- 5:00–5:30 Discussion—Q&A period with all presenters

Friday, October 18

The Clovis Archaeological Complex

- 8:00–8:30 Clovis across the continent: Distribution, chronology, and climate *Vance T. Holliday and Shane Miller*
- 8:30–9:00 Clovis technology: A beautiful complexity *Bruce A. Bradley and Michael B. Collins*
- 9:00–9:30 Clovis-era subsistence: Continental patterning and regional variability *Gary Haynes*
- 9:30–10:00 Break
- 10:00–10:30 Clovis caches: An update and consideration of their role in the colonization of new lands *David Kilby and Bruce Huckell*
- 10:30–11:00 The Younger Dryas Boundary (YDB) cosmic impact hypothesis, 12.9 ka: A review *James P. Kennett, Allen West, Ted Bunch, and Wendy Wolbach*
- 11:00–11:30 Pleistocene extinctions: The state of evidence and the structure of debate *Nicole M. Waguespack*
- 11:30–12:00 Discussion—Q&A period with all presenters
- 12:00–1:30 Lunch

Late-Pleistocene Archaeology of Western North America and South America, and the Biological Evidence for the Peopling of the Americas

- 1:30–2:00 The increasing complexity of the colonization process: A view from the North American west *Charlotte Beck and George T. Jones*
- 2:00–2:30 Bioarchaeological biographies of ancient Americans *Douglas W. Owsley*
- 2:30–3:00 The first humans in the Yucatán peninsula found in drowned caves: The days of the late-Pleistocene/early-Holocene in a changing tropic *Arturo H. Gonzalez Gonzalez, A. Terrazas, M. Benavente, J. Avilés, C. Rojas, J. M. Padilla and E. Acevez*

- 3:00–3:30 Break
- 3:30–4:00 Rethinking early objects and landscapes in the Southern Cone
Nora Flegenheimer, Laura Miotti and Natalia Mazzia
- 4:00–4:30 Late-Pleistocene economic and cultural diversity in north Peru
Tom D. Dillehay
- 4:30–5:00 The first colonization of South America eastern lowlands: Brazilian archaeological contributions to Settlement of America models
Adriana Schmidt Dias and Lucas Bueno
- 5:00–5:30 Early human occupation of Lagoa Santa, central Brazil: Implications for the dispersion and adaptation of early human groups in South America
Mark Hubbe, Walter Neves, Danilo Bernardo, André Strauss, Astolfo Araujo, and Renato Kipnis with Neves
- 5:30–6:00 Discussion—Q&A period with all presenters

Saturday, October 19

The Older-Than-Clovis Archaeological Record of North and South America

- 8:00–8:30 Adaptations along the ice margin: Analysis, interpretation and implications of four pre-Clovis megafauna butchery sites in the western Great Lakes Region
Daniel J. Joyce
- 8:30–9:00 Paisley Caves: 14,500 years of human occupations in the northern Great Basin
Dennis L. Jenkins
- 9:00–9:30 In search of the First Americans? What the Friedkin site, Texas, and Manis site, Washington, tell us about the First Americans
Michael Waters
- 9:30–10:00 Break
- 10:00–10:30 The ones that still won't go away
J. M. Adovasio and D. R. Pedler
- 10:30–11:00 Topper, an early-Paleoamerican site in South Carolina
Albert C. Goodyear, Douglas A. Sain, Megan Hoak King, Derek T. Anderson, and M. Scott Harris
- 11:00–11:30 Discussion—Q&A period with all presenters
- 11:30–12:30 Lunch
- 12:30–1:00 The Mammoth Steppe hypothesis: The mid-Wisconsin (OIS 3) peopling of the Americas
Steven R. Holen and Kathleen Holen

- 1:00–1:30 The Pleistocene human occupation of Piauí: An unacceptable reality? And nevertheless they are old!
Eric Boëda
- 1:30–2:00 North America before Clovis: Variance in temporal/spatial cultural patterns, 24,000 to 13,000 BP
Michael B. Collins, Dennis J. Stanford, and Darrin L. Lowery
- 2:00–2:30 Fingerprinting stone tool production processes: Towards an identification of human artifact characteristics
William Andrefsky, Jr.
- 2:30–3:00 A geoarchaeological approach to the search for pre-Clovis sites in North America: An example from the Central Plains
Rolfe D. Mandel
- 3:00–3:30 Geochronology, stratigraphy and taphonomy as the foundations for pre-Clovis research
Thomas W. Stafford, Jr.
- 3:30–4:30 Panel discussion summarizing the Conference
- 4:30–5:00 Closing statements

Banquet 6:00 Occupying new lands: Global migrations and cultural diversification with particular reference to Australia

Peter Hiscock



South America

Special display of Clovis-like bifaces, points, overshot flakes, and blades from the El Cayude site, Venezuela; El Jobo and Fishtail points from Pedregal Valley and the Caribbean coast of Venezuela; and early artifacts from Vale da Pedra, Brazil.

Pre-Clovis

Artifacts and other evidence—including projectile points, bifaces, blades, bladelets, bladelet cores, burins, scraper, knives, bone points, human coprolites, modified mammoth bone, mammoth bone flakes, butchered mammoth leg bones, and more—will be on display from these key sites.

Blueberry Hill, Virginia ■ Cactus Hill, Virginia ■ Coats-Hines, Tennessee ■ Duewall-Newberry, Texas ■ Friedkin, Texas ■ Gault, Texas ■ Hebior Mammoth, Wisconsin ■ Manis, Washington ■ Meadowcroft Rockshelter, Pennsylvania ■ Miles Point, Maryland ■ Mud Lake, Wisconsin ■ Paisley Caves, Oregon ■ Pearsall site, Virginia ■ Schaefer Mammoth site, Wisconsin ■ La Sena, Nebraska ■ Lovewell, Kansas ■ Topper, South Carolina

Beringia

A special collection of fluted points and artifacts from these key sites in Alaska: Swan Point ■ Serpentine Hot Springs ■ Owl Ridge ■ Dry Creek

Solutrean

Artifacts from various sites in Europe and laurel-leaf points from the Atlantic shelf of the eastern seaboard of the U.S.—including the Cinmar biface! ★

Japan

Late microblade and early microblade Upper Paleolithic and Pre-Upper Paleolithic artifacts from these sites:

Kamihoronai-Moi ■ Ogachikato-2 ■ Shimaki ■ Rubenosawa

★ For a sneak preview, see page 16. For the real thing, come to the 2013 Paleoamerican Odyssey Conference!

