MAMMOTH TRUMPET

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Center for the Study of the First Americans
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J. DAVID KILBY

A biface, anyone?

We'll never know what purpose the Clovis knapper had in mind for this magnificent preform when he buried it in Colorado 13,000 years ago. He may have cached it at a location his party routinely visited on hunting trips as a ready supply of toolstone for refurbishing their toolkits. Or it may have been simply too wonderful to use, and so he buried it as a ceremonial offering. Whatever his motive, he buried it so that no one could find it. And no one did, until J. David Kilby, a doctoral candidate at the University of New Mexico. Kilby has studied more than 20 Clovis caches in the West and as far north as Minnesota. Our story on the conclusions he has reached begins on page 13.

The Center for the Study of the First Americans fosters research and public interest in the Peopling of the Americas. The **Center,** an integral part of the Department of Anthropology at **Texas A&M University,** promotes interdisciplinary scholarly dialogue among physical, geological, biological and social scientists. The **Mammoth Trumpet,** news magazine of the **Center,** seeks to involve you in the peopling of the Americas by reporting on developments in all pertinent areas of knowledge.

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Pleistocene Human Colonization of Beringia

A Workshop That Really Worked!

ALTHOUGH SCIENTISTS generally understand climate and environmental change during the Last Glacial Maximum (LGM), the complex dynamics of human dispersal across eastern Siberia, Alaska, and portions of the Yukon and Northwest Territories—collectively known as Beringia—have eluded precise definition. A big step in clarifying the picture was made at an intensive workshop, Pleistocene Human Colonization of Arctic and Subarctic Siberia and Beringia, held last November 17–19 at Texas A&M University. Researchers from around the world met to discuss key issues concerning population movements throughout Beringia at the end of the Pleistocene and their implications for the settlement of the Americas. Hosted by the Center for the Study of the First Americans, the workshop reviewed the current state of knowledge, outlined research priorities, and identified avenues for new research.

CHARLOTTE D. PEVNY

Workshop participants take time out for a group photo in front of the Sterling Evans Library on the Texas A&M University campus.

Sponsored by the International Quaternary Association (INQUA) and the National Science Foundation, the workshop was organized by **Ted Goebel,** a member of the TAMU fac-

INSIDE

ulty and Associate Director of CSFA, to "foster international and interdisciplinary research on the spread of modern human populations into northernmost Siberia and Beringia during the late Pleistocene—40,000 to 10,000 years ago."

With this objective in mind, scientists engaged in researching human colonization above 55° N latitude assembled to participate in the "think tank." The 23 presenters from across the continental U.S. and Alaska, Russia, France, and Canada represent 16 different academic institutions, federal agencies, and private firms. Their papers focused on the known paleoenvironmental data from Beringia including reconstructed late-Pleistocene geography, geomorphology, climate, and vegetation, the distribution of archaeological sites, and technological variability.

An interdisciplinary and international event

This remarkable 3-day workshop was intended, says Goebel, to "initiate international dialog between various Quaternary specialists—not just archaeologists, but also geomorphologists, paleobotantists, and paleontologists." So that Russian- and English-speaking researchers could exchange ideas effectively, four or five presentations were given consecutively, followed by a 20-minute discussion period where everyone could pose questions and make comments.

Russian archaeologists also had the opportunity to examine firsthand late-Pleistocene materials from the continental U.S.: bifaces, overshot flakes, wedge-shaped cores, blades, and expedient tools from the Gault and Buttermilk Creek sites; casts of Clovis, Goshen, and Folsom projectile points; casts of numerous forms of ivory points, as well as a bone wrench and ivory atlatl hooks, courtesy of **Andy Hemmings** (Texas Archeological Research Laboratory, University of Texas); and casts of artifacts from Beringian sites, courtesy of **Dennis Stanford** (Smithsonian Institution).

Taking stock of our current base of knowledge was only half the mission. An equally important objective of the workshop was to plot a course through unknown waters; in Goebel's words, to propose new research "that will lead to recovery of a comprehensive Paleolithic record and an understanding of the process of Paleolithic settlement." Accordingly the workshop agenda allotted six hours for participants to work in special-topic groups, then present their individual findings to all the attendees.

Among the non-presenters who attended the workshop were scientists active in peopling of the Americas research including **Alan Bryan, Ruth Gruhn, Andy Hemmings, David Madsen,** and **Dennis Stanford.** Also attending were TAMU faculty members **Sheela Athreya, Vaughn Bryant,** and **David Carlson.** Graduate students from the Department of Anthropology **Jessi Halligan, Tom Jennings, Josh Keene, Charlotte Pevny, Tim Riley,** and **Ashley Smallwood** shuttled attendees to and from the workshop, to dinner, and on a field trip to visit Buttermilk Creek, a Clovis-age site.

Setting the geographical stage

Following a welcome from **Ben Crouch,**

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Mammoth Trumpet, Statement of Our Policy

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

Executive Associate Dean for the College of Liberal Arts, and **Michael Waters,** Director of CSFA, **Gary Haynes** (University of Nevada, Reno), the current president of INQUA's Commission on Palaeoecology and Human Evolution (PAHE), set the tone for the workshop. His paper, "INQUA's Initiative to Explore Human Dispersals in the Late Pleistocene," discussed the Commission's objective to "compare the many cycles of colonization and abandonment of large parts of the world by humans and human ancestors and to understand why hominins dispersed so widely and so quickly at certain times." Haynes summarized two similar undertakings sponsored by PAHE and described strategies they employed to explore specific colonization events in Africa and Australia.

CHARLOTTE D. PEVNY

Mike Waters (*left foreground*) heads up a tour of the Buttermilk Creek site. A "walk about" gave workshop participants an appreciation of the layout of the area while Waters summarized the 2006 excavation season and explained the stratigraphic sequence at the site. Like Gault, its sister site, Buttermilk Creek contains Archaic, late-Paleoindian, and Clovis components.

Julie Brigham-Grette (University of Massachusetts, Amherst) showed how climate and environmental changes, reflected in glaciation and vegetation, influenced human occupation of western Beringia. **John Clague** (Simon Fraser University) summarized similar findings for eastern Beringia (Alaska, Yukon Territory, and British Columbia). These speakers established the paleoecological background needed to investigate colonization evidence from specific regions within Siberia and Alaska.

Presenting specific regional data, **Kelly Graf** (University of Nevada, Reno) reviewed population fluctuation within the Yenisei River Basin of western Siberia and noted that colonization above 55° N latitude didn't occur until 30,000–22,000 CALYBP. Extreme glacial conditions in the northern latitudes during the LGM, approximately 22,000–19,000 CALYBP, limited both the number of Paleolithic sites and large-mammal populations. An increase in population size after 19,000 CALYBP is evident in the appearance of late Upper Paleolithic sites and their related microblade technologies.

Getting a handle on artifacts

Combining geoarchaeological investigations with technological analyses of lithic assemblages from sites within the Transbaikal region of southeast Siberia, **Ian Buvit** and **Karisa Terry** (Washington State University) discussed how hunter-gatherers adapted to rapidly changing late-Pleistocene environments and expanded into arctic zones. "So much attention is paid to Siberia's role in the peopling of the Americas," Buvit emphasizes, "that we tend to forget how awesome the 40,000-plus years of Northeast Asian prehistory are in their own right."

