# MAMMOTH TRUMPET

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# The Clovis Diet: Mostly Mammoths?

**THE DEBATE HAS RAGED** in the literature since the late 1960s: Did Clovis people specialize in hunting big game? Were they responsible for wiping out the Pleistocene megafauna? Or is our understanding of the Clovis way of life clouded by too much attention to the archaeological record of the Southwest, where Clovis points have been found with several mammoth skeletons? And is even that record biased by the higher archaeological visibility of mammoth versus deer or rabbit kills?

Gary Haynes and his graduate student Jarod Hutson reviewed the evidence in their paper "Clovis-era subsistence: Regional variability, continental patterning," which they presented at the 2013 Paleoamerican Odyssey conference (**MT 29-1,** "The Conference That Was!") and which appears in the companion book, *Paleoamerican Odyssey,* published by the Center for the Study of the First Americans. They concluded that the Clovis diet varied from region to region, but overlying this variability was a focus on big game, indeed the biggest game, whenever and wherever it was available.

## The debate

Clovis was first recognized as a late-Pleistocene archaeological culture when Clovis spear points were found in association with mammoths at sites such as Dent in Colorado, Blackwater Draw in New Mexico, Miami in Texas, and Lehner in Arizona. These discoveries suggested the possibility that Clovis hunters were specifically targeting mammoths, though until the late 1960s most archaeologists appear to have assumed that big game constituted only a portion of the Clovis diet.

## INSIDE

In 1967, the late Paul Martin began to make his famous "blitzkrieg" argument that the Clovis culture was directly responsible for the extinction of mammoths and other Pleistocene megafauna in North America. Certainly, the appearance of Clovis appeared to coincide with

TERESA WRISTON

**Haynes in Zimbabwe sorting through dry-screened sediments at an NSF-funded rockshelter excavation.**

the disappearance of many species of Pleistocene large mammals in the Americas as well as in other parts of the world.

Several archaeologists have criticized Martin's arguments and conclusions. Donald Grayson and David Meltzer are

JAROD HUTSON

**Hutson at the entrance of a hyena den near Ngamo Pan in Hwange National Park, Zimbabwe, August 2011.**

among the principal critics of what has been called the Overkill hypothesis. They observed that the bones of large animals are preferentially preserved and discovered relative to bones of smaller and generally non-extinct species, so the sample of Clovis kill sites must be biased in favor of big game. In addition, the chronology of big-game extinctions isn't well established, so some of the Pleistocene big-game species may have become extinct centuries before the appearance of Clovis.

Haynes and Hutson agree that large mammal bones likely are better preserved and easier to find, but they note that this "does not prove that Paleo-indian people chose small game more often that we see in the archaeological record." Indeed, citing the work of Todd Surovell and Nicole Waguespack, Haynes and Hutson argue that "Clovis-era people clearly decided to hunt big game even when smaller animals must have been more abundant." They submit that while some might call this "specialization," it is instead "a strong and rational preference."

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**Mammoth Trumpet**
Department of Anthropology, Texas A&M University
4352 TAMU
College Station, TX 77843-4352



| | |
|---|---|
| Michael R. Waters | Director and General Editor<br>e-mail: mwaters@tamu.edu |
| Ted Goebel | Associate Director and Editor, **PaleoAmerica**<br>e-mail: goebel@tamu.edu |
| James M. Chandler | Editor, **Mammoth Trumpet**<br>e-mail: wordsmiths@touchnc.net |
| Christel Cooper | Office Manager<br>e-mail: csfa@tamu.edu |
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*–Michael R. Waters, Director*

As for the timing of megafaunal extinctions, Haynes and Hutson agreed that some data now suggest that a decline in the abundance of big game did precede the appearance of Clovis. They attribute this decline to hunting by proto-Clovis foragers who shared the "strong and rational preference" for the meat of the largest game available.

Haynes and Hutson draw upon several lines of evidence to build their case for a Clovis diet that, although variable, focused on big-game. First and foremost is the direct empirical evidence of food remains at Clovis and proto-Clovis sites. This could include "bones with cutmarks or burned seeds in fire features" as well as protein residues preserved on the working edges of stone tools.

MICHAEL R. WATERS

Ethnographic analogies provide a second line of evidence, and a third consists of applications of various relevant social theories, such as optimal foraging theory, to gain insight into what sorts of foods a hypothetical "optimal forager" would tend to eat considering the resources available in a given environment.

## Clovis-era diets: The evidence

The direct evidence for the diets of Clovis age people includes 19 sites at which mammal bones and Clovis artifacts have been found in relatively clear association. These include the classic Clovis sites of Dent and Blackwater Draw as well as Eastern sites that may be the same age or slightly younger. Eleven sites include the remains of at least 56 mammoths. There are also 33 bison from 6 sites, 14 hare or cottontail rabbits from 2 sites, and 11 deer from 3 sites. Other species of large and small game represented in smaller numbers include 2 mastodons from one site, 9 horses from two sites, 3 caribou from three sites, 8 prairie dogs from one site, and 8 deer mice from one site.

DAVID CARLSON

**Where mammoth once roamed: Blackwater Draw, New Mexico *(above),* and Duewall-Newberry, Texas. Clovis artifacts were found in association with mammoth remains at the Blackwater Draw site. Although no artifacts were found at the Duewall-Newberry site, it appears to be of Clovis age.**

In addition to the sites with preserved animal bones, there are nine sites that have produced Clovis-age stone tools with traces of blood identified on their edges. Five of these sites had tools that tested positive for cervid (caribou or deer) blood, three had tools that tested positive for "elephant" (mammoth or mastodon) blood. Two sites included tools stained with bovid (bison or musk ox) blood, and two sites had tools with horse blood preserved on their edges. Evidence for small game included tools bearing blood residues from hare or rabbit at two sites, and dog and mouse at one site.

In addition to the bones of large and sometimes small mammals, Clovis sites also very rarely yield evidence of plant foods, such as hawthorn nuts, goosefoot seeds, and blackberries. Given the generally poor preservation of plant remains at most archaeological sites, Haynes and Hutson acknowledge that "the proportion of plant foods in the Clovis-era diet is very difficult to know." Nevertheless, they conclude that "plant foods must have featured regularly in Late Glacial diets" (**MT 29-3,** "Clovis spear points used to process plants"). However, the absence of much evidence for specialized grinding technology at Clovis-era sites at least means that they weren't eating a lot of acorns or grass seeds, which would become "the staples of many later (post-Clovis, Archaic) groups."

## Beyond the physical evidence

There are avenues to understanding the lives and diets of early Paleoindians that go beyond the empirical evidence. One of these avenues is ethnographic analogy, which involves using recent hunting and gathering cultures as potential models for the behavior of ancient hunters and gatherers. Haynes and Hutson acknowledge that there are "possibly unknowable differences between modern peoples and late Pleistocene human populations." Nevertheless, they observe that some ethnographically studied groups actively pursued large mammals "in spite of high risks and costs." Such activity, however, may be more about males showing off than simply meeting dietary requirements (**MT 28-1,** "The Big-Game Hunting Conundrum").

Haynes and Hutson also consider the theoretical expectations for Clovis diet based on "Optimization Theory," but reject such theoretical models as a reliable guide. For example, they assert that using this theory it could be argued that "mammoths would not have been deliberately hunted [by Clovis hunters], because mammoths were rapidly becoming extinct at the time fluted-point makers were seeking food." The logic of this argument would appear to be based on the idea that species that are hard to locate due to their rarity would be suboptimal choices to hunt.

Donald Grayson, an archaeologist whom Haynes and Hutson identified as an opponent of Pleistocene Overkill, says that Optimal Foraging Theory doesn't support the notion that Clo-

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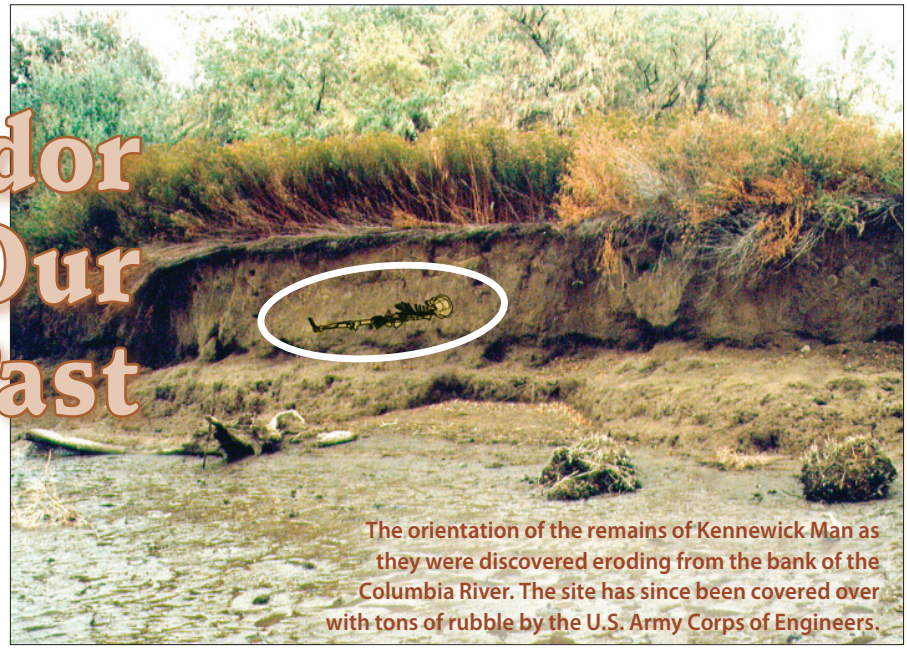
CHIP CLARK, SMITHSONIAN INSTITUTION

# Kennewick Man

# Ambassador from Our Ancient Past



The orientation of the remains of Kennewick Man as they were discovered eroding from the bank of the Columbia River. The site has since been covered over with tons of rubble by the U.S. Army Corps of Engineers.

THOMAS W. STAFFORD

**KENNEWICK MAN** is the most famous Paleoamerican skeleton ever discovered. After the recent publication of a new book edited by Douglas Owsley, Curator of Physical Anthropology at the Smithsonian Institution, and Richard Jantz, Emeritus Professor of Anthropology at the University of Tennessee, he also is the most intensively studied and reported. The book, ***Kennewick Man: The Scientific Investigation of an Ancient American skeleton,*** includes the contributions of an international team of 51 scholars and scientists representing at least 35 universities, museums, and other institutions. This team of researchers has given us an unprecedented look at the life and times of a man who lived in the Pacific Northwest sometime between about 8700 and 8400 CALYBP. D. Troy Case, Associate Professor of Physical Anthropology at North Carolina State University and a contributor to the volume, writes that Kennewick Man is "an exceptionally eloquent example of osteobiography." We know many facts about this human being and even poignant details—in his youth, for example, he had a pleasing smile.