Artifact Exhibits

Clovis

Artifacts—including projectile points, bifaces, blades, blade cores, overshot flakes, endscrapers, channel flakes, and other tools—will be on display from the following sites:

Blueberry Hill, Virginia ■ Cactus Hill, Virginia ■ Carson-Conn-Short, Tennessee ■ Crook County Cache, Wyoming ■ De Graffenried Cache, Texas ■ Eckles Clovis site, Nebraska ■ Fenn Cache, Plains ■ Friedkin, Texas ■ Gault, Texas ■ Hogeys Cache, Texas ■ Jake Bluff, Oklahoma ■ Jefferson Island, Maryland ■ Johnson, Tennessee ■ Little River Complex, Kentucky ■ Mochorn Island, Maryland ■ Mockingbird Gap, New Mexico ■ Pearsall site, Virginia ■ Rimrock Draw Rockshelter, Oregon ■ Sage Hen Gap, Oregon ■ Shawnee-Minisink, Maryland ■ Sheep Mountain, Oregon

Western Stemmed Tradition

Artifacts—including projectile points, bifaces, scrapers, knives, bone tools, and perishable artifacts—will be on display from the following sites:

Bonneville Estates, Nevada ■ Paisley Caves, Oregon ■ Rimrock Draw Rockshelter, Oregon ■ Sage Hen Gap, Oregon ■ Sheep Mountain, Oregon ■ Cooper's Ferry, Idaho ★

Folsom and Late Paleoindian

Artifacts—including points, channel flakes, endscrapers, knives, and other tools—will be on display from the following sites:

Badger Hole, Oklahoma ■ Cooper, Oklahoma ■ Jake Bluff, Oklahoma ■ Shifting Sands, Texas ■ Friedkin, Texas ■ Phil Stratton, Kentucky

ARTIFACTS!

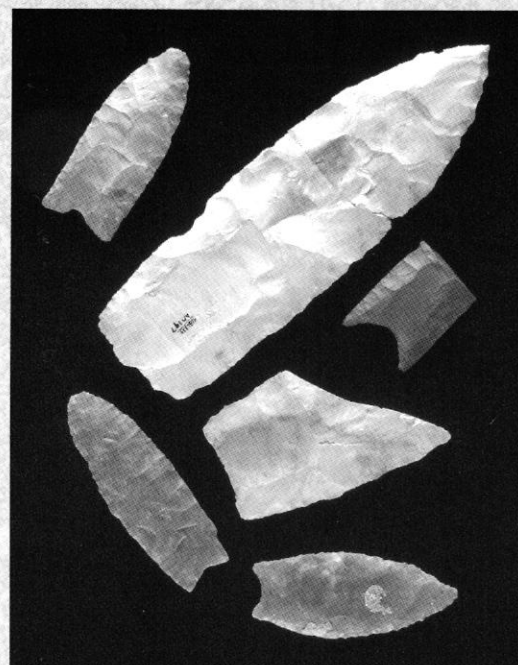


Gault site ►

This stratified Clovis workshop in east-central Texas, intensively studied for 20 years, has been the classroom for many future scientists.

◀ Fenn Cache

A remarkable collection of 56 projectile points, tools, and preforms made by Clovis hunters 13,000 years ago. It was found many years ago in the Plains.

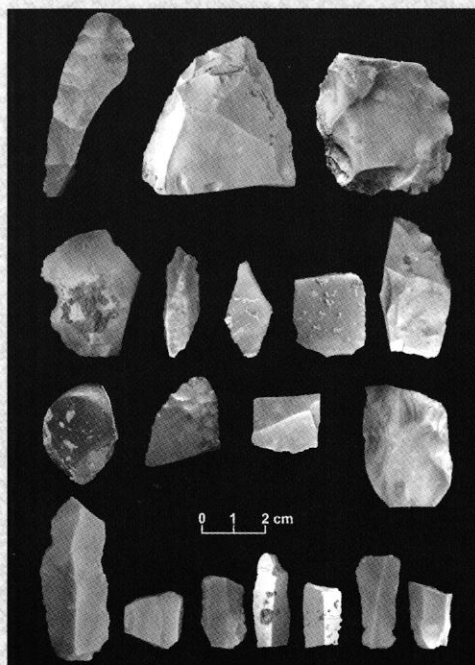


Schaefer site ►

A woolly mammoth was butchered here in southern Wisconsin by people 14,500 years ago—1500 years before Clovis. Two artifacts and modified bone were found.

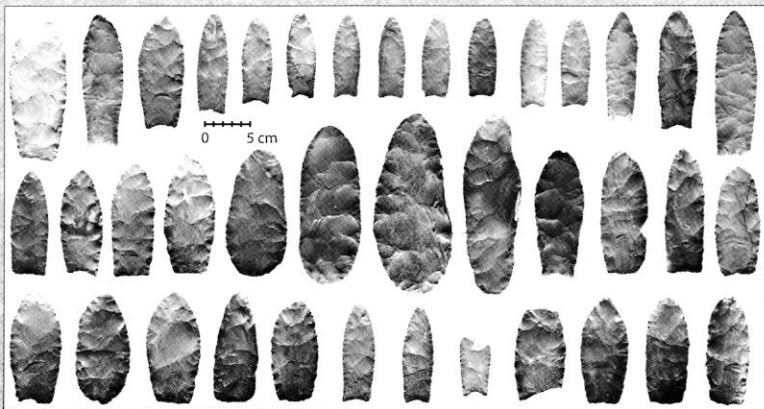
◀ Friedkin site

Immediately adjacent to the Gault site, this site yielded artifacts below the Clovis level—bifacial like Clovis, but lacking the diagnostic features of Clovis lithic technology.



Hogeye Cache ►

This cache of 52 projectile points, preforms, and bifaces made of Edwards Chert was recently discovered just 75 km east of the Gault site. Clovis hunters cached these weapons 13,000 years ago. This is the second-largest Clovis cache ever discovered in North America.



Part 1 of 2

DENNIS STANFORD AND BRUCE BRADLEY think we've missed an important chapter in the story of the peopling of the Americas. Paleolithic Asians trudging across the frozen, windswept plains of Beringia may not have been the first to discover America. Instead, they argue, Paleolithic Europeans paddling skin boats along the ice-fringed margins of the North Atlantic may have been the first to arrive and these descendants of the southwestern European Solutrean culture became the ancestors of America's Clovis culture. The implications of this scenario for our understanding of human prehistory are far-reaching, but the theory is controversial.

Michael Collins, in his foreword to Stanford and Bradley's new book *Across Atlantic Ice: The Origin of America's Clovis Culture*, describes it as the culmination of "a twenty-year intellectual excursion far outside the academic mainstream." Their theory may be far outside the academic mainstream, but Stanford and Bradley aren't crackpots. They are serious scholars with impeccable credentials. Stanford is the Director of the Paleo-Indian Program at the Smithsonian Institution's National Museum of Natural History. Bradley is an Associate Professor at the University of Exeter in England and a top-notch flintknapper. How did they come by the conviction that Paleolithic Europe was the homeland of the first Americans?