Alexey Teten'kin (Irkutsk State Technical University) summarized archaeological data of the Lena and Vitim rivers. Inter-

continued on page 15

SHAKING THE TIMBERS OF CLOVIS-FIRST

It takes hard facts to shatter a paradigm that has dominated Peopling of the Americas studies for half a century. Anyone who continues to argue that the Clovis people were the First Americans faces an Everest-high barrier raised by geoarchaeologist Mike Waters and geochronologist Tom Stafford in their article in the 23 February 2007 issue of *Science,* "Redefining the Age of Clovis: Implications for the Peopling of the Americas." Drawing on dates from the updated Clovis radiocarbon database and extraordinarily accurate AMS ^{14}C dates on culturally associated organic matter from 11 geologically secure Clovis sites across the U.S., they arrive at startling conclusions, among them:

- Clovis likely spanned 200 calendar years, from 13,125 to 12,925 CALYBP, ***a period both shorter than previously thought and more recent.***
- This revised time scale reopens the possibility of human migration during the Late Glacial through the Ice-Free Corridor ***before the oldest known Clovis date.***
- Other cultures existed coincident with Clovis, including Goshen and occupations in the Great Basin, on a California coastal island, and ***in South America as far south as Tierra del Fuego.***
- Emerging archaeological evidence (including Monte Verde in Chile and Mud Lake in Wisconsin—where butchered mammoth remains predate the oldest verified Clovis site by nearly 2,500 radiocarbon years) supports ***pre-Clovis human presence in the Americas.***

Any doubts that the Clovis-First theory no longer reigns over Peopling of the Americas studies are dispelled by the final paragraph of Waters and Stafford's article:

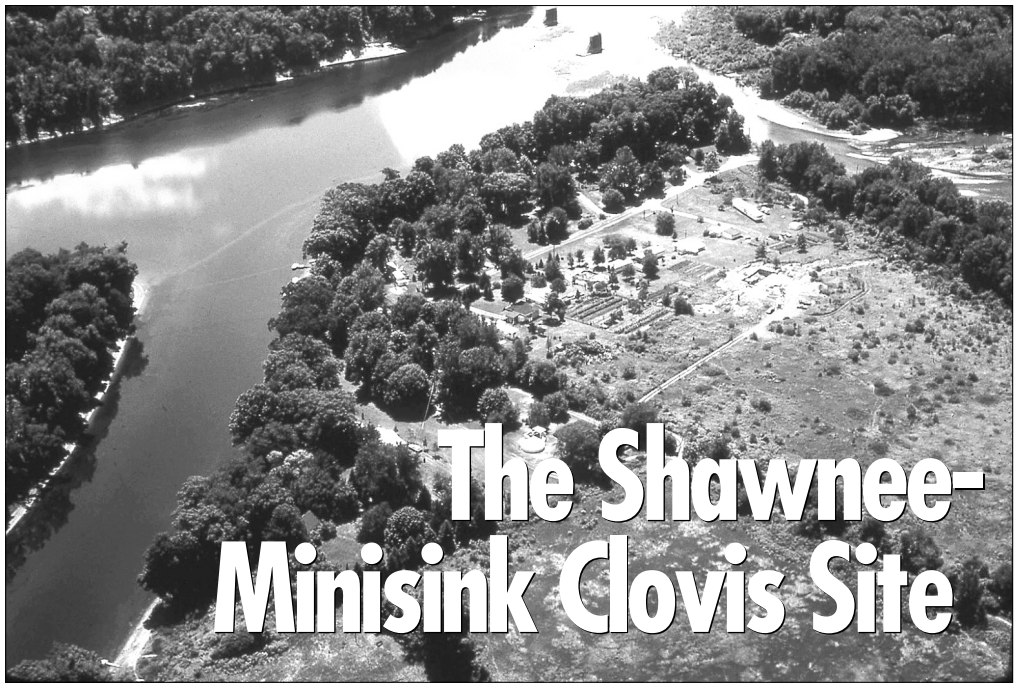
> ***The archaeological data now show that Clovis does not represent the earliest inhabitants of the Americas and that a new model is needed to explain the peopling of the Americas.***

In the next issue of *Mammoth Trumpet* Drs. Waters and Stafford will amplify on their explosive report and tell us the direction of their future research.

–JMC

A Spring That Keeps Flowing—

The Shawnee-Minisink Clovis Site



RICHARD J. DENT, AMERICAN UNIVERSITY

Aerial photo of Shawnee-Minisink at the confluence of the Delaware River and Brodshead Creek, taken during 1970s excavations by American University.

MORE THAN THREE DECADES AGO, a curious amateur archaeologist discovered what has arguably become one of the most important Clovis sites in the Northeast.

Renewed research at Shawnee-Minisink (36MR43), after digging ceased there in 1977, is expanding perceptions of when Ice Age peoples arrived there and how they may have used the site. While underscoring the importance of revisiting previously examined sites with fresh ideas and improved technology, it also spotlights how amateur and professional archaeologists working together stimulate scientific inquiry into our past.

The story begins with Donald Kline, retired power company repairman and welder, who describes himself as a self-taught avocational archaeologist. Kline found the Minisink site in 1972 while exploring a river terrace on private land near the confluence of the Delaware River and Brodhead Creek, some 4 miles south of Stroudsburg, Pennsylvania. Originally called the DeRocco site in honor of the land owner, its present name is derived from two nearby villages.

Kline, a former member of the Society of Pennsylvania Archaeology, says that after getting the landowner's permission he began digging on land that had been a corn field. It wasn't long before he completed two "10-foot-by-10-foot" squares down to a depth of 6 ft, recovering artifacts related to Woodland and Archaic periods. Then Kline learned that researchers Elmer Erb and Bill Strohmeier at the Byram site in New Jersey had uncovered 8 distinct occupation levels to a depth of 14 ft.

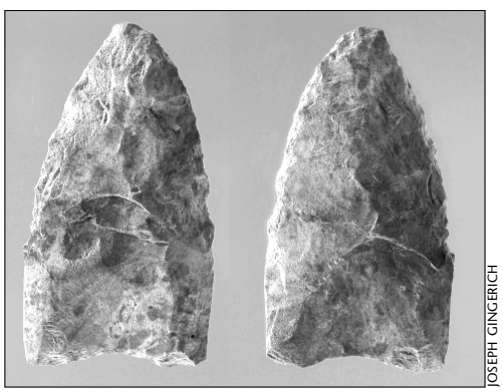
The deeper we dig, the luckier we get

"That's when I thought maybe I wasn't digging deep enough," Kline says. So he opened a new unit and went deeper. At about 92 inches down, below the previously reached sterile level, Kline uncovered many flakes—an exciting discovery that suggested he had uncovered a very early occupation.

"The first half-hour, I must have found more than 100 flakes," he recalls. "I thought, 'Oh, my God! There is another occupation down there!' Before long, I found the nicest endscraper I have uncovered in all my years digging."

This cultural material ended at about 9 ft. Augering another 4 ft revealed no further occupation. Knowing he had found something important, Kline sought help from professionals, who could bring better tools and methods to the project.

The first professional to visit the site, John Witthoft of the University of Pennsylvania, was very impressed with the artifacts and their antiquity. Russell Handsman of the American University, who was working in the Upper Delaware Valley at the time, was also impressed and contacted William Gardner of Catholic University and Charles W. McNett, Jr. at American University. Kline welcomed them to the project, which soon came under an umbrella of research designated as the Upper Delaware Valley Early Man project and financed in part with grants from the National Science Foundation and National Geographic Society. With Kline's continued participation, American University researchers dug there from 1974 through 1977. They unearthed more than 55,000 artifacts, including a Clovis point of tan-colored pink chert in 1975. They also bagged a wide range of lithics, including hundreds of endscrapers, point fragments, and debitage. Black flint used to make many of the tools and much of the debitage was traced to a nearby source, the Zimmerman Flint Quarry (36MR44). The flotated contents



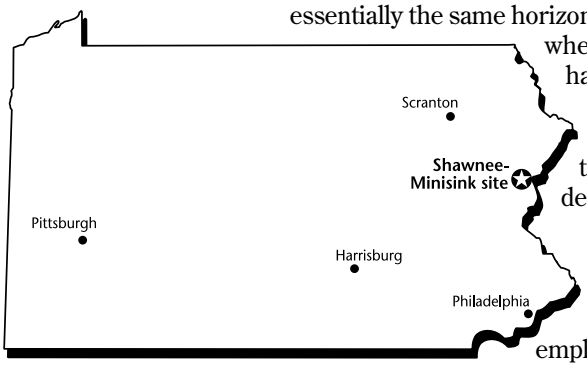
JOSEPH GINGERICH

Clovis point (38.87 mm long) recovered from square 4 in August 2006.

of a hearth yielded bone, fishbone, nuts, and carbonized seeds of the hawthorn plum (*crataegus* sp.), a fleshy fruit.

Bringing new tools to the job

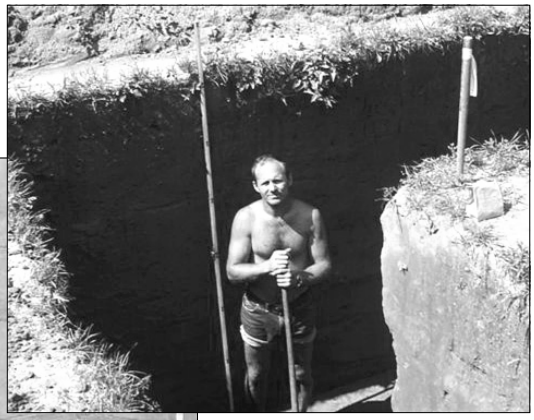
Dating techniques of the time required large amounts of charcoal for processing. The U.S. Geological Survey radiocarbon Laboratory in Reston, Virginia, processed four charcoal samples taken from the Paleoamerican level during the 1970s excavations, according to American University reports published on the university's Web site. Scientists regarded two samples as the level's best age indicators: One was 10,590 ± 300 RCYBP (lab No. W-2994); the other 10,750 ± 600 RCYBP (lab No.W-3134). The two best dates contained large margins of error, the best that technology could offer at the time.