Kennewick Man isn't one of the very first Americans, but he's the earliest American for whom we can write such a relatively complete biography. What else have we learned about this man whom Owsley and Jantz refer to as an ambassador from America's ancient past?


## Who was Kennewick Man?

Kennewick Man, or the Ancient One as he is called by some American Indians, died when he was between 35 and 40 years old. He stood around five feet seven inches tall and weighed about 160 pounds. According to Benjamin Auerbach, Associate Professor of Biological Anthropology at the University of Tennessee, compared with American Indians of the historic era, Kennewick Man was "tall, broad-bodied, and massive." His body proportions indicate his ancestors lived in a cold climate (**MT 28-3,** "Early skeletons point to a single source population for the First American").

He had strong legs. Owsley and Jantz conclude that he "seldom ran long distances, but rather sprinted for short distances, making sudden turns and stops." They further argue that "he routinely walked in shallow but fast-moving water, probably to catch fish." He had an ear condition, popularly referred to as Surfer's ear, a "result of frequent contact with cold water," but this likely had no significant effect on his hearing.

He had large hands and was right-handed. His right arm was significantly more developed that his left—an asymmetry that suggests to Daniel Wescott, Associate Professor of Biological Anthropology at Texas State University, that he "engaged in habitual spearing or harpooning of fish and mammals in fast-flowing rivers and streams and along the ocean coast." Owsley and Jantz identify other activities that Kennewick Man likely engaged in, including

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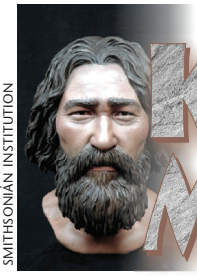
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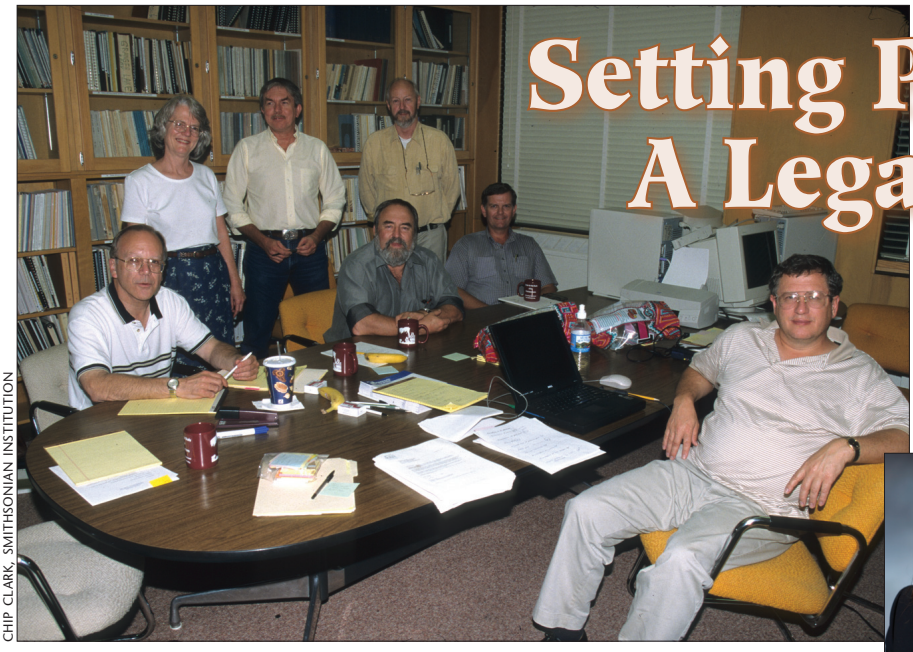
# KENNEWICK MAN

**DOUGLAS OWSLEY AND RICHARD JANTZ** have produced a landmark study of Kennewick Man—the nearly 9,000-year-old human skeleton recovered from the muddy bank of the Columbia River back in 1996. However, without an eight-year legal battle, this study would never have happened. Alan Schneider and Paula Barran, the attorneys for the scientists who sued the U.S. government for the right to study this amazing skeleton, tell the story in one of the chapters in the just-published book ***Kennewick Man: The Scientific Investigation of an Ancient American skeleton.***

The Owsley and Jantz volume is the most comprehensive analysis of any Paleoamerican skeleton ever published. It raises the bar for future studies of ancient human remains and sheds a remarkable amount of light on the life and times of this ambassador from Paleoamerica. Contributing to the volume are 51 scholars representing 35 institutions—and two attorneys. What are they doing here in the company of all those scientists?

Ironically, this study of Kennewick Man came about because the U. S. Army Corps of Engineers initially decreed that no studies whatsoever would be done on these remains. Instead, they would be given to a coalition of American Indian tribes for immediate reburial. Given the immense, unprecedented scientific importance of this amazingly complete and well-preserved skeleton and the arbitrary nature of the decision made by the Corps, Owsley and seven other scientists decided to sue the government in order to halt or at least delay reburial and thereby give scientists the opportunity to study the remains. Given the likelihood that the court case would generate negative publicity, they would have to sue as private citizens so as not to draw their institutions into the legal quagmire.

In an interview published in *Smithsonian* magazine, Owsley said that when he told his wife, Susan, that he was going to sue the U. S. government, she asked, "Are we going to lose our home?" He replied that he honestly didn't know, but that "this was one of those extremely rare and important discoveries that come once in a lifetime. If we lost it. . . . Unthinkable."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## Setting Precedents: A Legal Odyssey


KEENE STUDIO

**The team of scientists and lawyers meet at CSFA, Texas A&M University, September 2002. From left, attorney Alan Schneider *(seated)*; Cleone Hawkinson, Schneider's paralegal assistant; Thomas Stafford, specialist in radiocarbon dating from the University of Aarhus, Denmark; Dennis Stanford *(seated)* of the Smithsonian Institution; Robson Bonnichsen, then Director of CSFA; Michael Waters *(seated),* current Director of CSFA; Douglas Owsley of the Smithsonian; Paula Barran *(inset),* Schneider's co-counsel.**

### A brief history of the Kennewick Man case

Kennewick Man was discovered quite by accident July 28, 1996. The Benton County coroner contacted James Chatters, a local archaeologist, to assist with evaluating the remains. Chatters examined the bones that had been found, then went to the discovery site and collected more bones. Based on a superficial examination of the skull and a scatter of historic artifacts observed at the site, Chatters initially thought the individual might be a European American pioneer. But then he noticed that the teeth were worn to an unusually severe degree and observed a stone projectile point lodged in the pelvis. These aspects suggested the remains might be prehistoric

rather than historic. To determine which of these alternatives was correct, he sent off a sample of bone for radiocarbon dating. The results indicated that Kennewick Man was more than 8,000 years old.

At this news, a number of local Native American tribes became outraged that destructive testing had been done without their consent. They demanded that the remains be given to them for reburial.

On August 30, the Army Corps took possession of the skeleton. According to administrative record of the Corps in this case, "The Corps was resolved to demonstrate that it was 'a compassionate and supportive partner of the tribes.'" The Corps assured the tribes that the bones would not be "subjected to further desecration via scientific study."

On September 17, the Corps announced that "the skeleton would be given to a coalition of four tribes and one unrecognized band." October 24 was the date set for transferring the remains to the coalition.

At this news, Douglas Owsley, head of the Division of Physical Anthropology at the Smithsonian Institution, and other scientists requested permission to study the skeleton before the transfer. The Corps refused to grant permission because of the religious and other objections of the tribal coalition.

Seeing no alternative, Owsley helped assemble a Dream Team of top scientists, who sued the Corps to halt the transfer and to allow them the opportunity to study the remains. The team of plaintiffs/scientists included three archaeologists: the late Robson Bonnichsen, founding Director of the Center for the Study of the First Americans; Dennis Stanford, Director of the Smithsonian Institution's Paleoindian Program; C. Vance Haynes, now Professor Emeritus of Anthropology at the University of Arizona; and five physical anthropologists: Owsley; C. Loring Brace, now Professor Emeritus of Anthropology at the University of Michigan; George Gill, Professor of Anthropology at the University of Wyoming; Richard Jantz, now Professor Emeritus of Anthropology and Director Emeritus of the Forensic Anthropology Center at the University of Tennessee Knoxville; and D. Gentry Steele, Professor of Anthropology at Texas A&M University (now deceased). These men became the plaintiffs in the court case.

JAMES CHATTERS

**Discovery site on the shore of Lake Wallula showing exposed habitat where the bones of Kennewick Man were found. Photographed looking east, June 29, 1996.**

Attorneys Barran and Schneider filed a lawsuit in the federal district court in Portland, Oregon, to stop the transfer of the remains. After an emergency hearing the Corps agreed to postpone the transfer. After a series of motions, counter-motions, and hearings, the court ruled 27 June 1997 to set aside all decisions of the Corps regarding the fate of Kennewick Man. The court directed the Corps "to fully re-open this matter, to gather additional evidence, to take a fresh look at the legal issues involved" and to make a decision based on a more thorough review of all the evidence.

## Burying history

In conjunction with their efforts to study the remains of Kennewick Man, some of the scientists requested permission to return to the discovery site to conduct an investigation. A host of questions could only be answered by such a study. Was the burial site part of a larger occupation? Were there artifacts present that might clarify the cultural affiliation of Kennewick Man? Were there other ancient burials in the area? Did the site contain clues to what the environment was like at the time of Kennewick Man?

The coalition of tribes that wanted to rebury the remains of Kennewick Man, whom they had begun referring to as the Ancient One, objected to disturbing the site. As a compromise, the Corps decided to conduct its own less-invasive investigation. The scientists could sit on the sidelines and watch.

The result was predictable. Schneider and Barran point out that the Corps itself would eventually admit that "its investigations had failed to establish the site's characteristics or boundaries or to determine whether the site contained 'any additional in situ and significant archaeological resources.'"

In spite of those failures, the Corps decided it was time to preserve the site from further erosion—and further study. It came up with a plan to bury the site with rocks and earth and then plant rows of willow trees across it. The scientists objected to the plan, but the Corps decided to proceed regardless. Schneider and Barran assert that the tribes wanted the site "covered as soon as possible"—"and so did the White House."

Both houses of Congress passed bills to prohibit the Corps from proceeding with their plan without prior approval of the district court. The Corps announced it would comply with the bills, and Congress went on recess for Easter with the legislation temporarily held up in conference committee. During the recess, between April 6 and 14, the Corps hastily implemented their plan and used helicopters to bury the site under a million pounds of boulders, rocks, and sand.