In the early 1980s, Stanford was part of a team that was invited to study museum collections in China and to survey for Paleolithic sites along the border between northern China and Siberia. The team found nothing that looked remotely like Clovis technology, and all the material they studied was either the same age as Clovis or later. These facts appeared to call into question the idea that Clovis ancestors had made their way into the New World through northeastern Asia. At about the same time, Bradley was working with George Frison at the Sheaman site in Wyoming and was impressed with the similarities between the stone-tool technology at this Clovis site and what he had seen of Solutrean technology while working in France a decade earlier.

In 1996 Stanford visited the Cactus Hill site in Virginia. This site has a Clovis layer overlying an earlier occupation. Stanford and Bradley described the assemblage as "highly reminiscent of Clovis" except for two stone projectile points, which were

thinner than Clovis points and unfluted. A radiocarbon date for this lower layer indicated it was nearly 16,000 radiocarbon years old.

Shortly after their visit to Cactus Hill, Stanford worked on a museum exhibit in Solutré, France, comparing Clovis and Solutrean caches. He became impressed with the similarity between Spanish Solutrean indented-base spear points and the Cactus Hill points he had just seen.

At around this same time, the Kennewick Man skeleton was discovered and was drawing considerable public attention because, although it was more than 9,000 years old, the skull looked more European than Native American. Stanford and Bradley now acknowledge that while the characteristics of this

Do Clovis Origins Lie in Paleolithic Spain?



Hypothesized routes used by Solutrean people while exploiting the North Atlantic ice-edge environment.

ancient American do, indeed, resemble those of modern Europeans, those physical traits were common in "early prehistoric populations in the Northern Hemisphere and are even retained by some modern south Asians." At the time, however, some archaeologists were proposing that Kennewick Man might have been descended from an earlier migration of Europeans, so it too appeared to support a possible Solutrean connection.

These converging lines of evidence suggested to Stanford and Bradley that it would be worth pursuing the possible connections between the Clovis and Solutrean cultures. In 1999 and 2000, they made extended trips to France and Spain to

examine the Solutrean material firsthand. Their new book, published in 2012 by the University of California Press, presents the most current and complete formulation of the Solutrean Hypothesis.

The Solutrean Hypothesis

Stanford and Bradley summarize the Solutrean Hypothesis as follows:

During the Last Glacial Maximum, sometime between 25,000 and 13,000 years ago, members of the Solutrean culture in the southwest coastal regions of Europe were led by subsistence behavior appropriate to their time and place to exploit the ice-edge environment of the polar front across the North Atlantic and colonize North

Bradley (left) and Stanford at Santander, Spain, 2001.

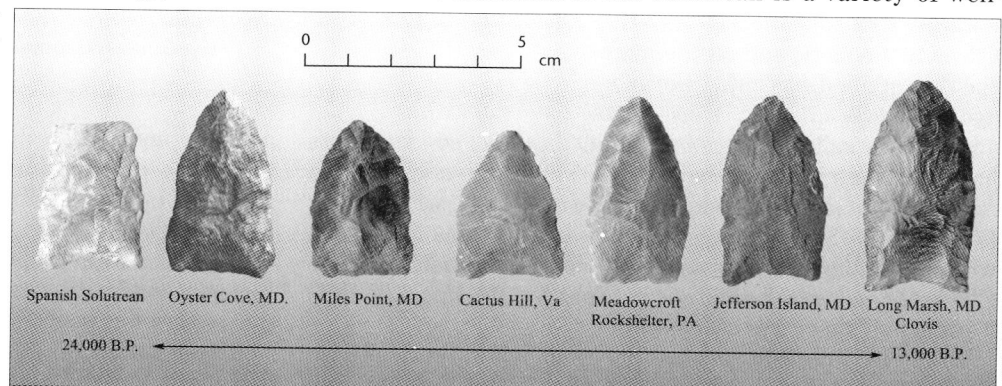
America to become—after several millennia—what we know as the Clovis peoples, who eventually spread far and wide across the Americas.

The arguments in support of this hypothesis include inadequacies of the existing Out-of-Beringia Model, strong similarities in the stone-tool technologies of the Solutrean and Clovis cultures, archaeological data that suggest that Solutrean hunter-gatherers had the capability to thrive in the ice-edge environment of the North Atlantic, paleoenvironmental data that show the potential of the ice-edge environment to support Solutrean hunters, and ethnographic models that show that the ice-edge environment could have been effectively exploited by a stone age technology.

Problems with the Out-of-Beringia model

In a 2004 paper in the journal *World Archaeology*, Stanford and Bradley assert that the generally accepted idea of the peopling of the Americas from northeastern Asia via the Bering Land Bridge is “informed speculation and not supported by archaeological evidence.” Furthermore, they claim, “the theory has become dogma, and

Sequence of early mid-Atlantic projectile points based on dating stratigraphic sequences.



ultimately ideology.” In their new book, they point out that the land bridge connecting Asia with Alaska appears to have

been a bitterly harsh environment that would have been difficult for pedestrian hunters to traverse. Moreover, they claim that the so-called Ice-free Corridor, a passage between the two massive ice sheets that had coalesced during the Last Glacial Maximum to encompass the entirety of northern North America, was not open early enough to have allowed the supposed ancestors of Clovis to have made their way into the interior of America 13,000 years ago.

In addition, as Stanford had discovered, the stone-tool technologies present in northern Asia during this period don't appear to resemble Clovis technology and are therefore unlikely ancestors of Clovis. According to Stanford and Bradley, the “Paleolithic northern Asians had a totally different concept of weaponry than Clovis peoples.” Asian spears were bone rods inset with microblades, whereas Clovis technology was based on thin bifaces.

Finally, Clovis points are much more common in eastern North America than in the West, which suggests to some scholars that the Clovis culture must have a deeper antiquity in this region. Moreover, some of the earliest and best-documented pre-Clovis sites, such as Meadowcroft Rockshelter and Cactus Hill, are in the East.

After reviewing these data, Stanford and Bradley asked themselves the question, If not northeastern Asia, where could the ancestors of Clovis have originated? After two decades of research, they think they've found the answer in the coastal regions of France and Spain.