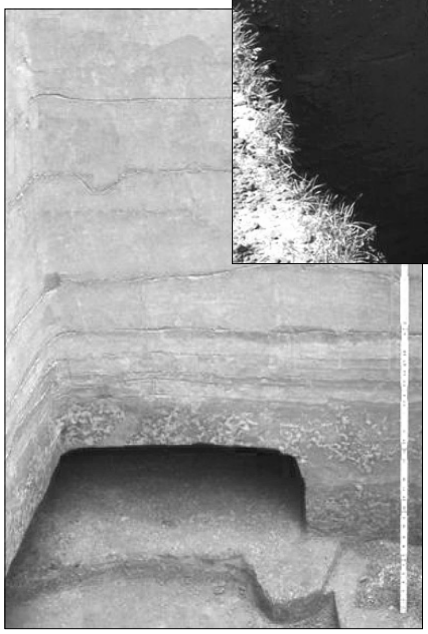


However, recent advances in radiocarbon dating techniques, especially the use of AMS (accelerator mass spectrometry), which requires smaller amounts of carbon material while frequently producing dates with smaller margins of error, gave researchers a chance to date the curated carbonized hawthorn plum seeds and zero in on more accurate dates for the occupation. Two seed samples taken from a hearth floor in the Paleoamerican level yielded dates of 10,940 ± 90 RCYBP (Beta-101935) and 10,900 ± 40 RCYBP (Beta-127162).

Calibrated results put the age of the Paleoamerican level at about 12,900 calendar years ago. Researchers now have a securely dated site some 400 years older than previously thought.

Older dates for Paleoamerican occupation are only part of the site's importance. The overall collection from all levels shows distinct cultural occupations from various phases of Woodland and Archaic to Paleoamerican, stretching across a time span of nearly 13,000 years and a half-dozen geological and climatological periods. Considerably more may be waiting, since this material was pulled from an excavated area encompassing about 3,900 square ft—or about one quarter of the site's estimated extent.





BOTH: DON KLINE

▲ **Shawnee-Minisink discoverer Don Kline, 1972–1973 season.**

◀ **Hearth uncovered in 1972–73 season yielded the first seeds and bone fragments found. They date to 10,590 ± 300 RCYBP.**

The reward: A textbook Clovis site

The site's Paleoamerican component also is unique because it was deeply buried, sealed within a layer of gradually deposited silty loam capped by 3 ft of sand, according to American University's Charles W. McNett. Dr. McNett in 1985 edited a book on the site and its relation to the Upper Delaware Valley Early Man Project.

The Paleoamerican artifacts, McNett writes, were "found in essentially the same horizontal locations that they had occupied when left there by the Paleoindians who had made and used them." They "had not been subjected to any sort of disturbance from later occupations, the activities of burrowing rodents, or floodwaters."

There is "arguably no Paleoindian component currently available for study that has been subject to less post-depositional disturbance," he emphasizes in the 1985 book.

In addition to the numerous endscrapers and a fluted biface of weathered Onondaga chert, the late-Paleoamerican component also features a large corner-notched jasper projectile point named the "Kline point" to honor the site's founder.

Overall, Kline is pleased with the success of his discovery and the secrets the 1970s excavations have yielded. Commenting in understatement, he admits that "it turned out to be quite a find for an amateur."

Chapter two of the continuing saga

After American University completed its planned excavations in 1977, the site sat untouched, gradually changing from an overgrown farm field to small forest. In 2003, Kline got the itch to dig there again. He didn't get much support from researchers at American University, where tensions ran high over resumption of digging by an "amateur" archaeologist.

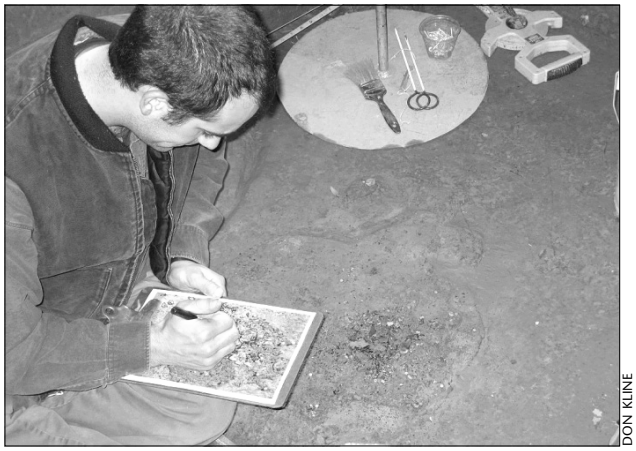
Joe Gingerich, then a student at Temple University in Philadelphia, now enters the story.

He was working on a field school some 25 miles from Shawnee-Minisink. Gingerich's academic advisor knew Kline, and knew he planned to dig there again. Introduced by his advisor to Kline, Gingerich agreed to collaborate—thereby assuring quality control in hopes of cooling academic discontent over Kline's plan to resume digging.

"A lot of people were upset with Don for returning to the site," says Gingerich, now a graduate student at the University of Wyoming. "We realized Don was going to go back and dig. We

could help and make the most of it, or we could sit back and let the excavation occur without getting as much information out of it as we might like."

American University had no immediate plans to return. So Gingerich worked with Kline on weekends, when his field school wasn't in session. He and Kline got along well, Gingerich adds, and it wasn't long before Gingerich led research efforts there full time. Gingerich was excited by the potential for new discovery, and he hasn't been disappointed.



DON KLINE

Researcher Joe Gingerich maps a Paleoamerican flake cluster in unit 1, consisting of over 3,000 pieces of debitage.

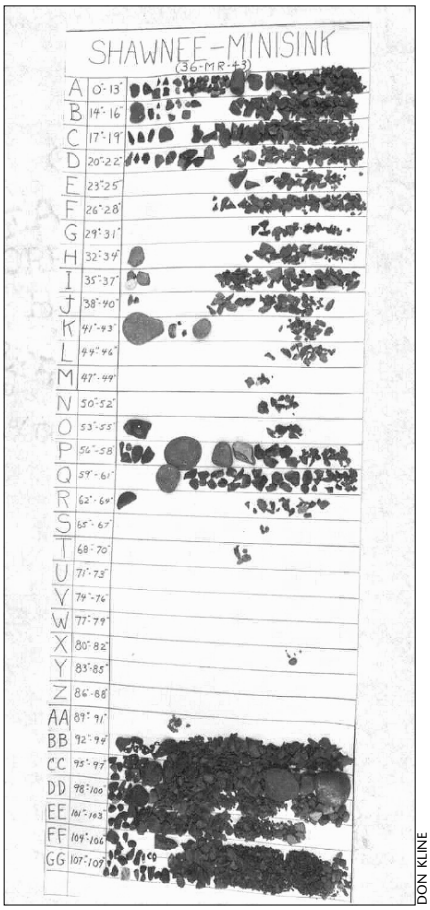
"Shawnee-Minisink represents one of the most intact Clovis assemblages in the East," he writes in a 2004 article in *Current Research in the Pleistocene* 21. "It is only one of eight sites in the Northeast that have produced chronometric dates associated with fluted projectile points."

Since 2003, Gingerich says, excavators have pulled more than 10,000 more artifacts from the Paleoamerican level. The finds include two new hearths, more endscrapers, a fluted Clovis point, and seeds, lots of seeds. Hawthorn plum, which was probably popular as a dietary supplement, remains the most abundant plant species. Plum seeds his team have unearthed from a hearth, AMS-dated to 10,820 ± 50, 10,915 ± 25, and 11,020 ± 30 RCYBP, convincingly reinforce the dates American University posted for seeds taken during the 1970s excavations. The 2006 field season material is still being analyzed. Dr. Lucinda McWeeney, a private New York–based botanical researcher, is studying plant remains; Dr. Daniel Wagner, a colleague, is conducting soil studies at the site, hoping to put it into a better environmental context.