During the subsequent legal proceedings, the U.S. Court of Appeals for the Ninth Circuit found that the government could point to "scant or no evidence of cultural similarities between Kennewick Man and modern Indians," but added in a footnote to the decision that the opportunity to discover such evidence

had been deliberately foreclosed by the precipitous decision made by the Corps to bury the site.

## The Department of the Interior investigation

After the court ordered the Corps to take a fresh look at the issues and conduct a more thorough review of the evidence, the Corps asked the Department of the Interior (DOI) for advice and counsel. The DOI chief consulting archaeologist, Francis McManamon, responded with an opinion letter stating that all human remains in the United States older than "the historically documented arrival of European explorers" should be regarded as "Native American" and were therefore subject to disposition under NAGPRA. With that issue settled, at least to the satisfaction of the DOI, McManamon assembled his own team to collect background archaeological and historical information from published sources.

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On the basis of the DOI team's results, Secretary of the Interior Bruce Babbit issued a determination letter awarding Kennewick Man to the Tribal Claimants. The Corps reaffirmed its decision to refuse to allow the plaintiff scientists to study the skeleton. The plaintiffs responded by filing a motion to set aside the findings of the DOI.

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▲The Dream Team gets the opportunity to study Kennewick Man at the Burke Museum of the University of Washington, December 2004. From left, the late Robson Bonnichsen, then Director of the Center for the Study of the First Americans; Alan Schneider, the scientists' attorney; Douglas Owsley of the Smithsonian Institution; Thomas Stafford of the University of Aarhus, Denmark *(face hidden)*; and Hugh Berryman of Middle Tennessee State University.

◀Jantz collecting metric data for craniometric analysis of the Kennewick Man skull.

## District Court decisions

After 14 months of deliberation, U.S. Magistrate John Jelderks ruled in favor of the plaintiffs (**MT 18-1,** "Judge rules scientists can study Kennewick Man" ). Schneider and Barran summarize the decision as follows: "The court found that the Secretary's award of the skeleton to the Tribal Claimants was contrary to both applicable law and the evidence in the case. . . . Rather than remanding the case to the agencies for new administrative proceedings as is customary when agency determinations are set aside, the court entered a final judgment in favor of plaintiffs allowing them to study the skeleton."

The government and three of the Tribal Claimants appealed the decision to the Ninth Circuit Court of Appeals. The appeals court affirmed the district court's decision and order. Owsley's Dream Team could study Kennewick Man (**MT 19-1,** "Major Decision: Kennewick Man Case").

Actually, it turned out to be a bit more complicated than that. According to Schneider and Barran, "Even with two court orders in plaintiff's favor, gaining access to the skeleton was not routine or easy." Ultimately, the scientist-plaintiffs were able to conduct their studies in July 2005 and February 2006. The amazing results are reported in the companion article.

## Legal precedents

Schneider and Barran conclude their review of the Kennewick Man case by considering all the legal precedents set by the case. They point out that these precedents "may be as significant as the scientific study results."

The Kennewick Man case represents the first time that "scientists or anyone seeking to assert the interests of science" challenged a federal agency's NAGPRA decisions. Schneider and Barran assert that the Kennewick Man lawsuit "changed the course of federal cultural resource management in ways scarcely imagined a decade before." Among the most far-reaching precedents established by the decisions in the Kennewick Man case, Schneider and Barran list the following.

**Interpreting NAGPRA** The decision established the right of scientists "to challenge agency over-interpretation of NAGPRA." The government argued that the only people with standing to challenge NAGPRA decisions were people who had a right under the terms of NAGPRA to claim the human remains or objects in question. The courts decided that scientists do, indeed, have a personal interest in NAGPRA decisions: "They propose to personally conduct tests on the remains, and to analyze the results of those tests. This data will then be used to further their ongoing research." The court decided that this constituted sufficient grounds for standing.

**Defining "Native American"** The decision established that the term "Native American" in NAGPRA was restricted, by the plain language of the law, its objectives, and its legislative history, only to human remains that have a "special and significant genetic or cultural relationship" to a presently existing federally recognized tribe, people or culture. This will, in effect, limit valid NAGPRA claims to remains that are not much more than a few hundred years old. This doesn't, of course, mean that Kennewick Man cannot be the ancestor of some or all modern American Indians. It just means that there can be no special relationship between him and any particular modern tribe.

**Balancing archaeology and repatriation** Schneider and Barran conclude with the observation that, in the light of the Kennewick Man decisions, "museums and federal agencies will have to change their criteria for making NAGPRA classifications of ancient human remains, and for how they evaluate repatriation claims. . . . Federal agencies will have to take more care when undertaking activities that might adversely affect an archaeological site. They will also have to reassess their policies and procedures to ensure that they act as truly neutral and unbiased decision makers when confronted with challenges to repatriation claims."

These outcomes may indeed be "as significant as the scientific study results."

*– Brad Lepper*

## Suggested Readings


Benedict, J. 2003 *No Bone Unturned: The Adventures of a Top Smithsonian Forensic Scientist and the Legal Battle For America's Oldest Skeletons.* HarperCollins, New York.

Lepper, B. 2002 Judge rules scientists can study Kennewick Man. *Mammoth Trumpet* 18 (1):1–3, 18–19.

——— 2003 Major decision: Kennewick Man case. *Mammoth Trumpet* 19 (1):1, 3–4, 18–19.

——— 2004 Kennewick Man decision upheld by Court of Appeals. *Mammoth Trumpet* 19 (2):1–2, 18–19.

Owsley, D. W., and R. L. Jantz, editors 2014 *Kennewick Man: The Scientific Investigation of an Ancient American Skeleton.* Texas A&M University Press, College Station.

Preston, D. 2014 The 9,000-year-old man speaks. *Smithsonian* 45(5):52–63.

Schneider, A. L., and P. A. Barran 2014 The precedent-setting case of Kennewick Man. In *Kennewick Man: The Scientific Investigation of an Ancient American Skeleton,* pp. 90–107. Texas A&M University Press, College Station.


## Ambassador from Our Ancient Past

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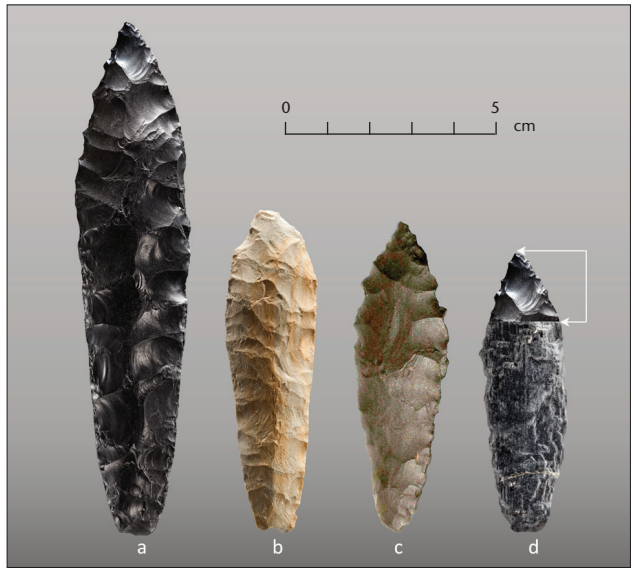
throwing a spear with a spear thrower, flintknapping, poling a boat, and netting fish in the river or ocean.

### Where did he come from?

Based on characteristics of the skull and face, C. Loring Brace, Professor Emeritus of Anthropology at the University of Michigan, and his colleagues conclude that Kennewick Man appears most similar to the Ainu, the indigenous peoples of Japan, and Polynesians. Jantz and Katherine Spradley, Associate Professor of Biological Anthropology at Texas State University, came to the same conclusion, noting that his proportions were particularly close to the Moriori of New Zealand. They caution, however, that the similarity of Kennewick Man to Polynesians "obviously does not suggest a direct connection with Polynesians. Rather it suggests that early Americans and Polynesians have roots in the same Asian populations, probably those inhabiting coastal areas and using watercraft to exploit marine resources." This is an especially important point because in the popular media, Kennewick Man has been portrayed variously as either a Caucasian or a Polynesian with all the simplistic migration scenarios implied by those categorizations.




JAMES DI LORETO; ALISON STENGER (FOR C.)

**Haskett points. The area bounded by the arrows represents the portion found lodged in the hip bone of Kennewick Man.**

George Gill, Professor Emeritus of Biological Anthropology, concludes that much of Eurasia 12,000 years ago "was inhabited by an extensive network of related peoples of a generalized and basic Caucasoid appearance. Beyond Europe these people were particularly prevalent in coastal and southern Asia and were typified by high, long skulls, prominent chins and noses, modest cheek bones, and parabolic palates." Far to the north, in colder inland areas, Gill believes there lived people with Mongoloid skeletal characteristics. He suggests that these two populations entered America by two separate routes—following the coastline in small boats, or walking dry shod across the Bering Land Bridge (**MT 29-4,** "Tracking Paleoamerican Migrations with Mitogenomes"). Gill thinks Kennewick Man belonged to the former group.

Is there other evidence linking him to the Pacific Rim? In spite of the fact that he was buried more than 200 miles from the Pacific Ocean along the banks of the Columbia River, the chemical composition of his bones suggests he didn't eat terrestrial game animals such as bison or elk. Instead, it appears he subsisted on a limited variety of resources available along the coast, including seals, salmon, and possibly birds. Owsley and Jantz observe that his bone-collagen isotope values are most similar to documented Pacific coastal populations "with diets based primarily on marine mammals."

Additionally, the predominant variety, or isotope, of oxygen in his bones indicates that for at least the last 10 years of his

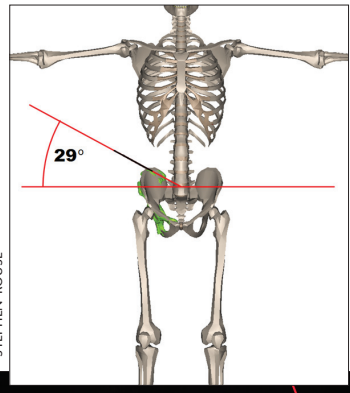
life the water he drank didn't come from the Columbia River. Owsley and Jantz conclude that he "drank cold river water originating in high-elevation snow or glacial melt."

Kennewick Man's teeth also point to a Northern coastal homeland. His teeth are heavily worn. Brace and his colleagues found that 23 of his 30 teeth exhibit the most severe degree of wear in their classification system. They note that the wear pattern is highly reminiscent of the wear seen in the teeth of pre-contact Eskimos. Among the Eskimo, this extreme wear results from using teeth as tools when working hides. Owsley and Jantz observe that "an unusually rounded first molar suggests he habitually held cordage or a similar material between his teeth on the right side."