The Solutrean culture dates to the middle of the Upper Paleolithic in southwestern Europe. It existed in this refugium during the last major glacial period, about 20,500–16,500 RCYBP. The hallmark of the Solutrean is a variety of well-

made leaf-shaped, shouldered, stemmed and concave-based projectile point styles used for hunting such mammals

as reindeer and horse in France and red deer and ibex in Spain and Portugal. In addition, Solutrean folk had begun to gather marine mollusks as well as small amounts of fish. Rock art in caves as well as open-air sites were abundant in the Solutrean.

Stone-tool technology points to a connection between the Solutrean and Clovis cultures

Stanford and Bradley argue that “the similarities between Solutrean laurel leaf and Clovis point manufacture are remarkable, from the initial selection of raw material, which displays a preference for exotic stones, through the final edge treatment.” Perhaps the most important similarity is the common use of overshot flaking.

Overshot flaking occurs when a flake struck from one edge extends entirely across the face and then plunges up through the biface, removing part of the opposite edge (MT 26-2, “What It Means to Be Clovis”). Normally, flintknappers regard this as a mistake, but if they’re highly skilled they can utilize

What lies beneath? The Solutrean maritime adaptation

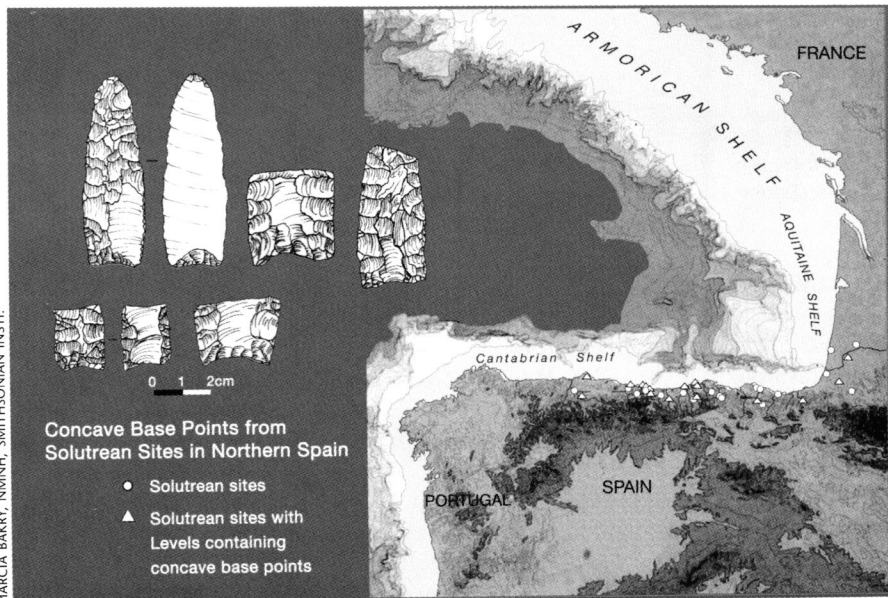
Stanford and Bradley argue that the Solutrean culture was more focused on marine resources than traditional interpretations suggest. They assert there was a “dramatic appearance of aquatic resources such as shellfish, fish, and seal” at Solutrean sites such as La Riera Cave in Spain. Moreover, many of these same species are depicted in the cave art, which also was becoming increasingly important during this period. Seals, auks, walrus, and salmon all are occasionally represented on cave walls.

Stanford and Bradley are convinced there is much more evidence of this maritime focus waiting to be discovered at sites that now lie submerged beneath the ocean. They point out that during the Last Glacial Maximum, the French Aquitaine shoreline would have stretched more than 30 miles beyond the present coast while the coast of northern Spain extended 6 miles past its current limit. Similarly, the North American coast on the eastern seaboard would have reached as far as 93 miles beyond today’s coastline. Moreover, tantalizing evidence already has been found indicating that archaeological sites are

present beneath the waters of our continental shelves.

In 1970 the crew of the *Cinmar*, while fishing about 62 miles off the coast of the Virginia Capes, made a discovery that not only showcases the kinds of archaeological treasures that may abound on these submerged landscapes, but also may provide the technological missing link between the Solutrean and Clovis cultures. While harvesting deep-sea scallops, the crew

Northern Spain and southwest France showing the distribution of concave-based Solutrean points. A large proportion of the late-Pleistocene land surface in the Aquitaine now lies submerged on the continental shelf. There must be many Solutrean sites in this vast underwater expanse. Some may provide the missing evidence for a Solutrean coastal adaptation.



this technique to produce bifaces with a high width/thickness ratio, in other words, bifaces that are extraordinarily wide and thin. Bradley admits that, even for experienced flintknappers, overshot flaking is “one of the most challenging techniques” to master.

According to Stanford and Bradley, over the entire history of flintknapping the use of overshot flaking as an intentional and regular strategy to produce bifaces was practiced only by the Clovis and Solutrean cultures. Considering that the Solutrean and Clovis cultures are separated by thousands of years in time and by thousands of miles of ocean, Stanford and Bradley assert that “this level of correspondence between technologies is remarkable.” But is it a case of independent invention or is there a historical relationship between these two cultures? Stanford and Bradley point out that the technologies are so similar that “no one would question the Solutrean origin of Clovis if Solutrean sites were found in northeastern Asia instead of southwestern Europe.”

fortuitously dredged up several bones from a mastodon along with a large “Solutrean-style laurel leaf biface.” The biface, a tooth, and a tusk fragment were donated to Gywnn’s Island Museum, where in 2008 they were discovered by Darrin Lowery, then a graduate student at the University of Delaware. Lowery notified Stanford, who arranged for the bones to be radiocarbon dated. The bones turned out to be nearly 23,000 years old. That age is consistent with the location of the find near the edge of the continental shelf.

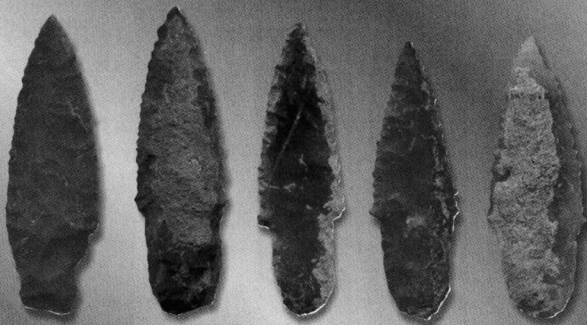
The biface is made from a banded meta-rhyolite that was quarried from near Emmitsburg, Maryland, and use-wear analysis indicates it was used as a butchering tool. Although Stanford and Bradley admit that there is “no definitive proof” that the knife and the mastodon bones actually occurred in direct association, they contend that the apparently complementary pieces of evidence “overwhelmingly support” that possibility.