Unearthing the Clovis point during the 2006 field season was one of the highlights for Gingerich. A colleague found the point 234.7 cm below the surface, within the seed and charcoal-dated Paleoamerican zone and about 50 cm from a hearth. The point was made from heavily weathered white-spotted gray chert. Gingerich believes it may have come from any of several toolstone sources within 30–50 miles of Shawneee-Minisink. "The point was completely intact," he says, "about 39 millimeters in length, with flutes on both sides, and looks like it had been sharpened in the haft." His plans call for dating charcoal found near the point, Gingerich says. But he also is expecting to get more reliable and stable AMS dates from the plant seeds found in the hearth.

In the same level where they found the Clovis point, Gingerich notes that they "probably collected 2,000 pieces of debitage from within one quad." Endscrapers continue to be the most abundant tool found on the site, he says, with sharp edges that suggest a "lot of natural retouching occurred while they were in use." The scrapers, he adds, probably were used to process wood or bone since they have steep edge angles and sharp margins that would make them unsuitable for working hides.

Dates recorded so far, and dates he anticipates getting from the 2006 field season, all fall approximately in the range of 10,800 to 11,000 RCYBP, says Gingerich. That makes them consistent with age ranges recorded in the earlier Minisink digging and with other well-known Eastern Paleoamerican sites such as Cactus Hill and Meadowcroft Rockshelter. He notes that the minimum age for the upper middle stratum IIA at Meadowcroft has been dated to around 11,300 RCYBP. "If we consider this date accurate for that living floor," he concludes, "then our dates fit well with the earliest occupations of the region."



DON KLINE

"I think the artifact photo really tells the story of this deeply stratified site," says discoverer Don Kline of these sample artifacts found in 1972 in an area roughly 20 by 20 ft. "The artifacts are every 3 inches except the topsoil, with artifacts on left and flakes on right. The 30-inch sterile zone between the early Archaic and Paleo makes it a pure Paleo site, very rare.

The changing picture of Clovis

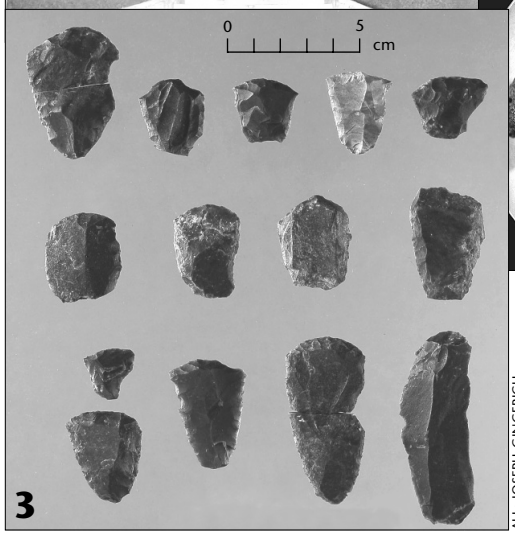
Data analysis is far from complete, Gingerich admits, but initial work suggests to him that the Paleoamerican component was repeatedly occupied, which differs from earlier interpretations. Gingerich eagerly awaits supporting data for that hypothesis. Analysis of the 1970s excavations suggests it was an ephemeral Clovis site used for such activities as manufacturing stone tools and processing food and other materials. Conventional theory sees Clovis peoples as fast-moving nomadic hunters, always pushing forward and seldom staying put for prolonged periods.

Gingerich says he hopes to reshape the

debate by showing that the site was repeatedly occupied for a longer duration than conventional wisdom might expect.

"This site and others could change the perception of what Clovis occupation might have been like," he suggests. He suspects Shawnee-Minisink fits the same model as do other sites in the region: That it was used as a base camp by hunters, who practiced restricted mobility around the camp because they had access to a good tool-stone quarry and excellent knowledge of the landscape they traveled through. On the other hand, he concedes, it might mean they had to keep returning to the site until they learned the lay of the land and eventually moved on. Further research into either possibility, Gingerich says, opens new possibilities for enlarging our understanding of the Clovis culture.

Plant remains from the excavated hearths are helping to complete the picture of what the landscape looked like 13,000 years ago. Traces of hickory and oak found within the hearths, for example, suggest that these and other hardwoods were more prevalent than previously thought.



ALL: JOSEPH GINGERICH

1 Temple University anthropology students (*clockwise from top*) Mara Kaktins, Michael Reinhart, and Amanda Black excavate the Paleoamerican level in unit 1, 2003 season.

2 Hawthorn plum seeds recovered from hearth contexts at Shawnee-Minisink have been interpreted as dietary remains. They directly date to almost 11,000 radiocarbon years ago.

3 A sample of scrapers recovered from unit 1 in the 2003–2004 field season.

A debt of gratitude to hard-working amateurs

Gingerich will continue to excavate the site to see what more can be learned. The Minisink project, he emphasizes, shows that there's always something new to be gained from revisiting previously examined sites. Renewed work there has already earned Shawnee-Minisink recognition as a vital link in understanding Clovis in the East, says Gingerich, who considers himself fortunate to be working there.

He gives the lion's share of the credit to amateurs like Don Kline. Clovis researchers, Gingerich freely admits, owe them a debt of gratitude for their help in finding and understanding past cultures. He recalls that "Don has always welcomed insights from others, sharing his knowledge and discoveries with other researchers. He did it in 1972 after he found the site, and he did it again in 2003 with me. You know it was really because of Don Kline that this site was found, and he has helped create a lot of new information that is going to enrich us in terms of our understanding of Clovis sites in the East."

For his part, Kline is pleased with the research accomplished so far—so pleased, in fact, that he's going to begin exploring again. "You know, these people [Paleoamericans at the Minisink] came from somewhere and went to somewhere," he says. "I would like to look into that."

–George Wisner

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www.american.edu/cas/anthro/shawneeminisink, "Shawnee-Minisink Site" and "Shawnee-Minisink: New Dates on the Paleoindian Component." Anthropology Department, American University, Washington, D.C.,

Suggested Readings

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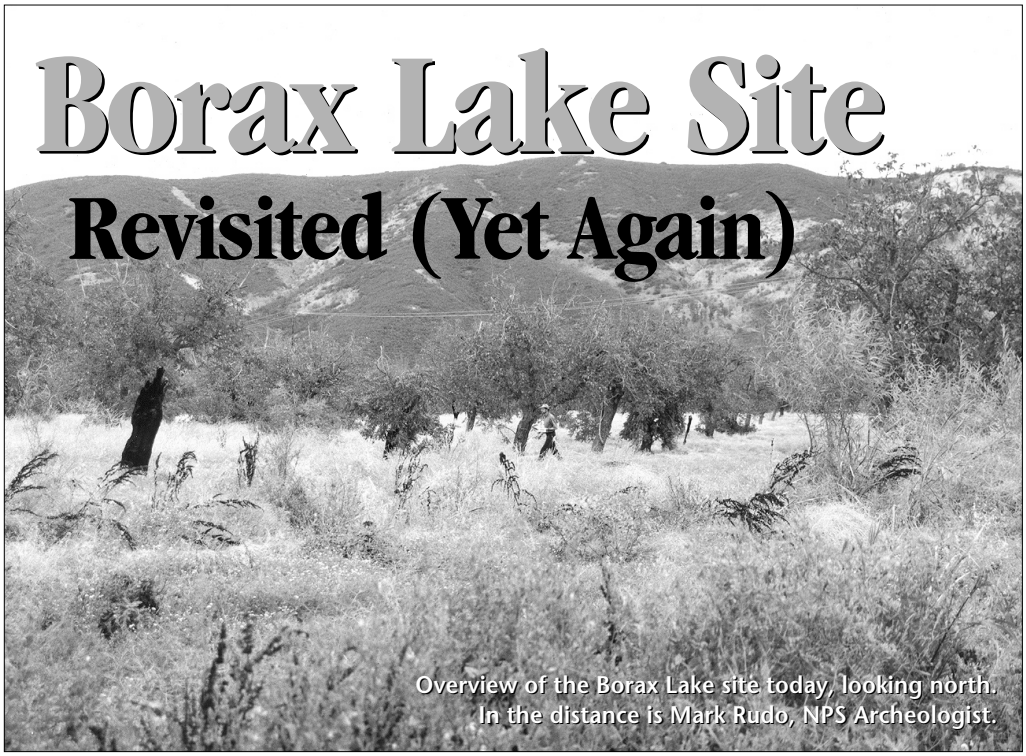
Borax Lake Site Revisited (Yet Again)



MATILDA GIL

Overview of the Borax Lake site today, looking north. In the distance is Mark Rudo, NPS Archeologist.

by Mark R. Barnes, Senior Archaeologist, NPS

A MUSEUM ARCHAEOLOGIST, digging in a walnut grove in northern California in the 1930s, was exploring cultural strata laid down along the shoreline of Borax Lake, a Pleistocene pluvial lake. Unlike other pluvial lakes in the Great Basin and coastal California, however, Borax Lake didn't dry up at the end of the Pleistocene. Instead, its stable lakeshore environment was home to successive cultures well into the Holocene. The first occupation found by this dogged scientist ultimately proved to be far older than the first supposed human presence west of the Sierra Nevadas. Not only did Borax Lake archaeology refute the classic model of the routes used by the First Americans to colonize North America, it produced the first evidence of a culture contemporary with Clovis but unique to the Far West, the Western Pluvial Lakes Tradition.