The extreme wear on the teeth also could be the result of a diet that included food containing an abrasive substance. According to Della Collins Cook, Professor of Biological Anthropology at Indiana University, dried fish are "notoriously abrasive." Alternatively, flour made by grinding nuts or seeds in a sandstone mortar contains grains of highly abrasive sand.

## Injuries picture a brutal life

Kennewick Man sustained a variety of injuries over the course of his life severe enough to be recorded in his bones. As a young adult, he received a spear wound to the right hip. The spear entered from the right rear, as if he had turned to the left to try to avoid the incoming spear. The point became embedded in the bone, but there is no sign in the bone that the wound became infected, nor is there any evidence that Kennewick Man favored his left leg in later years, so this potentially grievous wound apparently healed completely.




STEPHEN ROUSE

CHIP CLARK, SMITHSONIAN INSTITUTION

**The hip bone of Kennewick Man, with the embedded tip of a Haskett projectile point *(arrow)*. The inset shows the angle at which the spear penetrated the body.**

Dennis Stanford, Director of the Smithsonian Institution's Paleoindian/Paleoecology Program, believes that the spear must have been hurled with great force to inflict such a wound and concludes it must have been thrown with the aid of a spear thrower, or atlatl. He identifies the projectile point as a heavily reworked Haskett point. Haskett points, hallmarks of the Western Stemmed Tradition, have been dated to 12,000–9000 CALYBP. Naturally this only identifies the cultural affiliation of the person who threw the spear, not necessarily that of the man hit by it.

Cook thinks that it would be wrong to presume that the projectile-point wound "resulted from interpersonal violence rather than from a hunting accident or any other scenario." Owsley, on the other hand, told CBS News, "I think this is something that's intentionally lobbed at this man with the intention of killing him." Owsley's view is supported by the relatively high incidence of traumatic injuries in documented Paleoamericans. Moreover, this wound and other unrelated traumatic injuries all point to a pattern of interpersonal violence in the life of Kennewick Man.

Later in life, a few years before his death in fact, Owsley and Jantz conclude that Kennewick Man broke five ribs on his right side and another on the left as the result of a "severe blunt-force trauma." As a result of his "vigorous lifestyle" the ribs weren't allowed to heal. Finally, Kennewick Man has two small depression fractures in his skull. None of these old wounds, however, appears to be directly related to his death.

Kennewick Man died at the age of about 40. There is no clear evidence of the cause of death, but 40 years would have been a reasonably long life for a hunter-gatherer of this period. By the time of his death, his teeth were so badly worn that orthodontist John Hayes supposes he was likely experiencing "varying levels of daily discomfort and even pain."

## Was he deliberately buried?

Initially, because the bones had already eroded out of the river bank when they were discovered, investigators weren't sure whether Kennewick Man was intentionally buried in a grave or if his body was simply covered with naturally deposited river sediments. Detailed observations by Owsley and Jantz's team establish conclusively that Kennewick Man was deliberately buried in a carefully prepared grave, which offers insights into who he was and the mortuary practices of this early period of American history.

Owsley, Jantz, and their team carefully recorded the locations of carbonate-cemented sediment on the various bones of Kennewick Man. These data show he was laid to rest on his back in an extended position with his head slightly elevated. His arms appear to have been positioned beside his body with the palms of his hands facing down.

These data also showed that Kennewick Man's grave had been dug so that his head was about seven inches higher than his feet. His body was buried parallel to the river with his head to the east, which was upstream. His left side was closer to the river.

No artifacts were recovered with the bones. Many Paleoamerican burials lack funerary offerings, so their absence in this case may be unremarkable. However, because of the circumstances of the discovery and recovery of Kennewick Man's remains, it's possible that funerary objects originally were present, but were lost in the muck of the river bed.

## Unanswered questions

Owsley and Jantz believe that their book presents "the most complete analysis of any Paleoamerican skeleton to date." Nevertheless, they and the various contributors to the volume realize that much more remains to be learned from Kennewick Man.

Ancient DNA extracted from Kennewick Man's teeth and bones could provide direct evidence of his ancestry. Was he a recent immigrant from Asia or simply a wide-ranging Paleoamerican? Identifying ancient proteins in the bones "may offer a potential way to determine the cause of Kennewick Man's death."

Henry Schwarcz, Professor Emeritus of Geography and Earth Sciences at McMaster University, and his coauthors would like to analyze the varieties of chemicals in the enamel of Kennewick Man's teeth, which would provide insights into the environment of his youth as well as his early diet. Stanford argues that X-ray fluorescence analysis of the projectile point "may not only shed light on the type of point in Kennewick Man's hip, but may also help to determine Kennewick Man's origin, where his travels may have taken him, and where he was when he received his injury." Moreover, Owsley and Jantz acknowledge that "as science progresses, additional studies beyond those suggested here will become possible."

## Ambassador from our ancient past

Dorothy Lippert, archaeologist and Choctaw Indian, wrote in 2005 that "in the end, what we may be able to learn from the skeleton of this man [the Ancient One/Kennewick Man] is all we could learn from any one of ourselves: He was a human being, just like us." Owsley, Jantz and the impressive team of scientists and scholars they assembled demonstrate in their monumental study of this skeleton that we can learn far more than that. ***Kennewick Man: The Scientific Investigation of an Ancient American skeleton*** is nothing less than a biography of a man who lived around 8,500 years ago.

What, beyond the fact that he was a human being, have we learned about Kennewick Man?

CHIP CLARK, SMITHSONIAN INSTITUTION

**The skeletal remains of Kennewick Man.**

He was tall and broad-shouldered, a formidable fellow proficient with atlatl and spear or the fishing spear. He was around 40 years old, a respectable age for that time. In his youth he had a pleasant smile, but years of hard living had taken that from him. He bore other traces of that hard life: a spear point still lodged in his hip, a series of never quite healed broken ribs, and two small skull fractures.

He was a man of the North, or at least of the northern Pacific Coast, who was buried more than 200 miles from the ocean along the Columbia River in a broad valley of shrubby steppe. It appears, then, he wasn't near his home when he died. Nevertheless he was given an extended burial in a comfortable, if shallow, grave—not a trivial task if you don't have a metal shovel.

What was Kennewick Man doing so far from home? Was he on a trading venture, a visit to a son or daughter who had married into a distant group, or perhaps a vision quest? Whatever Kennewick Man's motives for being in this place, so distant and different from his homeland, it seems plausible to suppose he was journeying up the Columbia River—a journey interrupted by his death. Someone, perhaps fellow travelers or local friends, gave him a respectful burial on the river bank to send him on the final journey to "the undiscovered country from whose bourn no traveler returns."

But Kennewick Man did return in 1996, and Doug Owsley, Richard Jantz, and the team of scholars they assembled devoted the next 18 years first to securing the right to study the remains of this ancient American, then to listening attentively to the stories only he could tell.

For Owsley, at least, the monumental biography of Kennewick Man that he and Jantz have produced isn't the final word. As he told CBS News, "I feel like the skeleton is just beginning to talk to us and we need to carry on that conversation." MT

*– Brad Lepper*

How to contact the principals of this article:
Douglas Owsley
Department of Anthropology
National Museum of Natural History
MRC 112
Smithsonian Institution
10th and Constitution Avenue NW
Washington, DC 20560
e-mail: owsleyd@si.edu

Richard Jantz
Professor Emeritus and Director Emeritus,
Forensic Anthropology Center
250 South Stadium Hall
Knoxville, TN 37996-0720
e-mail: rjantz@utk.edu

## Suggested Readings

Benedict, J. 2003 *No Bone Unturned: The Adventures of a Top Smithsonian Forensic Scientist and the Legal Battle For America's Oldest Skeletons.* HarperCollins, New York.

Owsley, D. W., and R. L. Jantz, editors 2014 *Kennewick Man: The Scientific Investigation of an Ancient American Skeleton.* Texas A&M University Press, College Station.

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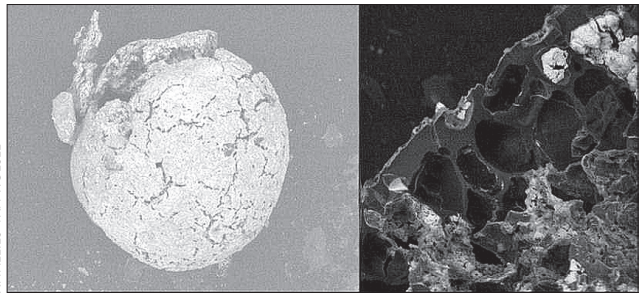
# THE CLOVIS COMET

## New Developments in the Proxy Evidence, Part I

**IN THIS YOUNG CENTURY,** few topics have generated as much debate among First Americans researchers as the Younger Dryas Impact Hypothesis (YDIH)—better known as the Clovis Comet theory. In 2007, physicist Richard Firestone and 26 colleagues in various disciplines proposed in the *Proceedings of the National Academy of Sciences (PNAS)* that a comet exploded in the Earth's atmosphere about 12,900 calendar years ago. In so doing, they claimed, it contributed to the collapse of the Clovis culture, the extinction of North American megafauna, and the Younger Dryas Interval—a thousand-year climatic reversal that occurred just as the Ice Age was ending.



ANNELIES VAN HOESEL

**Complete carbon microspherule *(left)* and close-up of the internal structure of a broken carbon microspherule. (from van Hoesel et al., *PNAS* 109:20, 7648–7653.)**

The YDIH has polarized the scientific community. Some major players immediately chose sides. Others waited for enough solid evidence to make a decision one way or another. Many are still waiting. Meanwhile, most of the lines of evidence presented by Firestone and his colleagues have been criticized and dismissed by critics unable to verify evidence for them, though other independent researchers have confirmed them. Accusations of shoddy research have been hurled by both sides. The pro-YDIH camp insists that dissenters haven't followed their research methods properly. The dissenters argue that some of those methods have never been formally published or clearly defined. Many scientists who find the evidence troubling—or reject the theory outright—wish the whole mess would just go away so we can all get on with more important questions about the peopling of the Americas.

In an earlier article in this series (**MT 29-3,** "The Clovis Comet: The Cratering Evidence"), we examined three proposed candidates for a Clovis comet crater in Canada, none of which panned out. YDIH proponents note that if a comet exploded high in the atmosphere, as they now believe, there would be no cratering. Their critics say there's no crater because there was no comet—indeed, that it would violate the laws of physics for a large comet to explode high in the atmosphere.