Was this Solutrean-like point used to butcher a mastodon on the

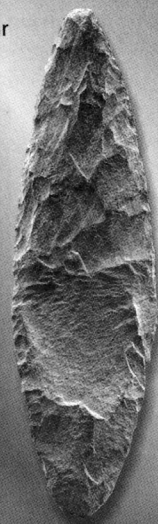
Showy points!

Found along the Salmon River in Idaho, the Cooper's Ferry Western Stemmed Tradition points may date to 11,000 years ago. The Cinmar laurel-leaf biface was recovered from 250 ft below sea level on the outer continental shelf of Virginia with mastodon remains that dated to $22,780 \pm 80$ RCYBP.

What do these points have in common? They'll all be on display at the Paleoamerican Odyssey Conference in Santa Fe. Be there!



Cooper's Ferry WST



Cinmar biface

18.5 cm

Atlantic coast of North America 23,000 years ago? If so, then it is compelling evidence in support of Stanford and Bradley's theory.

Does X mark the spot?

A key piece of evidence regarding the origins of the first Americans is the DNA of modern Native Americans as well as DNA from the skeletons of Paleoamericans (MT 22-2, "Ancient DNA in Canada Reveals New Founding Lineage of Native Americans"; MT 22-4, "Genetic Discovery Refines Our View of the Peopling of the Americas"; MT 23-2, "Largest-ever Survey of Native American Genes Sheds Light on First Americans"). From this evidence, geneticists have determined that Native Americans are descendants of one, or possibly as many as three, migrations from Asia.

Yet Stanford and Bradley claim that because no undisputed remains of Clovis or Solutrean people have been found to provide genetic data for comparisons, such "grand schemes that link the earliest Americans to either Asia or Europe via DNA evidence are at best only speculation." They point to the presence of the mitochondrial genetic marker haplogroup X2 in both European and Native American populations, particularly groups in eastern North America, and its absence in contemporary Siberian groups as evidence for an ancient European origin for at least some Native Americans.


Could Solutrean people travel from Spain to America?

Stanford and Bradley allow that one of the strongest objections to the Solutrean Hypothesis is the assumption that the ocean constituted an insurmountable barrier to Paleolithic people. To show that the North Atlantic ice edge could have provided a sustainable environment for Solutrean people, Stanford and Bradley point out that the late-glacial North Atlantic was rich

in seals, walruses, fish, and various kinds of sea birds, and that historically the Inuit of Alaska and Greenland have thrived in just such environments.

Michael Collins, in his foreword to *Across Atlantic Ice*, attributes much of the criticism the idea has received to "chronoracism," which he defines as "the denigration by our contemporaries of the intellectual and technological capabilities of our *Homo sapiens* ancestors." Stanford and Bradley argue that researchers "continually underestimate the abilities, vision, and the intelligence of our ancestors." They make a compelling case that if the Solutrean hunters possessed a maritime adaptation comparable to that of the Inuit, they could have made the journey from the coast of Spain. Many critics of their theory might concede this point, but still argue that the evidence for Solutrean people having such an adaptation, or that they actually did make that trip,

is far from convincing.

In the concluding article in this series, we'll consider what a few of those critics have to say. 

—Brad Lepper

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Suggested Readings

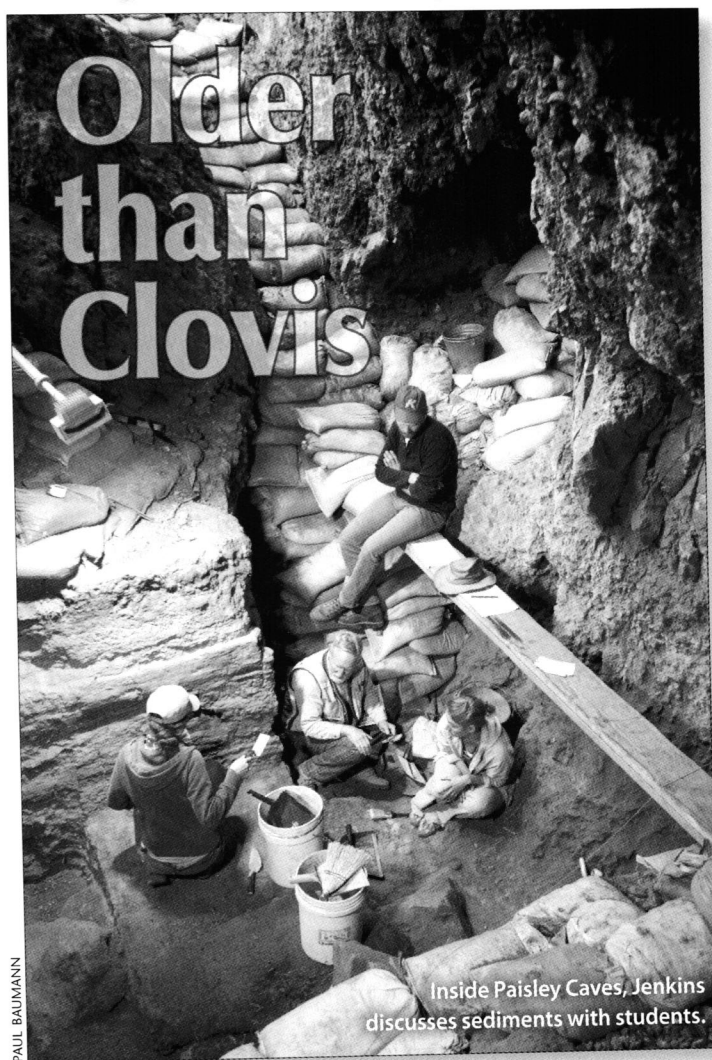
Bradley, B., and D. Stanford 2004 The North Atlantic Ice-Edge Corridor: A possible Paleolithic Route to the New World. *World Archaeology* 36(4):459–78.

——— 2006 The Solutrean-Clovis Connection: Reply to Straus, Meltzer, and Goebel. *World Archaeology* 38(4):704–14.

Stanford, D. J., and B. A. Bradley 2012 *Across Atlantic Ice: The Origin of America's Clovis Culture*. University of California Press, Berkeley.

Also, check out the 2005 Discovery Channel documentary, "Ice Age Columbus: Who Were the First Americans?"

The Western Stemmed Tradition Points from Paisley Caves



PAUL BAUMANN

Inside Paisley Caves, Jenkins discusses sediments with students.

HOW MUCH EVIDENCE is necessary to establish a site's age? This is the question I ask myself as I listen to Dennis Jenkins, Senior Research Archaeologist at the Museum of Natural and Cultural History at the University of Oregon, give a public lecture on his recently concluded excavations at the Paisley Caves in south-central Oregon. How many radiocarbon dates do you need to establish stratigraphic integrity in three small caves? Would 10 be enough if they were the right 10? 20? 100?