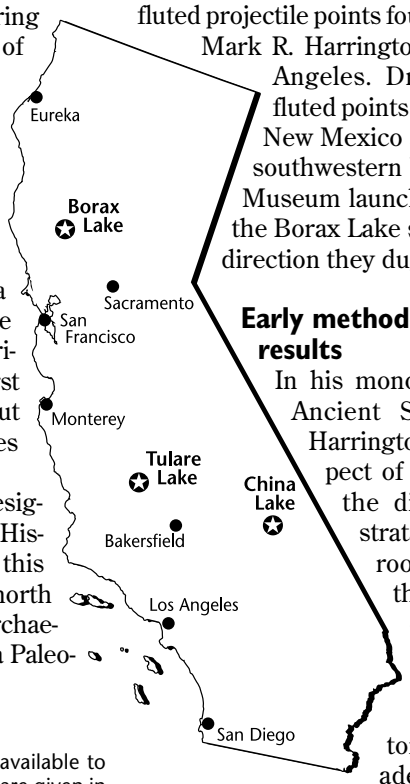
In September 2006 the Secretary of the Interior designated the Borax Lake site (CA-LAK-36) a National Historic Landmark. It was recognition long overdue for this paradigm-shattering site, located two hours' drive north of San Francisco, because for decades professional archaeologists questioned the legitimacy of Borax Lake as a Paleo-Indian site.

Layer-cake stratigraphy in a walnut orchard

The Borax Lake site is located near Clear Lake within an abandoned walnut orchard on a late-Pleistocene alluvial fan along the eastern shore of Borax Lake. The site is around 1,400 ft above sea level in the Sonoran woodland-grass vegetation zone, a mosaic of grasslands, oaks, gray pines, and chaparral typical of the Coast Ranges of northern California. The Borax Lake Obsidian Dome, a ridge near the site and less than 100 ft above the lake, contains extensive obsidian deposits that are assumed to have been the source of toolstone for prehistoric inhabitants.

During the Paleo-Indian and early-Archaic periods (12,000 to 8000 RCYBP[1]) of the primary occupation of the Borax Lake site, the climate was cooler than present. It's likely that coniferous forests covered much of the northern coast ranges at the end of the Pleistocene. After about 7000 RCYBP, the climate became much warmer and drier, developing into the present-day environment.

In early 1938, amateur archaeologist Chester Post showed fluted projectile points found along the shores of Borax Lake to Mark R. Harrington of the Southwest Museum in Los Angeles. Dr. Harrington saw they resembled fluted points found at the eponymous Clovis site in New Mexico and other Pleistocene kill sites in the southwestern U.S., and immediately the Southwest Museum launched four seasons of investigations at the Borax Lake site (1938–1946). Under Harrington's direction they dug 10 trenches and 6 test holes.



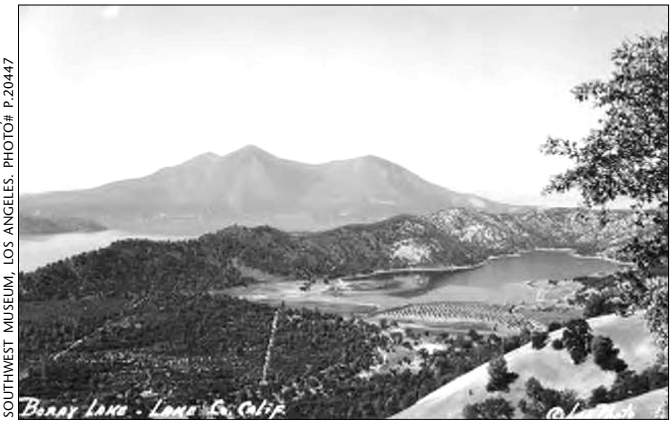
Early methodology produced checkered results

In his monograph (**Suggested Readings,** "An Ancient Site at Borax Lake, California"), Harrington writes that the most frustrating aspect of the Borax Lake site excavation was the disrupted condition of the cultural strata, mainly in Layer 1, on account of the roots of walnut trees planted on top of the site at the beginning of the 20th century and the subsequent disturbance caused by rodents attracted by the trees.

Another problem was that Harrington's test holes and trenches were inadequate to produce conclusive stratigraphic sequencing over the entire 26-acre Borax Lake site.

[1] Even though radiocarbon dating is a technique that wasn't available to early researchers at the Borax Lake site, all dates in this article are given in radiocarbon years before present for consistency.

Geoarchaeologist C. Vance Haynes found that Harrington, in order to compensate for the lack of more extensive horizontal investigation and better stratigraphic information, "plotted the frequency of projectile point types with depth and thereby concluded that the fluted points were the earliest." Harrington concluded that small bands of Paleo-Indian and early-Archaic peoples first occupied the site, making fluted points and later wide-stemmed points while encamped beside Borax Lake. The greater number of stemmed points and their broader distribution over the site suggested to Harrington that the early-Archaic period "represents the major part of the occupation of the site and includes the largest part of the artifact collection."



COURTESY OF THE AUTRY NATIONAL CENTER, SOUTHWEST MUSEUM, LOS ANGELES. PHOTO# P.20447

Borax Lake, with extinct volcano Mt. Konocti in the background, about the time of Harrington's initial excavations.

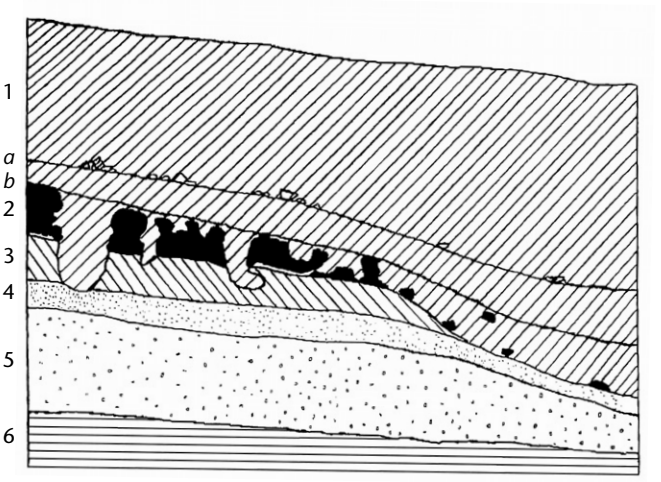
Harrington excavated the Borax Lake site before the sequencing of prehistoric cultures of the Far West was well understood and established. Lacking dating techniques other than relative geological dating, he erroneously concluded that "the entire artifact-bearing deposit was laid down within perhaps a few centuries." Thus his research at the Borax Lake site is sadly imperfect: He correctly interpreted cultural occupations as dating from the Paleo-Indian Period, but he incorrectly lumped early- and middle-Archaic occupations with the Paleo-Indian.

From the time Harrington's fieldwork and analysis were published in 1948, most California archaeologists rejected his findings. Their reaction, note Drs. Haynes and Clement Meighan of the University of California–Berkeley, launched "an immediate and continuing controversy over the age of the site, the nature of the artifacts, and the interpretation to be drawn from the Borax Lake collection," with particular focus on whether it contained a Paleo-Indian component. To many archaeologists, the artifacts in Harrington's Borax Lake collection

Layers at Borax Lake

Harrington's interpretation of Borax Lake site deposits identified six geological layers.

- **Layer 6,** the lowest layer, a "gray homogeneous clay," according to Harrington "was an original lake-bottom deposit dating from some stage of the Pleistocene" before that which produced the succeeding layers, when the waters of Borax Lake covered the vicinity of the site.
- **Layer 5,** next deposited, consisted of sand and gravels "laid down as beach deposits after the lake had withdrawn somewhat, although at the time, the climate was rainy enough to maintain the lake at a point considerably higher than it reaches today, or the beach would not have formed at this level."
- **Layer 4** was a silt layer deposited on Layer 5 when the lake's water level rose again. Harrington didn't find evidence of human occupation in Layers 6 to 4.
- **Layer 3,** a mixed clay and gravel alluvium washed down from the surrounding mountains during the pluvial, or wetter, late Pleistocene covered much of Layer 4.
- **Layer 2,** an alluvium composed of iron-rich red gravelly clay deposited on Layer 3, formed the occupation surface, Harrington notes, "when the first human visitors arrived at Borax Lake." He inferred that during this initial occupation, "long exposure had caused considerable erosion, and the iron in the soil had become oxidized." This erosion apparently cut through Layer 2 and, in some areas, down into Layer 3.