The only YDIH evidence remaining is proxy data—indirect evidence, most so tiny it's invisible to the naked eye. In this series of three articles, we'll take a look at the arguments for and against nine proxy markers found in locations throughout North America. We'll start by focusing on three: Black Mat deposits; charcoal and soot in Younger Dryas Boundary (YDB) and immediate post-YDB deposits; and carbon microspherules.

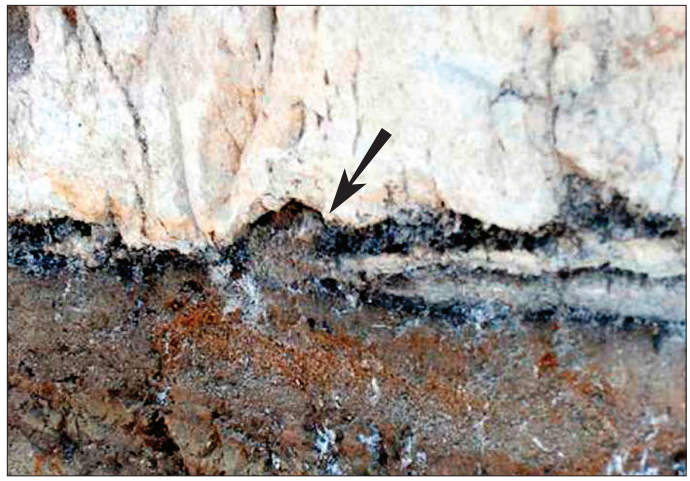
TED BUNCH

**Ted Bunch pointing to a shocked piece of Coconino sandstone below the south rim of Meteor Crater, 2009.**

### Black Mats

The Black Mats can be considered "a layer roughly marking the onset of the YD in the sediment," as Dutch Earth sci-

entist Annelies van Hoesel puts it. YDIH proponents believe the Black Mats formed as a result of impact-related climate change and continent-wide wildfires ignited by the heat of the cometary air burst(s)—a claim their critics vigorously reject. As geoarchaeologist Vance Holliday points out, "What is called 'Black Mats' varies. Some are marsh deposits; some are lake deposits; others are uplands soils; some are black, some are gray, and some are white!" Alternative origins have been proposed for these organic-rich horizons, including water-transported organic material, decayed algae in shallow reservoirs, organic material oxidized by groundwater, the remains of wood fires, and the decomposition of charred wood.

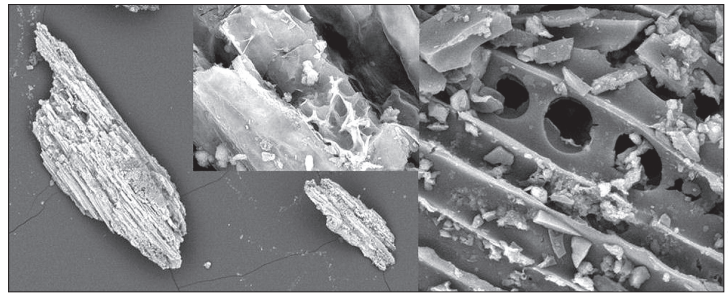


TED BUNCH

**Stratigraphic profile from the Murray Springs site, showing the classic Black Mat *(arrow)*.**

Sediments referred to as Black Mats aren't uncommon in the geological record; nor do they represent a single stratigraphic horizon. Various Black Mats range in age from 6000 to 40,000 RCYBP. As Alexander Andronikov of the University of Arizona points out, "There are other layers similar to the Black Mats known throughout the Quaternary, but only those generated around 12.9 ka are so widespread. . . . Their hemisphere-wide presence is one of the indications that the YD climate oscillation was a world-wide phenomenon." Although other researchers agree, Andronikov cautions, "Whether such a change was triggered by an impact, by sheer terrestrial processes, or by the combination of the terrestrial and extraterrestrial processes is a matter of a further and very thorough study."

Andronikov equates the Black Mats with the Usselo Horizon (UH) of Western Europe—a buried soil horizon—noting that most Black Mat sequences contain a thin (2–5 cm) basal layer likely corresponding to the Lower YDB. UH sequences are represented by dark charcoal-rich layers in wind-deposited sands. But as van Hoesel notes, "The Usselo Horizons generally started forming during the Allerød period, *prior* to the YD onset. The Black Mats started forming near the onset of the Younger Dryas, per C. Vance Haynes. Although the UH soils also mark a boundary between post-YD and earlier sediments, they're not exactly contemporaneous with the Black Mats." Her own findings don't support an ET impact.



ANNELIES VAN HOESEL

**Charcoal samples from Usselo Horizons in Europe (from van Hoesel, Annelies et al., 2012. "Nanodiamonds and wildfire evidence in the Usselo horizon postdate the Allerød-Younger Dryas boundary." *PNAS* 109:20, 7648–7653.)**

## Charcoal and soot

YDIH advocates also argue that concentrations of charcoal, grape-like clusters of aciniform soot, and other forms of carbonized matter found in immediate post-YDB sediments are further evidence of widespread biomass burning at the YDB. But soot and charcoal in all their forms aren't limited to YDB strata. They occur in nearly all strata to some extent—because across geological time, wildfires are common. At Lake Cuitzeo, Mexico, a site YDIH proponents have recently focused on, strata from a deep core yielded several classes of purported impact microproxies of about the right age. The deposits of charcoal and soot, however, are concentrated 5 cm above other microproxies.

It's possible, of course, that carbon particles falling onto a lake surface would sink to the bottom slower than heavier microproxies would. Critics, however, have challenged the dating of YDB layers at various sites, and questioned whether stratigraphic layers above and below them were also tested for their charcoal/soot concentrations. Some researchers who have collected samples from the very same sites cited by YDIH proponents as having abundant microproxies have found none at all (e.g., **MT 25-2,** "In the Crucible of Scientific Enquiry: The Clovis Comet Revisited"). YDIH advocates fire back that these critics either used the wrong sampling protocols or didn't collect their samples from the same locations—or even the same sites. "One cannot sample the assumed same stratum somewhere else, especially hundreds of meters away, with no reliable age determination or stratigraphic congruency," states Ted Bunch of North Arizona State University. "Any stratigraphic profiler knows that nearly any stratum is unhomogeneous, horizontally and vertically, with distance." He cites as an example the controversial Arlington Canyon site in California, where critics failed to replicate the findings of YDIH advocates. "The stratigraphic descriptions and radiocarbon ages presented in their papers," he says of the critics, "conclusively demonstrate that their samples, supposedly taken from the identical exposures, were actually taken seven kilometers away from the stratigraphic section" studied by YDIH proponents such as James Kennett and Allen West.

Even in cases where charcoal and soot peak at or just above the YDB, natural processes may have concentrated the particles there. Lag can occur when erosion removes lighter particles (such as silt) from the sediments, causing heavier material to

collect on one surface. When that surface is buried, the concentrated material can mimic a homogeneous stratum. In addition, frost heaving, rodent burrowing, root growth, and contraction and expansion of sediments can mix or concentrate materials through upward and downward movement. Says van Hoesel, "Depending on the site, it's possible that wildfire proxies have been redeposited into younger deposits or mixed with either older or younger sediments."


ANNELIES VAN HOESEL

**The Usselo Horizon soil (*arrow*) at the Katarzynka site near Torun, Poland.**

## Great balls of carbon!

The origin of carbon microspherules is an especially contentious issue in the YDIH debate. As the name suggests, these are microscopic balls of carbon whose surface patterns suggest, to some, that they were created in a high-heat/fast-quenching environment. Measuring 10–700 microns in diameter, they often exhibit roughened surfaces and spongy interiors. Sometimes nanodiamonds are imbedded inside and on their surfaces.

YDIH proponents postulate that the spherules formed when native carbon, incinerated by an air burst, reformed into these interesting little spherules. Some critics dismiss the carbon spherules as insect feces and charred fungal spores, "though they cannot explain the presence of nanodiamonds in them," notes Dr. Bunch. Annelies van Hoesel, who reported on the absence of wildfire/nanodiamond evidence in UH soils in a 2012 *PNAS* article, concludes that whatever they are, they and associated glass-like carbon were likely created in wildfires at much lower temperatures than those cited for an extraterrestrial impact event—specifically, at temperatures below 500° C. Conversely, pro-YDIH teams have created carbon spherules in lab experiments at temperatures exceeding 1,600° C that quite resemble the YDB spherules.


ANNELIES VAN HOESEL

**Annelies van Hoesel *(foreground)* and Alexander Andronikov doing fieldwork at Lommel (Molse Nete site, Belgium).**

Researchers have identified these spherules at numerous YDB sites, including Sheridan Cave in Ohio, where archaeologist Kenneth Tankersley identified spherules in a charcoal layer dating from about 12,900 CALYBP, along with other YDIH microproxies such as magnetic grains, magnetic microspherules, and nanodiamonds. Two species of megafauna—flat-heated peccary and giant beaver—went extinct after the event that deposited the charcoal.

Then there are the deep cores from Lake Cuitzeo. In the YDB stratum, researchers found (relatively) copious carbon spherules associated with other microproxies, including nanodiamonds and magnetic microspherules. There are none at all in the strata below the YDB unit.

But critics have blasted the veracity of the Lake Cuitzeo cores, arguing that the dating was poorly controlled. The proposed YDB section, which lies 2.65–2.8 m below the surface, is bracketed by dated deposits at 1.95 m (age 9900 RCYBP) and 3.35 m (18,800 RCYBP). The six samples from the strata in between yielded radiocarbon ages significantly older than the bracketing dates, which suggests that the strata were contaminated by old carbon. The researchers subsequently excluded the six dates from the radiocarbon analysis, and the location of the YDB was extrapolated based on statistical regression.

The merit of carbon spherules as a YDIH proxy was also shaken several years ago when physicist Mark Boslough of Sandia National Laboratories isolated and had dated one carbon spherule from sediments collected from the Gainey site in Michigan. Tim Jull of the University of Arizona conducted the actual dating, using a grant from Vance Holliday. As it happened, the spherule was essentially modern. Given the expense of the dating method, Boslough didn't attempt another date. "I have always encouraged the YDIH proponents to have their samples radiocarbon dated," he says. "I hope they use this as an opportunity to find out if any of their samples are consistently from the YDB, and to publish the results regardless of what the answer is. Firestone has done that, and found that the sample ages are all over the map. He posted his results online, but as far as I know, this has never been published in a peer-reviewed journal."