How about 213 and counting?

Critical scientists might quibble with one or two dates. Dr. Jenkins has run 213 AMS radiocarbon dates so far on organic matter, including seeds, twigs, coprolites, bones, leather, cordage, and grass threads recovered from three of the small

caves in the string of caves at the site on the margin of Summer Lake. The dating was predominantly done by Dr. Thomas Stafford (Stafford Research Laboratories, Inc.). Because dates were obtained on objects with relatively short lifespans, there's little likelihood that older carbon contaminated the samples. To check for contamination by younger carbon, especially important in the case of coprolites, AMS dates were obtained on multiple sample fractions. In almost every case, multiple fractions from an item yielded overlapping dates with small error bars. There's little evidence for water-borne carbon in the cave.

These are good AMS dates, 213 and counting, the vast majority in good stratigraphic order with few reversals. And they indisputably date the materials to pre-Clovis times.

The hard work of practicing sound science

The Paisley Caves were first excavated in the 1930s and then lay untouched by archaeologists until Jenkins began his work here. When he first announced his initial discoveries at the Paisley Caves in a 2008 article in *Science*, which included an analysis of an impressive number of human and non-human coprolites from which ancient DNA (aDNA) had been successfully ex-



UNLESS NOTED ALL PHOTOS: DENNIS JENKINS

Tiny cordage: a bit of thread from Paisley Caves on Jenkins's fingertip.

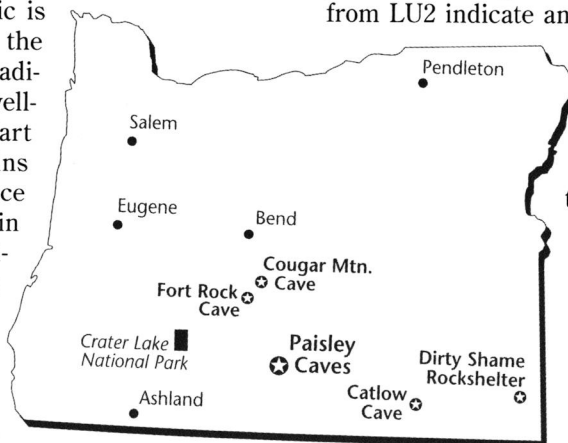
tracted, Jenkins thought his work at the caves was almost over (MT 25-4, 26-1, "Paisley Caves"). But then he invited a panel of experts out to inspect the site, its stratigraphy, and the coprolites. The site had produced abundant human and non-human coprolites, animal bones, lithic debitage, and some cordage, and clearly the dates on the coprolites indicated human use of this cave contemporary with and before Clovis. But skeptics were critical of the attribution of coprolites to humans, and of the absence of artifactual evidence for human occupation in the lowest levels. CSFA Director Dr. Mike Waters, CSFA Assistant Director Dr. Ted Goebel, and others felt that more excavation was needed, and recommended that a trench be dug that connected two block excavations in Cave 5.

"I didn't want to dig that trench," Jenkins had told me earlier over dinner, "I'd dug the heck out of the cave," and he wanted to leave something for future researchers to come back to. But hindsight is 20/20. Jenkins says, "Looking back, I'm ecstatic that we dug the trench. I really did get some wise advice."

Found: non-Clovis points at least as old as Clovis

The first reason Jenkins is ecstatic is that excavating the trench led to the recovery of Western Stemmed Tradition (WST) projectile points from well-dated contexts. Slides of these dart points flash on the screen. Jenkins pauses long enough for the audience to take in the images. Anywhere in the West, WST points from well-dated contexts are rare, so finding these in stratigraphic context is an important discovery. But more important still are the ages of these diagnostic projectile points: Of the four recovered, three are from contexts that are as old as or older than Clovis (10,800 to 11,050 RCYBP). The fourth dates immediately after 10,800 RCYBP. The illustrations of these points in the recent article in *Science* by Jenkins and his team are unambiguous: Thick ground and collaterally flaked stems project from weak shoulders. The blades are broken off. All four points are made on local obsidian, which is typical of artifacts from this part of Oregon, where obsidian flows are abundant but chert sources rare.

The points were recovered from deposits LU1 and LU2 in the caves. LU1 is a poorly sorted fine sand to loamy sand containing subangular pebbles and cobbles. Macrobotanical remains and wood-rat (*Neotoma* sp.) fecal pellets are common. LU1 overlies a boulder deposit derived from the local bedrock that marks the lower boundary of sediment deposition in the cave. AMS dates on or-



parallel bedding is visible. AMS dates on organic materials from LU2 indicate an age of 10,000 to 11,565/12,350 RCYBP.

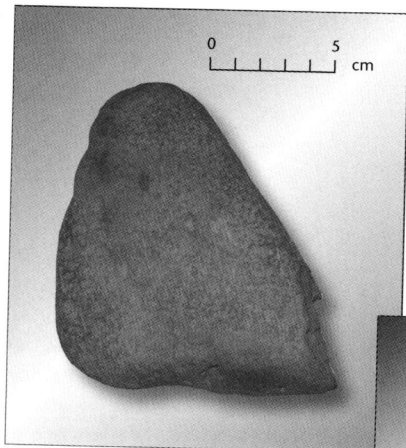
Projectile point 1294-PC-5/6D-47-1, an obsidian basal fragment with a single weak shoulder and no grinding on the stem, was recovered from a context in the lower portions of LU2 dating between 10,050/10,965 and 12,140/12,260 RCYBP. Projectile point 1895-PC-5/16A-23-6a also came from LU2 from a context bracketed by an AMS date of 11,070 RCYBP on a twig of sagebrush and a date of 10,855 RCYBP on macerated plant material. Projectile point 1961-PC-5/18a-10-1 is a symmetrical, weak shouldered mid-section fragment

exhibiting grinding on the later margins of the stem. It was recovered from LU2 sediments in post-Clovis contexts dating from 10,200 to 10,855 RCYBP.

Support from the experts

Jenkins brought in Great Basin lithics expert George T. Jones of Hamilton College to examine the projectile points and debitage. Dr. Jones, a veteran of more than 30 years of fieldwork in the central and northern Great Basin, verified that the projectile points were indeed WST points. Jones states, "I'd be reluctant to attribute any of the examples to a 'recognized type' since all are just segments. All three [points that I examined] exhibit stemmed morphology, but none retain enough distinctive features that I would be comfortable attributing them (or not) to one of the established types."