- **Layer 1** was deposited, Harrington determined, during an unusually rainy period "as part of an alluvial fan . . . consisting of unsorted angular pebbles, gravel, sand, and clay." He subdivided this layer into Layer 1a and 1b. Generally of a yellowish color, it also contained dark deposits "due to mixture, during its deposition, with charcoal and other refuse of human origin." Harrington believed that Layer 1 was laid down around 3000 RCYBP during the Little Pluvial period, burying the earlier cultural deposits.

COURTESY OF THE AUTRY NATIONAL CENTER, SOUTHWEST MUSEUM, LOS ANGELES. PHOTO# P.20492

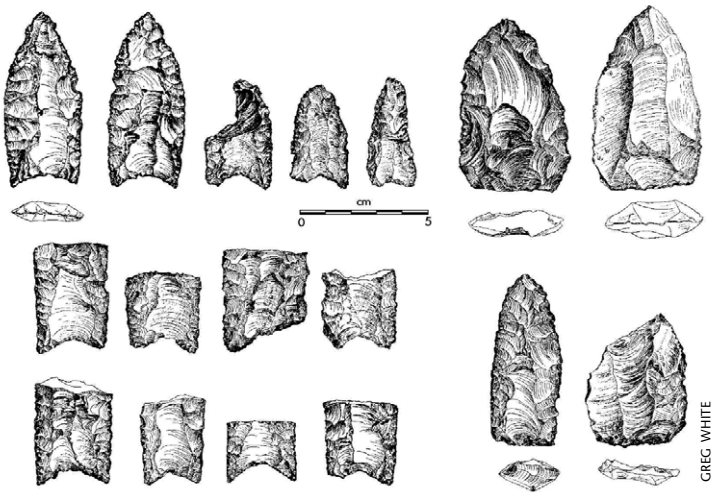
R. J. Sayles, a member of Harrington's team, indicates the spot where a Folsom point was found, 1945. The main trench cut through red hardpan that was riddled with animal and root holes.

"did not appear to belong together and did not fit the emerging pattern of similarities between one early man site and another."

New techniques torpedo an outdated paradigm

Harrington's ideas of Paleo-Indian occupation in northern California also ran counter to the then prevailing theory of the earliest occupation of North America. During the 1950s and 1960s, archaeologists theorized that the Americas were first settled along a path through Alaska and down into the Great Basin and Plains regions of North America; west of the Sierra Nevada Mountains was a marginal region that presumably wasn't settled until later, perhaps thousands of years after man's original entry into the New World. Accordingly, Meighan placed the Borax Lake site in the Middle Central California period, roughly 7000 to 3000 RCYBP, an interpretation that excluded the Paleo-Indian component.

In 1964, Haynes and Charles Rozaire, a participant in the original Borax Lake excavations, cut 16 backhoe trenches on three transects across the walnut orchard in order to resolve the strata and dating problems encountered by Harrington. Haynes, analyzing the data with Meighan, concluded that geological evidence actually supported Harrington's contention that the cultural material he recovered was located within and on a late-Pleistocene alluvial fan. Together they identified two artifact-bearing levels: a lower level, described as a grayish brown silt and gravel (Harrington's Layer 2), and an upper level composed of a yellowish brown clay and gravel (Harrington's Layer 1). The pair presumed that the artifacts found below these two levels in a dark brown gravel (Harrington's Layer 3) had been displaced from the upper two levels by erosion and rodent activity.



GREG WHITE

Fluted points from the Borax Lake site.

After Haynes and Rozaire finished their fieldwork at Borax Lake, Meighan conducted obsidian hydration (OH) dating tests on obsidian fluted points and chipped crescents found in 1964 and during Harrington's earlier excavations (OH dating, like radiocarbon dating, is a modern technique that simply wasn't part of Harrington's toolkit). The OH dates (equivalent to 12,000–10,000 RCYBP) place the obsidian artifacts in the Clovis age, and Meighan and Haynes concluded that geological evidence, projectile-point typology, and OH dating all supported Harrington's original view that humans occupied the Borax Lake site during the Paleo-Indian Period. Harrington's faulty conclusions about the site's age resulted from his misidentifying early- and middle-Archaic projectile points as Paleo-Indian. It was one error in otherwise creditable scholarship that nevertheless cast suspicion over the entire collection.

Meighan and Haynes further concluded that Paleo-Indian fluted points could be paired with chipped-stone crescent artifacts. (More about crescents below.) This pairing of dissimilar diagnostic lithic artifacts is singular to the Paleo-Indian cultures of the Far West. A radical concept at the time, it was later supported by similar finds at other extinct pluvial lakeshore sites in southern California and Nevada, such as Tulare and Lake Mohave, California, and Long Valley Lake, Nevada.

In their summary of the 1964 investigations and tests, Meighan and Haynes asserted that there may have existed in the region northwest of classic fluted-point sites a variant of Folsom or Clovis culture, approximately contemporaneous with Folsom but differing from Folsom in diagnostic artifacts that included crescents in addition to fluted points. Their most startling conclusion was that settlement of the northern Coast Ranges of California had been pushed back in time. Meighan's suggested time of initial habitation of 8000 B.C., they admitted, was open to reexamination.

By revisiting and reconsidering the Borax Lake site, Meighan and Haynes confirmed a Paleo-Indian occupation and corrected the sequencing of prehistoric cultures at the site. Their authoritative judgment established Borax Lake as the type site for the Paleo-Indian culture in the Far West area, and the early-Archaic "Borax Lake Pattern" for northern California. In March 1983, at a meeting of the Society for California Archaeology, Clement Meighan, the dean of California Archaeology, magnanimously stated that at Borax Lake,

> both the geology and the obsidian dating do not rule out an age of as much as 12,000 years ago for this pattern. This is vastly

earlier than Early Central California, so in the essential matter of estimating the antiquity of the site, Harrington was correct and the "Berkeley School" including myself was way off the mark.

Clovis of a special nature in the Far West

In light of Clovis mammoth kill sites in the Great Plains and Southwest, archaeologists viewed all Paleo-Indian people as a culture of big-game hunters whose salient feature was the pursuit of late-Pleistocene megafauna. Michael Moratto noted in 1984, however, that since no typical Big Game Hunting Tradition (BGHT) kill sites had been found in California or the western Great Basin, "the mere presence of fluted points does not necessarily signal BGHT activity in the Far West." Instead, Clovis-like fluted points were found in unusual places—along ancient lakeshores, in piedmont zones of former grassland, and in mountain passes between fossil lakes. The Far West, Dr. Moratto concluded, was a late-Pleistocene adaptation unique in North America.

The pattern of Paleo-Indian sites in the western Great Basin and California, clustered on the shores of pluvial lakes, appears to Moratto to be related to dramatic late-Pleistocene climatic changes, whereby increased rainfall, lower temperatures, and reduced evaporation led to a downward shift of biotic zones and created numerous pluvial lakes. "Between 22,500 and 12,000 B.P., during the Bonneville and Provo Pluvials," he notes, "more than 100 lakes were formed in the Great Basin; others appeared in California's Central Valley and even in the Coast Ranges."

COURTESY OF THE AUTRY NATIONAL CENTER, SOUTHWEST MUSEUM, LOS ANGELES. PHOTO# P.20565

Crescents from Borax Lake, 1947. The longest are about 10 cm in length.

A restudy in 1964 of Harrington's work at the Borax Lake site used extensive backhoe trenching and OH dating to examine large areas of the site stratigraphy. Not only did the new technology establish a span of 12,000 to 10,000 RCYBP for the site's initial occupation, it also documented an extended occupation lasting into the subsequent early-Archaic period (Borax Lake Pattern). Confirming the antiquity of some of the finds considerably enlarged the known geographical range of the Clovis culture; what's more, it also identified Western Great Basin and California variants of the Clovis culture.