According to Ted Bunch, Boslough used this one contaminated sample as an excuse to reject the entire YDIH. "This is

where the word 'disingenuous' comes into play," says Bunch. "Boslough asked [Allen] West for a carbon spherule to look for nanodiamonds, but apparently, Boslough never bothered to do so. Instead, he knew about a young radiocarbon date for the site from Firestone's earlier publication and had the spherule dated. Like Firestone, he got a modern date because of contamination, which is very common at archaeological sites. However, Boslough used that one erroneous date to imply that ALL 403 dates for 28 sites on four continents are in error. That is simply an indefensible, if not an disingenuous, claim."

RUPERT PARROTT

**Mark Boslough with fragments recovered from the Chelyabinsk, Russia, meteor of February 2013. Courtesy of the Pioneer Productions television series NOVA, "Meteor Strike" episode.**

Boslough rebuts, "I'd already rejected the Firestone version of the YDIH long before I had the sample dated. But I also think it's important to know that I still don't reject the 'entire' YDIH. I said in a 2012 radio debate with Kennett that I'm fine with a small impact at the YDB and that the Israde impact scenario (but not the postulated environmental effects) is possible. I published a letter in *PNAS* suggesting that there was indeed an impact near the YDB that explains the Pt [platinum] anomaly in the [Greenland] ice—but again, without the environmental effects."

ALEXANDER ANDRONIKOV

**Alexander Andronikov working at a Lutterzand outcrop in the Netherlands. A dark Usselo Horizon layer is visible between the Coversand I (lower deposit) and Coversand II (upper deposit).**

## The YDIH under fire

The Younger Dryas Impact Hypothesis represents one of those through-a-glass-darkly, if-only scenarios. The active geology of the Earth has so obscured terminal-Pleistocene events that it's almost impossible to discern most details. Maybe some large cometary fragments exploded in the atmosphere and played havoc with the environment, or maybe something completely different happened. If only there were a smoking gun—a crater, for example. But there isn't; nor would there be, if the air burst occurred miles above the surface.

All that the YDIH proponents can point to is impact proxies, which have increasingly come under fire from other scientists who either can't find them in the same deposits or dismiss them as something else. Even experts in the same discipline can't agree. This jousting has persisted for more than seven years now—and I'll eat my 2013 Paleoamerican Odyssey cap if adherents and naysayers aren't still thrusting and parrying seven years from now.

But that's how science advances. If the debate seems especially acrimonious, that's the risk we take when highly regarded experts with strong opinions clash on the academic field of battle. If such a spirited debate lasts long enough, there are sure to be casualties.

Tune in again for the next article in this series, in which we'll take a look at three more categories of microproxies: glass-like carbon and glassy material; magnetic grains; and magnetic microspherules.

*–Floyd Largent*

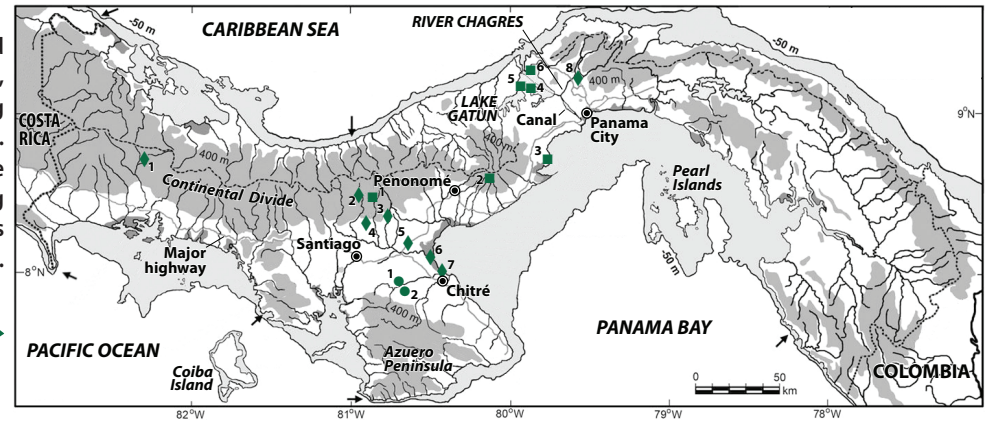
How to contact the principals of this article:

Mark Boslough
Sandia National Laboratory
P. O. Box 5800
Albuquerque, NM 87185-0370
e-mail: mbboslo@sandia.gov

Annelies van Hoesel
Department of Earth Sciences
Utrecht University
Budapestlaan 4, 3584 CD
Utrecht, The Netherlands
e-mail: a.vanhoesel@uu.nl.

Ted Bunch
Geology Program
School of Earth Science and Environmental Sustainability
Northern Arizona University
Flagstaff, AZ 86011
e-mail: tbear1@cableone.net.

Alexander V. Andronikov
Department of Planetary Science
Lunar and Planetary Laboratory
University of Arizona
Tucson, AZ, 85721
e-mail: andron@lpl.arizona.edu.




The Isthmus of Panama and important archaeological, paleontological, and coring sites older than 7000 RCYBP. The level at -50 m is the approximate coastline during the LGM. Arrows indicate sites occupied in the late Pleistocene.

♦ **$^{14}$C-dated archaeological site**
1 Casita de Piedra
2 Los Santanas
3 Corona
4 Carabali
5 Aguadulce Shelter
6 Vampiros 1 & 2
7 La Mula West & Central
8 Lake Alajuela

● **Paleontological site**
1 Llano Grande
2 La Trindaita

■ **Coring locality**
1 Laguna de la Yeguada
2 El Valle
3 Monte Oscuro

# Forgotten Land Bridge

**EVERYONE IN THE FIRST AMERICANS FIELD** knows the Beringian thesis, which argues that humans first entered the New World by following big-game herds across the Bering Land Bridge—that ultimate low-water crossing between Asia and Alaska that was exposed during the last Ice Age. According to the theory, these Paleoamericans then either followed the Pacific coast south, or filtered down into the interior of North America through gaps between the continental ice sheets, possibly after a period of sequestration in Alaska and western Canada. Colonization proceeded apace from north to south, populating both continents in as little as a few millennia. We haven't quite agreed on when this took place, though the general consensus is that it occurred after the Last Glacial Maximum (LGM). If so, it didn't take long for humans to find their way in. Evidence from sites like Monte Verde in Chile, Taima-Taima in Venezuela, and Debra L. Friedkin in Texas places human entry into the New World at least by 16,000 CALYBP.

The American continents are themselves connected by a land bridge, the Isthmus of Panama, which survives to this day. Indeed, many researchers specializing in the Isthmian region prefer the term "Central American Land Bridge," or CALB. First Americans researchers mostly neglected this relatively narrow strip of territory for decades, despite surface finds of fluted points as early as the 1950s. Exceptions included the late Junius Bird, who in the early 1970s conducted investigations at Lake Alajuela and elsewhere; Michael Snarkis, who in the late 1970s identified the Paleoamerican Turrialba quarry/workshop in eastern Costa Rica; and Anthony Ranere, who in 1988 discovered La Mula-Sarigua, a Clovis-era quarry/workshop in central Panama. Even when other North American researchers began paying attention to their South American colleagues' claims of great antiquity for some of their finds, the evidence from the CALB was mostly overlooked.

Lately, that situation has begun to change. As researchers take a greater interest in the southern continent (**MT 25-4,** "Paleo South America: Long time, no see"), they're also taking a closer look at the CALB, the most likely passageway for earliest human migration into South America.

## The Land Bridge, then and now

We know from early sites like Taima-Taima and Monte Verde in South America that pre-Clovis humans must have passed through the CALB on their way south. Unfortunately, we know almost nothing about these early immigrants. We've found only trace evidence of their presence, in the form of a few isolated surface finds. We can't even tell for sure whether they preferred the Pacific or Atlantic coast, came by way of boat, made their way south on foot—or all of the above.

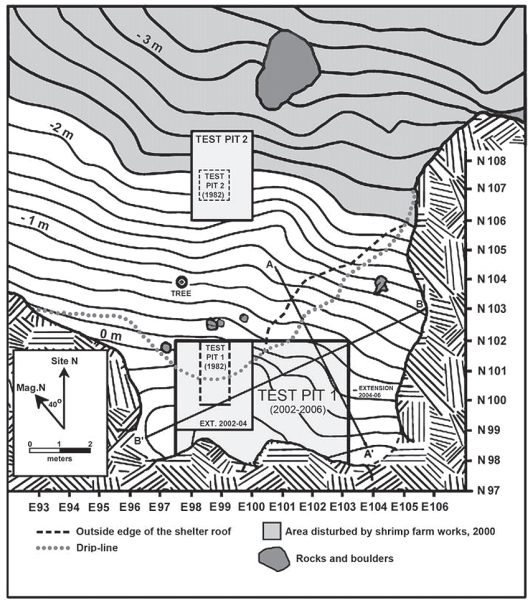
The biggest problem is that the CALB as it exists today is much narrower than it once was, with few surviving lowlands. Currently it includes all of Panama and Costa

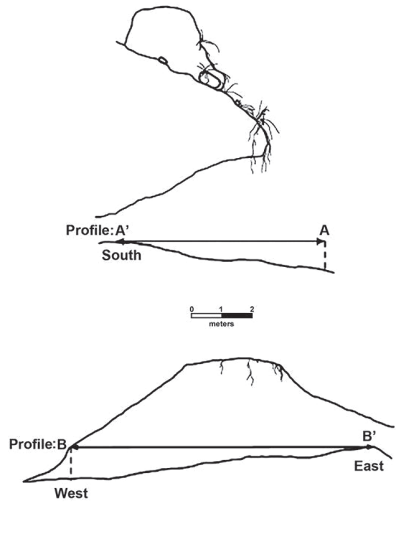

NORA FLEGENHEIMER

**This Fishtail point from the hill atop the Cerro El Sombrero site in Argentina is typical of Fishtail points found throughout Central and South America.**

Rica, as well as the Lake District of Nicaragua and the Atrato Basin of northernmost Colombia. During the late Pleistocene, however—when sea levels dropped as much as 130 m below the modern average—large expanses of the sea floors of the Bay of Panama, the Gulf of Nicoya, and the Gulf of Fonseca on the Pacific side would have been exposed on the surface. The Bay of Panama alone would have comprised a wide plain with a group of high hills in the center (today's Pearl Islands). The exposed area of continental shelf to the north, on the Caribbean side of the CALB, would have also been substantial.

This larger land area was advantageous for the people who gradually filtered southward to colonize the new territory. But for those of us who want to learn more about them today, it's a supreme frustration. It's possible that substantial early populations were in place within a few centuries of the initial arrival of humans from Asia, possibly even sooner, but that they remained coastal. If so, then most of the sites that might tell their story now lie under the sea. And if that's true, then a full understanding of early colonization of the CALB will have to wait until we can locate and excavate inundated sites on the continental shelf.