Jones also analyzed all 532 obsidian and 33 unmodified pieces of debitage from contexts older than 11,000 RCYBP to determine whether any flakes had features diagnostic of Clovis tool production, such as evidence for blade production, overshot flaking, Clovis-type platform preparation, preform thinning by flute flake removal, and flute flake termination repair. He found that the technology is consistent with generalized core reduction, biface thinning, and pressure flaking. No diagnostic evidence for Clovis biface reduction was found. But neither was there anything that could be identified as specifically diagnostic of WST biface production. Clovis expert Dr. Michael Rondeau (Rondeau Archaeological) also examined the assemblage and



A polished and battered probable food-processing stone. ▲

The stem of the oldest WST projectile point (1895-PC-5/16A-24, obsidian, approximately 4 cm long), recovered from a silt lens dating to 11,070–11,340 RCYBP. ►



ganic materials from LU1 place its age from about 12,350 to about 12,800 RCYBP. In Cave 5, the upper 10 cm is slightly younger, with ages of 11,565 and 11,770 RCYBP. Projectile point 1895-PC-5/16A-24 is a stem fragment, slightly asymmetrical, with heavily ground lateral margins. The fragment is broken below the shoulder, which is common in WST points. This point was recovered in situ from a silt lens dating between 11,070 and 11,340 RCYBP.

The overlying LU2 deposit consists of a poorly sorted mix of angular to subangular fine pebbles to coarse cobble-sized igneous rocks, abundant macrobotanical remains, and wood-rat fecal pellets. In places, strong to weakly expressed fine

came to similar conclusions.

"Can we say, No Clovis? No," Jenkins tells the audience. "Can we say, Only WST? No. You could not convict this site of being Clovis [in a court of law], but you also could not say it isn't, either."

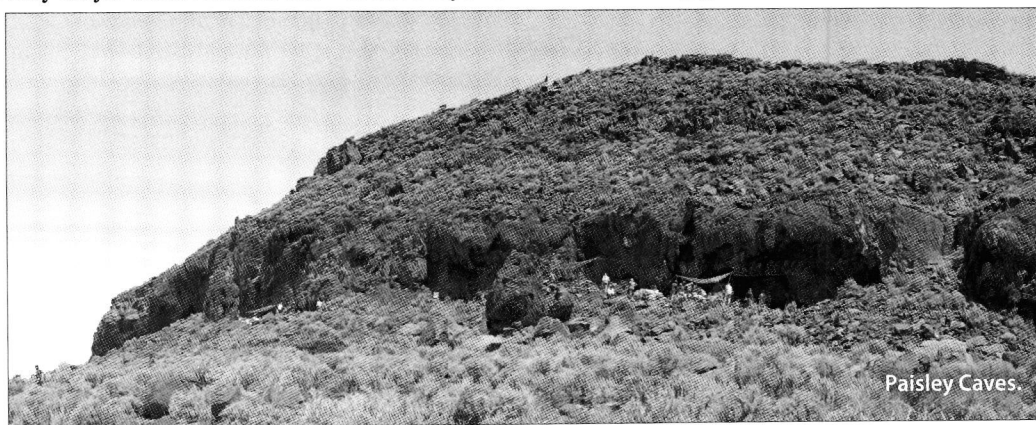
Organic evidence illuminates the occupants of Paisley Caves and their lifeway

If these projectile points were the only major discoveries from this site, it would be a monumental achievement, establishing unambiguously the existence of a separate lithic tradition contemporary with Clovis in the western United States, and helping to demolish the established paradigm of the Peopling of the Americas. But this site is so much more than four projectile points, debitage, and 213 AMS radiocarbon dates.

What really excites the audience is the slides Jenkins shows of the perishable materials from the caves. His fieldwork has focused mainly on Caves 2 and 5. In Cave 2, coprolites were found in a cracked mud lens dating to 10,980 RCYBP. Above this lens, his team encountered the "Botanical lens" rich with sagebrush and grass. Scattered over a broad area, he found a cluster of pronghorn antelope hairs that he thinks may have been "shaved off" the hide. Cutmarks are evident on the associated antelope bones. There are enough bones to suggest 8–10 antelope were killed and processed in the cave. The Botanical lens contains greasy patches that might be the fat by-products from antelope intestines. Nearby, they discovered strips of jackrabbit fur in a heap with knotted sagebrush bark threads that Jenkins tells the audience may be the remains of a rabbit-skin blanket. Other finds include a wooden peg, a piece of decoration made of a feather wrapped with cordage, a bone needle, and a wooden projectile point. As if this weren't enough, they find a lock of about 200 human hairs in strata of similar age. A louse sack clings to one strand of hair, testament Jenkins surmises to the reason the hairs were cut off.

Deeper still, Cave 2 has produced a horse maxilla dating to approximately $11,740 \pm 25$ RCYBP and a butcher-cut artiodactyl

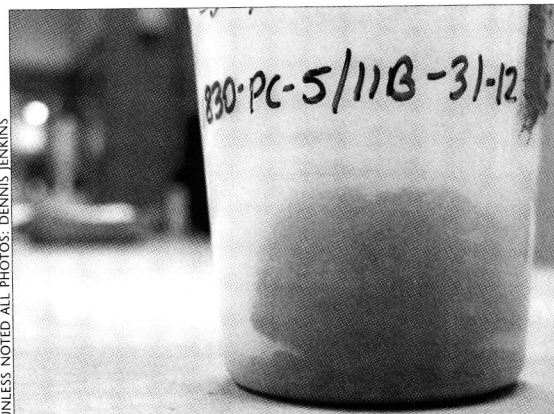
ily), grass pollen, and phytoliths. The audience make no sound as they begin to grasp the implications of plant use on our collective myth of Paleoindian big-game hunters.



PAUL BAUMANN

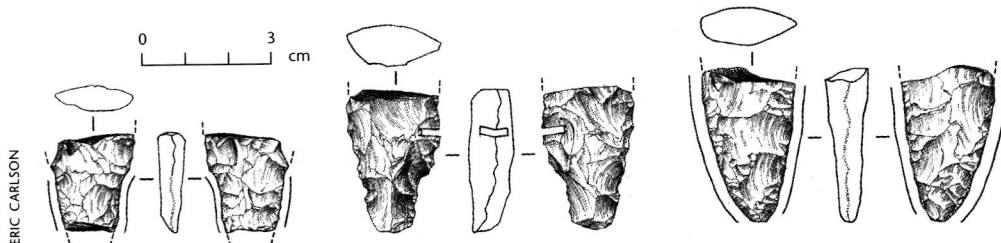
Finds from Cave 5 are equally exciting. A single piece of bear bone, its identity established based on morphology and the presence of bear protein, has a sawtooth break that seems intentional, suggesting its use as a tool. Of the more than 500,000 bones in the cave, this is the only one that comes from a bear. A nearby hand stone, with use wear and with horse protein residue on its working surface, comes from a level dated to approximately 12,350 RCYBP. Most intriguing of all is the slab of stone tilted upright against the wall to form a bin into which a large quantity of megafauna bones were tossed or stacked, the prehistoric equivalent of a dumpster. A coprolite at the bottom of the pit is pre-Clovis in age and contains human aDNA.