Stephen Bedwell defined this Paleo-Indian lakeshore-adapted culture, which produced Clovis-like fluted points and chipped-stone crescents, as the Western Pluvial Lakes Tradition (WPLT). Moratto believes the WPLT may have evolved from the Fluted Point Tradition after 12,000 B.P., as woodlands and deep (pluvial) lakes gave way to grasslands and shallow lakes, and flourished until the onset of the Altithermal approximately 8000 years ago, when lakes began to evaporate. Although the WPLT persisted into mid-Holocene times in the vicinity of larger lakes like Borax Lake, pluvial lakes largely vanished by circa 7000 B.P., and with them the cultural tradition.

Extending the search for WPLT sites

With Meighan and Haynes's confirmation of Harrington's evidence for Paleo-Indian occupation at Borax Lake, archaeologists working in the Far West from the 1970s through the 1990s began investigating the shore areas of dried-up late-Pleistocene pluvial lakes, intent on determining whether the Clovis-like fluted points and crescents at Borax Lake could be found in other areas.

In their 1970 article that clarified the dating of the Borax Lake site, Meighan and Haynes mention that Clovis-like points and crescents, similar to those found at Borax Lake, had been recovered as surface finds from scattered areas along the shores of dried-up Pleistocene lakes in the Far West: Tulare Lake and Lake Mohave in southern California, and Long Valley Lake in Nevada. Moratto confirmed in 1984 that amateurs had surface-collected 30 Clovis-like specimens at Tulare Lake; although none had been dated directly, he notes "on typological grounds the Clovis-like points argue for occupation of the ancient Lake Tulare vicinity earlier than 11,000 B.P."

Moratto records that at China Lake, another extinct Pleistocene lake in southern California, Emma Lou Davis and her colleagues identified at least 10 sites and localities with fluted bifaces and other traces of an early occupation they called "Classic Clovis." The bifaces are sometimes associated with old shorelines or paleosols and occasionally found near remains of Pleistocene animals.

In their study of the Paleo-Indian and early-Archaic peoples of the Western Great Basin, Alan L. Bryan and Donald R. Tuohy conclude that the WPLT is evidence of humans who left extensive lithic artifacts on the terraces and shores of lakes whose bioresources they exploited on their annual round. They observed that the complexion of artifacts changed over time with changes in the lake level. They also noted with regret that most WPLT artifacts, including those found at ancient China Lake, were surface finds only rarely found in datable stratigraphic context.

Crescents, sisters of the fluted point

Besides Clovis-like projectile points, the crescent, another diagnostic chipped-stone tool associated with the WPLT, has been found at Borax Lake and other Western Great Basin and California lakeshore sites. Sometimes referred to in the archaeological literature as a "Great Basin Transverse," the crescent is thought to date from 11,000 to 8000 RCYBP, a span that dovetails nicely with the Paleo-Indian and early-Archaic periods.

Noel D. Justice notes that although crescents vary widely in shape, those usually associated with Clovis and other early sites are basically simple half-moon shapes manufactured by pressure flaking. Since Great Basin sites yielding crescents are often located near extinct Pleistocene lakes, streams, and

springs, some investigators suggest that the crescent, when hafted in its middle to a spear, may have functioned as a broad missile tip effective in bringing down waterfowl. Use-wear analysis reveals that the convex side of crescents was sometimes used as a knife or scraper; with the crescent hafted endways in a handle, the concave side is thought to have been used in a manner similar to the Eskimo women's knife, the *ulu*.

Justice further mentions that blood-residue analysis of crescents from sites in the Great Basin of Nevada tested positive for a number of animal and plant species, including rabbit, ducks, trout, turkey, deer, and yucca.

Borax Lake, the archetypal WPLT site

The Borax Lake site must be considered the best representative site for WPLT Paleo-Indian occupation in the Far West simply because Borax Lake, alone among pluvial lakes, didn't dry up at the end of the late Pleistocene. From the Paleo-Indian into the early- and middle-Archaic Periods—millennia of increasing regional aridity—Borax Lake and nearby Clear Lake were among the few permanent lake environments not only in the North Coast Ranges, but also in the whole Western Great Basin and California area. Because Borax Lake was a stable lakeshore environment, successive prehistoric cultures deposited their material culture over some 9000 years. The other Paleo-Indian sites noted in the WPLT area of the Western Great Basin and California, on the other hand, consist only of surface scatters of stone artifacts from wind-deflated sites along the shorelines of the extinct lakes.

Besides the lakeshore location, prehistoric visitors also enjoyed exploitable niches in a mosaic of grassland, chaparral, oak, and pine forest environments around Borax Lake, and quarried extensive local obsidian deposits for toolstone. Their use of obsidian tools is a boon for scientists, since we can firmly date the earliest occupation of the site to the Paleo-Indian period by OH dating.

In 1987, the Archaeological Conservancy, a nonprofit group devoted to preserving significant archaeological sites, acquired the Borax Lake site as a permanent archaeological preserve. The Conservancy is currently working with Greg White of the University of California–Chico on a long-range research program as part of the Superior California Archaeological Research Center Expeditions (SCARCE) program, a systematic study of early-Holocene archaeological sites in north California that will also address Borax Lake and other Paleo-Indian sites in northern California. Says Dr. White, "SCARCE's general goal is the discovery of archaeological phenomena dating to the mid- to early- Holocene, contributing to the establishment of a baseline for the antiquity and economic pattern of human colonization of the region." MT

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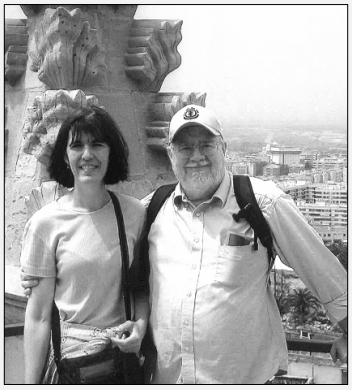
About the author Mark R. Barnes is a Senior Archaeologist with the National Park Service (NPS) Southeast Region Office in Atlanta, Georgia. He has worked throughout the United States and American Caribbean on National Register of Historic Places and National Historic Landmark (NHL) Programs of the NPS. He earned B.A. and M.A. degrees in Anthropology and Museum Studies from the University of Arizona–Tucson, and a Ph.D. in Archaeology from Catholic University in Washington, D.C. His research interests are Spanish colonial material culture and archaeological site preservation. Dr. Barnes is currently an associate professor at Georgia State University, where he teaches Historical Archaeology and Cultural Resource Management. He was responsible for NHL designation for the Hester site in Mississippi, the Hardaway site in North Carolina, and the Borax Lake site, all nationally significant Paleo-Indian sites.


MARK R. BARNES

Barnes is shown here in Spain, May 2006, with his wife, Dr. Karen F. Anderson-Cordova. She is the Unit Manager in charge of Review and Compliance for the Georgia State Historic Preservation Office.

Suggested Readings

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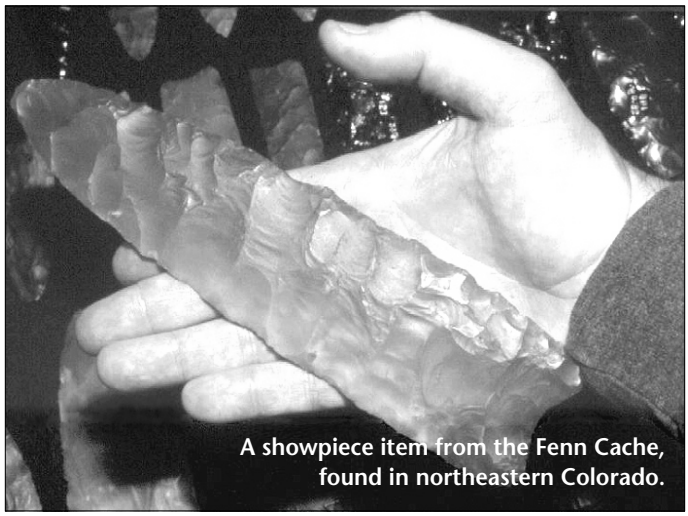
SNAPSHOTS IN TIME

New Insights from Clovis Lithic Caches

IN TODAY'S WORLD, it's fairly easy to protect your riches: you can put your valuables in a safe, or hide your money behind a thick bank vault door. But until a few centuries ago, neither banks nor safes were viable options. Earlier peoples, particularly our prehistoric ancestors, were forced to hide things where they could, in places they expected to return to—but sometimes never did. As researchers like the University of New Mexico's J. David Kilby have discovered, these ancient caches, lost or forgotten by their owners, offer a rich source of study for modern scholars.



A showpiece item from the Fenn Cache, found in northeastern Colorado.