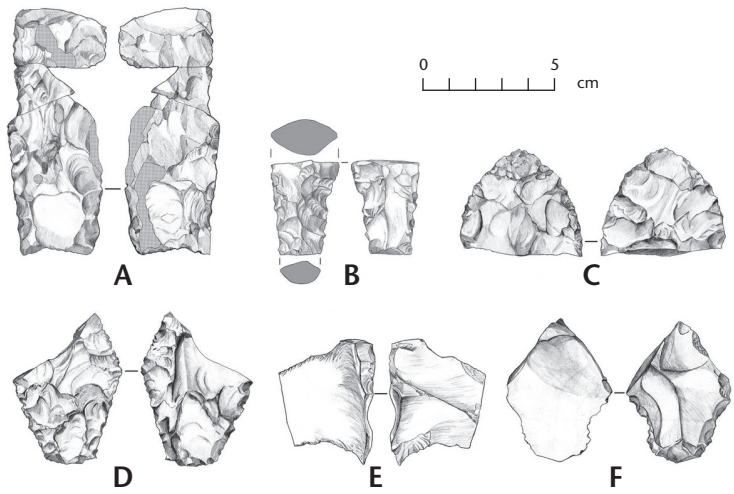



RICHARD COOKE ET AL.

**Excavation map and cross section of Los Vampiros-1 rockshelter, Panama.**

Noted South American archaeologist Gustavo Politis believes this may be possible for some, but not all, submerged sites. "In some areas like the Gulf of Mexico, sites have been already found in calm waters," he notes. "But on the Pacific coast, I doubt it. The sea-level rise would have destroyed most of the coastal sites. I think the proportion of sites still existing underwater is very low."




RICHARD COOKE ET AL. ALEJANDRA PATON, ARTIST.

**Paleoamerican stone tools from Panama, pre-7000 RCYBP. A, Clovis preform, broken during manufacture; B, medial section of a lenticular biface found on the surface at Lake Alajuela, similar in style to El Jobo points. C–F, artifacts from Los Vampiros-1: C, tip of a Fishtail point; D, fluted-point base; E, overshot flake; F,trimmed scraper.**

Clarification of the issue awaits new archaeological technology and techniques.

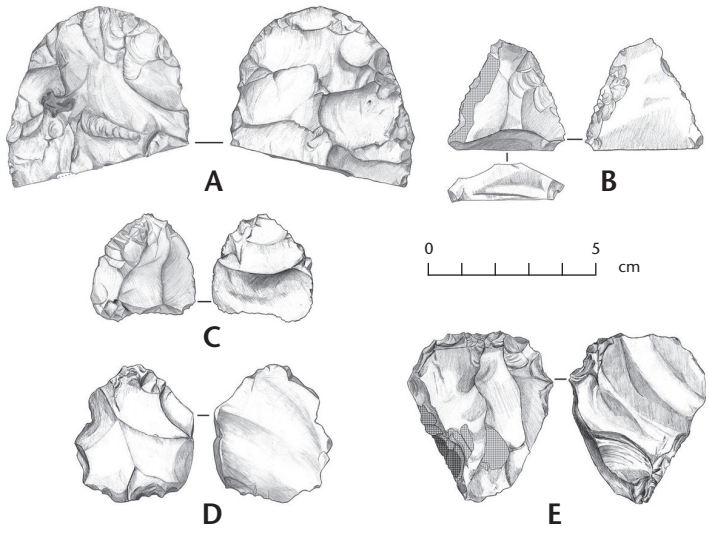
## The Pacific focus

Given the lack of hard evidence, it's hard to say precisely when the first humans reached the CALB. Researchers Richard Cooke, Anthony Ranere, Georges Pearson, and Ruth Dickau, in a 2013 article in *Quaternary International,* point out that the earliest surviving terrestrial sites in the CALB—those of the El Jobo/Monte Verde era—would most likely occur on or near modern Pacific coastlines that coincide with late-Pleistocene coastlines (these are indicated with arrows on the map.) The southwest tip of the Azuero peninsula and far southeast Panama seem particularly good places to prospect for such sites.

We know for certain that stable human populations were in place by Clovis times—and that some, in fact, left behind Clovis and Clovis-like artifacts. "I favor the hypothesis that the first explorers on the land bridge were pre-Clovis, affiliated with Taima-Taima and Monte Verde, while the Clovis occupation entered fully blown from further north," says Richard Cooke of the Smithsonian Tropical Research Institute. That said, recent mitochondrial DNA (mtDNA) research by Ugo A. Perego of the University of Pavia, Italy, shows a clear genetic continuity between very ancient and modern Native American populations in the region—suggesting that the Clovis interlopers failed to displace the original population of the region. This might explain why even during the Clovis era, there seemed to be multiple lithic technologies in use on the CALB.

Based on recent research in Beringia and elsewhere, Politis suggests the possibility of multiple pulses of immigration. "The first pulse probably used some sort of watercraft," he suggests. "I imagine a greater rate of human expansion; if using the marine route, occupation would occur within a few centuries

[of entering North America]." On the other hand, Dr. Cooke and Dr. Ranere argue, "Passage through the CALB may not have been all that fast . . . mitochondrial DNA data would argue against movement being rapid. Why should it [be]? Even though the annual precipitation was certainly lower than today's, and it was considerably cooler, tropical marine-coastal ecosystems are prolific, and the environment in present-day Panama in this area is benign."

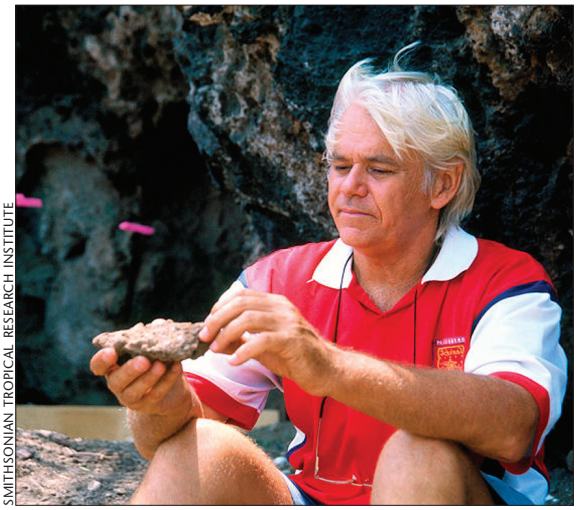



RICHARD COOKE ET AL. ALEJANDRA PATON, ARTIST.

**Artifacts recovered from the earliest occupation levels of Los Vampiros-1, the best-dated pre-Clovis site in Panama. A, biface tip, possibly a knife fragment; B, trimmed unifacial blade tool; C, unifacial thumbnail scraper; D, trimmed uniface, possibly a denticulate tool; E, spurred unifacial endscraper.**

Meanwhile, Politis suggests that "the second pulse of migration might have occurred just before Clovis times, using a land route . . . filling the different landscapes and environments before moving south. I suspect it would take much longer terrestrially, as groups developed and split." Politis believes the Pacific coast offered the easiest approach to Central and South America, while the Atlantic coast was secondary at best.

The aforementioned mtDNA studies of modern native populations in the CALB and South America have suggested the Pacific coastal route as the most likely one. So as you can see, everything's still in question—and we're entering another exciting time when new and even novel data are generating very interesting discussions among Paleoamerican specialists.



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**Cooke in the field.**

## Clovis and the vampires

However humans got to Panama, it's clear from regional artifact assemblages that they were firmly entrenched by the Clovis era, which suggests their ancestral groups were there in pre-Clovis times. Unfortunately, nothing we've found so far dates firmly to that period. Bird collected an anomalous biconvex tool from the exposed lake bed of Lake Alajuela (a.k.a. Lake Madden) in 1973 that he felt might be very early; in fact, it may be the midsection of an El Jobo point. In addition, a thick biface base that resembles the very early El Jobo/Monte Verde types was collected near Lake La Yeguada. These artifacts suggest the presence of the pre-Clovis occupation that Perego's mtDNA studies imply, but fall short of providing archaeological proof.

Upland pre-Clovis occupations are apparently nonexistent in the CALB. The earliest Paleoamerican occupation in the Panamanian uplands above 600 m above sea level (masl) is Casita de Piedra rockshelter in Chiriqui (~800 masl), where Dickau recovered bifacial thinning flakes associated with two charcoal dates in the 10,230–10,710 CALYBP range. However, forest-clearing activities at La Yeguada (650 masl) began about 11,150 ± 160 years RCYBP (12,680–13,760 CALYBP), within the Clovis era. There must have been people there to clear the forests, but they left very little hard evidence behind.

Technologies used by early Panamanians embody features of Paleoamerican traditions on both continents. This mix may constitute an evolutionary bridge between the two, or it may signify cultural mixing caused by diffusion of technology, mostly from the north; there's no way to be sure at this time. Perego's genetic continuity research suggests that either the natives adopted the incoming Clovis technology as one of several in the region, or else coexisted with Clovis groups arriving from the north. Interestingly, no one has found megafaunal remains in clear association with any Paleoamerican artifacts on the Isthmus of Panama, though the existence of these artifacts suggests to some that big-game hunting and processing was taking place. As Cooke and Ranere note, "The Paleoindian toolkit sensu stricto is certainly specialized for killing large mammals and working their carcasses, hides, ivory and bone." Appropriate species, especially mastodon and ground sloth, were present well into the terminal Pleistocene.

**Politis in Brazil, 2010.**

There are intriguing artifact assemblages in the CALB—including *outre passé* (overshot) flakes, fluted points, Fishtail points, thumbnail scrapers, spurred endscrapers and gravers, and possibly scraper-planes—that appear to be roughly coeval with Clovis, given the morphological and technological similarities. Artifacts found elsewhere are clearly Clovis or Clovis-related, including those at the Finca Guardiria workshop in Costa Rica, where 18 fluted points and many keeled scrapers (suggesting woodworking activity) have been recovered. At 10 hectares, Finca Guardiria is the largest Paleoamerican site in Central America. It now lies at an altitude of 700 masl in a humid premontane forest. Atlantic Coast localities in Costa Rica, like Birlen, have also produced a few fluted points, and a site called Los Camachos has yielded what appears to be a reworked Fishtail point. Other sites have produced assemblages with no obvious Clovis attributes, which more closely resemble El Jobo assemblages.

None of these localities offers a datable stratigraphic context—except one. Cooke et al. emphasize in their recent *QI* article that "In only one case . . . have [unequivocal] Paleoindian stone tools been found in primary buried deposits—at the Vampiros-1 site."