Jenkins's Danish colleague, Eske



A coprolite in a sampling cup
(diameter approximately 6 cm).

Willerslev of the Center for GeoGenetics at the University of Copenhagen, was able to extract DNA from coprolites to verify the attributions to source based on morphology and other criteria. His analysis of human coprolites shows that the people who used these caves during Clovis and pre-Clovis times came from Haplogroups A2 and B2, genetic types with ancestral homelands in Central Asia. Detailed search of sediments for DNA was also conducted, to rule out the translocation of DNA by water that could contaminate ancient



The oldest Western Stemmed Tradition points from the dated horizons at Paisley Cave 3.

rib dated to $11,930 \pm 25$ RCYBP. These are associated with a hand stone the size of his fist that bears a dark, shiny polish. Analysis of the polish showed proboscidian protein, as well as evidence for grinding roots (starch from members of the Apiaceae fam-

coprolites with younger DNA. Dr. Willerslev's analysis establishes that genetic material was not being carried down-profile by water. This makes sense, given the outstanding preservation of organic matter. His conclusion: This is clearly an assemblage

that has been sitting in dry deposits virtually untouched by percolating water. Willerslev's results have been replicated in blind tests by another genetics lab in York, England.

Oregon residents before and after Clovis

For Jenkins, the evidence points to multiple founding populations in the Americas. He tells the audience that he's not sure how many, but at least two were in eastern Oregon during the waning centuries of the Pleistocene. One group of foragers made stemmed projectile points primarily on local obsidian using a generalized core-reduction strategy. These were generalized broad-spectrum foragers who had already developed a strategy for seasonally exploiting the regional landscape. Mammoth, horse, and bison were on the menu, along with pronghorn antelope and jackrabbit, grass seeds, roots from the family that includes the Historic Period staple, biscuit root, and marsh plants. It appears that for short terms they repeatedly occupied the caves, whose aspect and location on the downwind side of Summer Lake would have made them cold and exposed shelters in bad weather. These people had as yet unknown interac-

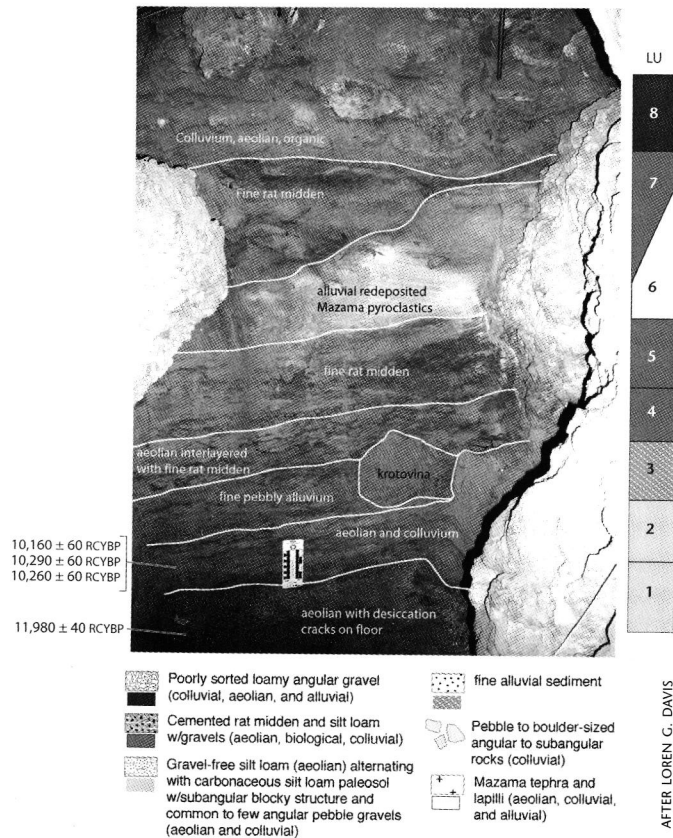
in Texas. The material is classic Clovis, indistinguishable except for raw material from sites in the Southwest, and thus likely dates to that narrow Clovis time frame of 10,800–11,050 RCYBP. Whatever their adaptation, and whether they entered this part of the Great Basin directly from the Ice-Free Corridor or from farther east, the Paisley Caves prove that the landscape they entered was already populated by a very different group of foragers. For a time, both groups appear to have shared the rapidly drying late-Pleistocene landscape. Around 10,800 RCYBP, Clovis technology vanished from the landscape as mysteriously as the megafauna perennially associated with it. Folks using WST technology, on the other hand, successfully adapted, and their descendants occupied the region for millennia more.

Jenkins's smile broadens as he reaches the end of his slide show. It's clear the audience are as excited about this discovery as he is. They pepper him with questions, and he doesn't seem to mind a bit. Like everyone else in the room, it is clear that he harbors no lingering doubt that the Paisley Cave data definitively show that Clovis was not first in the northern Great Basin. In this corner of the lower 48, we can be absolutely sure.

—Ariane O. Pinson

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Stratigraphic profile, Cave 2 west wall.



tions with people who made large fluted points archaeologists call Clovis using a distinctive bifacial core-reduction strategy.

We know that Clovis foragers were present in the region when the Paisley Caves were in use from evidence gathered at the Dietz Clovis site, a scant 35 miles to the northeast. My own work at the Dietz site reveals a pattern like the WST occupation at the Paisley Caves, regular short-term use consistent with foragers passing routinely through an area as part of a seasonal round. These Clovis foragers also made abundant use of local obsidian (rather than chert, which is common at Clovis sites to the south and east). The Dietz record, however, is a surface record, and virtually nothing remains that might inform us of diet, clothing, or other aspects of the Clovis lifeway in this region.

At the Dietz site, where I conducted five summers of fieldwork, there is no evidence for the kind of pre-Clovis materials that have been excavated from the Gault and Friedkin sites

tively show that Clovis was not first in the northern Great Basin. In this corner of the lower 48, we can be absolutely sure.

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Suggested Readings

Gilbert, M. T. P., D. L. Jenkins, A. Götherstrom, N. Naveran, J. J. Sanchez, M. Hofreiter, P. F. Thomsen, J. Binladen, T. F. G. Higham, R. M. Yohe, II, R. Parr, L. S. Cummings, and E. Willerslev 2008 DNA from Pre-Clovis Human Coprolites in Oregon, North America. *Science* 320(5877):786–89.

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