Vampiros-1 is a stratified multi-component rockshelter on the slopes of a small hill, currently located two miles from the present-day coast of Parita Bay. Throughout the Holocene, it was used as a fishing camp and processing locality; but during the late Pleistocene, when sea levels were 50 m below current levels, it lay 30–60 km from the shore. It wasn't used as a fish-processing camp during this time period; it was much too far from the coast for marine resources to be easily accessible. Though the nature and the formation processes of the site present significant challenges to the archaeologist, a careful examination of the stratigraphy and radiocarbon dates makes it clear that Paleoamericans occupied the site sporadically starting about 11,050–10,300 RCYBP. These occupants were most likely a Clovis-related group. The lithic assemblage, although relatively small, includes fluted points in association with *outre passé* flakes, another common Clovis marker. Excavators also recovered a fluted Fishtail point.

**About the author** Floyd B. Largent, Jr. obtained his master's degree in anthropology from Texas A&M University in 1991, studying under CSFA Director Mike Waters. After working as a salvage archaeologist for nine years, he opened a small bookstore, where he honed his writing skills between customers. He later segued into full-time freelance writing. Though he misses fieldwork, he's kept his hand in by writing for *Mammoth Trumpet* since 2002, contributing almost 60 articles. He's also been published in *Current Research in the Pleistocene, Plains Anthropologist, La Tierra,* and the *Journal of Paleopathology.*

Cooke emphasizes that the Vampiros-1 Paleo assemblage contains very few bifacial tools. "Most are unifacial—not only typical Clovis ones, such as spurred endscrapers, but also much cruder ones, including many flakes used to cut and scrape—as well as a large scraper-plane, which, if found unassociated, could well have been classified as pre-Clovis." According to Cooke, the idea that unifacial technology represents very early occupations, as opposed to bifacial technologies representing more recent cultures, still pervades the thinking of some Central America specialists.

The Clovis-style artifacts may signify a diffusion of the technology southward through existing cultures, though Cooke et al. advocate the rapid movement of early Paleo groups from North America through Central America and into northern Venezuela around 13,000 CALYBP. How the Clovis and El Jobo cultural materials might have been related, if they were at all, remains uncertain. They almost certainly weren't in use at the same time. Politis warns, however, that the age of the El Jobo Complex remains uncertain. "We need to redate classic El Jobo sites to contemporary standards to be sure about the chronology," he notes.

Fishtail-point sites are apparently a bit younger than Clovis, but by no more than 200–300 years. Did they develop from Clovis technology as it moved south? It's hard to say. Both represent the outcome of the same technological revolution that occurred about 11,000–11,500 RCYBP throughout the Americas.

## Final thoughts

Politis cautions that "sometimes, the data in [Central and] South America are not properly represented in North American debates. I'm not saying the data are ignored, just not properly represented. In the Southern Cone [the southernmost third of South America], we have evidence of people living there by 12,000–12,500 RCYBP (about 14,000–14,500 CALYBP). They represent the final part of this long immigration process, which must have started a few thousand years before Clovis. I think

How to contact the principals of this article:
Gustavo G. Politis
INCUAPA-CONICET
Facultad de Ciencias Sociales, UNICEN
Del Valle 5737, 7400 Olavarría, Argentina
e-mail: gpolitis@fcnym.unlp.edu.ar

Richard Cooke
Smithsonian Tropical Research Institute
Apdo. 0843-03092
Ancón, Panama
e-mail: cooker@si.edu

Anthony J. Ranere, Professor Emeritus
Temple University
Department of Anthropology
Gladfelter Hall, Second Floor
1115 West Berks Street
Philadelphia, PA 19122
e-mail: ranere@temple.edu

early Americans were coming from Asia after the LGM at about 16,000–17,000 RCYBP via a coastal route, and they came south very quickly. Any post-glacial, pre-Clovis site in North America is a good site to test this idea."

The sites are there: We see them at Swan Point in Alaska; Manis in Washington State; the Hebior, Shaefer, and Mud Lake sites in Wisconsin; Friedkin site in Texas; Coats-Hines in Tennessee; Meadowcroft Rockshelter in Pennsylvania; Paisley Caves in Oregon; and so many others. We just haven't yet managed to fit them into a context that fully integrates the data from both North and South America—and the land bridge that connects them. Fortunately, dedicated researchers like Politis, Cooke, Ranere, Dickau, James Steele, Georges Pearson, Renato Messina, and others are in the process of doing just that, following in the footsteps of Bird, Snarkis, Ruth Gruhn, and Alan Bryan.

Once again, it looks like we're in for some interesting changes in the field of Paleoamerican studies. Strap yourself in and hold onto your hat—it's sure to be an exciting ride! MT

*–Floyd Largent*

## The Clovis Diet: Mostly Mammoths?

*continued from page 3*

vis hunters would have avoided mammoths if they were rare. Instead, it "predicts that regardless of the rarity of a high-ranked resource, it will be pursued when encountered." In other words, if Clovis hunters really were focused on hunting mammoths and mastodons, whether it was because of the amount of meat they could get from a kill or because of the social status they would accrue as the mightiest of hunters, they would have hunted them whenever they came across one. Since optimization theories don't preclude the well-documented mammoth hunting, it may therefore be premature to reject their utility for contributing to our understanding of Clovis diets.

### Proto-Clovis diets

Haynes and Hutson also review the evidence for a pre-Clovis or proto-Clovis occupation and conclude that "human choices to hunt and process the very largest land mammals began centuries before the Clovis era and continued through it, a patterned foraging choice with a long history." The evidence they offer in support of this conclusion includes the Manis Mastodon site in Washington (**MT 27-4,** "Reconsidering the Manis Mastodon"), the Hebior and Shaefer mammoths in Wisconsin (**MT 28-2,** "The Manis Mastodon in Context: A Glimpse into Pre-Clovis North America"), and the Firelands Ground Sloth in Ohio (**MT 28-1,** "Pre-Clovis Butchered Ground Sloth in Ohio". Each of these sites has megafaunal bones associated with non-Clovis stone or bone tools or, in the case of the Firelands Ground Sloth, bones bearing stone-tool cutmarks.

In addition to this direct evidence, Haynes and Hutson also point to the indirect evidence of the decline in the abundance of spores of *Sporormiella,* "a fungus that thrives in megafaunal dung," beginning as much as 2,500 years before Clovis in eastern North America. Presumably a decline in the fungus was a result of a decline in the abundance of megafaunal dung, which in turn was due to diminishing numbers of megafauna. Since this *Sporormiella* decline preceded "changes in fire regime or climate," Haynes and Hutson agree with the idea that the extrapolated decline in megafaunal numbers was a result of pre-Clovis human hunting. Grayson, however, argues that this is circular reasoning: "One assumes that people drove the extinctions, and that, therefore, declining abundances of herbivores indicates the presence of such people." It is possible that megafaunal declines had begun long before people arrived in the region and that whatever hunting took place with the arrival of Clovis-era people only hastened the already inevitable extinctions. On the other hand, Haynes and Hutson acknowledge that there are numerous examples of mastodon and mammoth remains that post-date the decline in *Sporormiella* spores, so any pre-Clovis hunting must have "affected only some of the region's proboscideans."

GARY HAYNES

**Haynes studies herds of African elephants and their bone scatters to gain insight into proboscidean behavior and, by extension, Clovis kill sites. Because elephants need an abundant water supply, waterholes today and 13,000 years ago are places where hunters expect to find proboscidean prey. Haynes observed this herd in Hwange National Park, Zimbabwe, 2002–2010.**

### A varied diet with a predilection for large mammals

So, were Clovis-era big-game hunters specialists who ate the mammoths and other species of megafauna to extinction? Haynes and Hutson think the labels "specialist" and "generalist" are misleading, in part because there are no widely agreed-upon definitions of the terms. More importantly, the distinction suggests a dichotomy in hunter-gatherer diets that doesn't exist: "Rarely or never are hunter-gatherer groups exclusively carnivorous or vegetarian."

Haynes and Hutson acknowledge that "Late Glacial human groups left incomplete or sketchy evidence about their

dietary choices," but they argue that the archaeological evidence available to us can provide valid and testable insights into those choices. They conclude that "proto-Clovis and Clovis-era populations had omnivorous diets"; that is, "they ate whatever was available if those foods were acceptable or preferred." The "if" in that last sentence is important.

Diets certainly varied from region to region as well as from season to season and even from band to band, but Haynes and Hutson assert that there was a pan-continental preference for hunting the largest mammals available. Insofar as they believe that this preference is at odds with the assumptions of Optimization Theory, they suggest that "important sociological and cultural sense can be made" of the seeming contradiction implied by the apparent dietary variability on the regional scale, but the "opposite of variability" on the continental, indeed, hemispheric scale. They suggest that "persistent traditions and norms" may have promoted big-game hunting throughout the proto-Clovis and Clovis eras.

Did that pan-continental focus on big-game hunting result in the extinction of the mammoths and other megafauna? It's hard to see how it couldn't have had an affect, but Grayson counters that the apparent pan-continental preference for mammoth meat may be an illusion. According to Grayson, the evidence for Clovis and proto-Clovis diets isn't just incomplete or sketchy, it's fundamentally biased: "Almost all of these sites have been found because of the associated large mammals; the archaeological components were typically discovered later. Lehner is a classic example. If you find the artifacts by first finding the elephants, then obviously there will be a positive correlation between the two. As I have pointed in a number of places, it is unlikely that any rancher would have contacted Emil Haury (who discovered the Lehner site) because he had found bunny bones eroding out of a stream bank." And while Haynes and Hutson are correct to note that this bias in our data cannot prove that Clovis hunters "chose small game more often that we see in the archaeological record" it does make it difficult if not impossible to reliably assess the relative importance of large versus small game in Clovis and proto-Clovis diets.

Maybe the contradiction between dietary variability on the regional scale versus the "opposite of variability" on the continental scale is more apparent than real. Maybe the variability we see on the regional scale is an accurate reflection of what we would see on the broader continental scale if our data weren't biased.

Future discoveries of Clovis and proto-Clovis sites will further our understanding of dietary variability through time and across space, but the question of whether people made an important contribution to the extinction of the Pleistocene megafauna is not likely to be resolved anytime soon. Hutson predicts that "new sites, excavated using modern methods, will also help to clarify some of the subsistence patterns we see on a regional and continental scale." MT

*–Brad Lepper*




How to contact the principal of this article:

Gary Haynes
Department of Anthropology
University of Nevada–Reno
Reno, NV 89557
e-mail: gahaynes@unr.edu


## Suggested Readings


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