J. DAVID KILBY

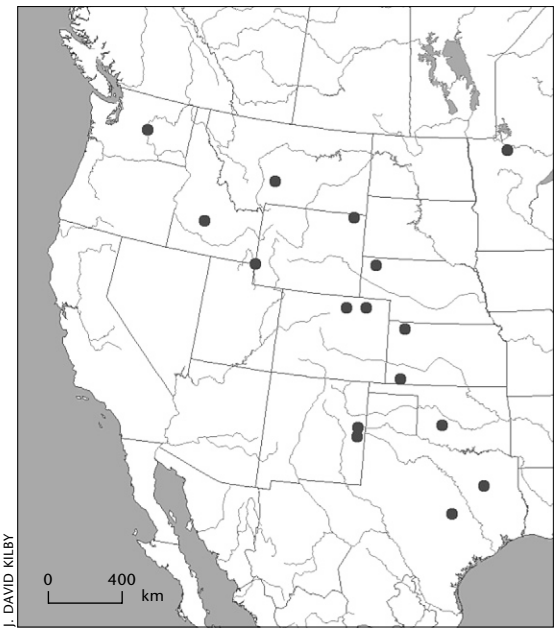
A Ph.D. candidate in UNM's Department of Anthropology, Kilby has spent the last several years traversing the country, examining almost every lithic cache ascribed to the Clovis culture. Although Clovis remains have been endlessly examined, interpreted, and reinterpreted since the 1930s, Kilby's ongoing assessment of their lithic caches offers new insights into both their technology and behavior. After all, most of our ideas about Clovis are based either on broken or worn-out tools collected from kill sites and camps, or quarry debris from the production of transportable tools. Caches, on the other hand, offer "snapshots of what a Clovis individual or group of individuals might be carrying on the landscape," providing windows into what Kilby calls "that portion of the reduction continuum that was probably most important: artifacts in their useful state."

Cache as cache can

While working his way through the master's degree program at Eastern New Mexico University, Kilby had the good fortune to find employment at Blackwater Draw, the Clovis typesite. Partly as a result of his experiences there, he found himself strongly drawn to Paleoamerican archaeology. Looking back, he says, "I found it ideally situated at the intersection of my interests in lithic technology, geology, and hunter-gatherer ecology. Admittedly, the romance of bands of highly mobile men, women, and children making a living on a late Ice Age landscape populated with big, weird animals adds to the attraction."

Ultimately, he decided to take on a daunting project for his dissertation research: investigating all known Clovis tool caches, and their relationships to other types of Clovis sites. He was surprised to discover that no one had yet performed a systematic comparison, so he aimed to fix that. "At a fundamental level," he explains, "my research partitions the great variation in Clovis assemblages identified as caches with the goal of understanding their functions—it appears that they did not all serve the same function, nor are they all 'caches' in a technical sense." He's also taking the opportunity to use these caches to track human adaptation to ecological conditions and change at the end of the Pleistocene, and to advance our understanding of Clovis technological strategies.

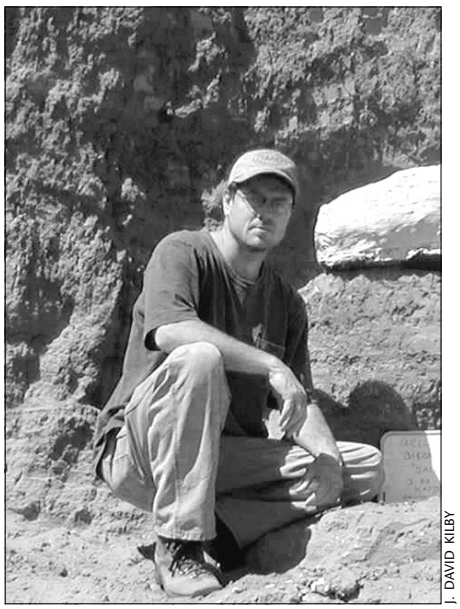
By Kilby's definition, a lithic cache is a tightly clustered group of artifacts, without associated manufacturing residue, that don't seem to correspond to standard kill, camp, and quarry sites. At such a site, the cache itself is the only evidence of activity. A cache's attribution as Clovis depends on its containing diagnostic Clovis artifacts with standard Clovis manufacturing elements, including overshot flaking on bifaces and prismatic blade technology. Of the 22 purported Clovis caches Kilby has examined, 16 match his criteria as true Clovis caches. Some are fairly limited; one such example is the 1992 Blackwater Draw cache from New Mexico, which consists of just five artifacts. Others are rather more extensive, such as the Sailor-Helton cache from Kansas, which comprises 166 separate pieces. All told, Kilby has examined approximately 660 cached Clovis artifacts, including projectile points, bifaces, blades, flakes, cores, and bone tools.



J. DAVID KILBY

The distribution of Clovis caches across the United States.

Kilby doesn't believe he's seen the end of Clovis caches. More are being reported regularly, and he thinks the number will grow as researchers get better at recognizing them. Then, too, caching seems to have been a common behavior in some Clovis groups. "Their rate of occurrence suggests that caching was a regular part of Clovis behavior," explains Kilby, "especially considering that we, as archaeologists, only


J. DAVID KILBY

Kilby at a bison excavation site in Tijeras Canyon, New Mexico.

glimpse those that were not retrieved prehistorically."

New light on enduring mysteries

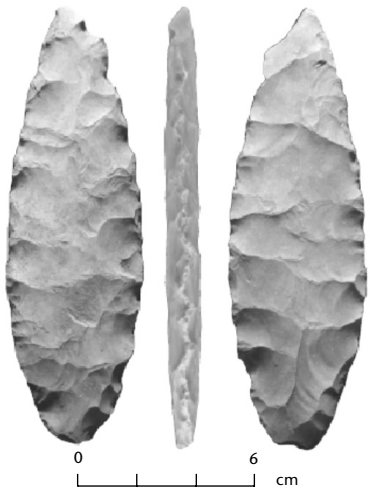
Doing archaeological research of any kind can be very much like detective work. This is particularly true when studying lithic caches, where often the only thing you have is the artifacts themselves and, if you're lucky, their discovery context. But even a set of lithic caches of like culture or age may have little in common. Some may include artifacts that are all of the same type; others may consist of a mix of different types of bifaces, cores, or even bone tools. In some caches, the pieces may be the crudest of roughed-out bifacial blanks; others may yield finely flaked, completed projectile points. Sometimes you even get ceremonial pieces, like some of the artifacts included in Utah's Fenn Cache, probably the most famous of all Clovis caches. "I'm not sure that there's such a thing as a typical Clovis cache," says Kilby. He points to the Simon cache from Idaho, which includes a wide variety of raw materials, including quartz crystal; then again, there's the Sailor-Helton Cache, with its 166 blades, flakes, and cores, all made of Alibates dolomite from north Texas.

These caches provide a unique perspective on Clovis land use. "Cache contents provide clues to the kinds of activities that were anticipated," Kilby points out. "For example, caches that consist of a single artifact type, such as blades or projectile points, may represent a specialized toolkit for a particular activity or activities, or may represent a specialized cache. A high proportion of artifacts in the early stages of reduction suggests a more generalized cache, and may indicate some uncertainty as to the specific tasks for which the items would be needed."

Even the individual components of Clovis caches can tell

A CACHE CLOSE TO HOME

OUR ARTICLE about Paleoamerican lithic caches wouldn't be complete without mentioning one that is directly associated with the CSFA. In his other role as professor of Anthropology at Texas A&M University, CSFA Director Mike Waters is directing the research of doctoral student Victor J. Galan, who's examining an ancient lithic cache recovered from a farm near Houston, Texas, for his dissertation research. Although that research is by no means complete at this point, Galan has already learned a great deal from the cache, which he has tentatively dubbed the Hagar Cache, after its discoverer.



The Hagar Cache consists of 22 lanceolate bifaces made from Edwards chert, high-quality material that was popular with prehistoric peoples throughout Texas. These particular specimens trace back to the region of Junction in west Texas—several hundred miles west of the Harris County farm where the cache was found. These pieces are so old that a weathering rind has developed on the exposed flake scars. Some of the artifacts are broken; in fact, five are just fragmentary. The smallest is about the size of a man's palm, the longest Galan describes as "the length of your forearm"—28 cm long. The fascinating thing about this piece is that, despite its length, it's no more than 6 cm wide. The artifacts were collected from three distinct clusters within the larger site, and Galan actually found one in situ. The others came to light when the landowner was borrowing dirt from the locality. According to Galan, either there were originally three separate but associated caches, burials, or activity clusters, or the farmer erased most of a larger site when he took the material for his barn floor.


BOTH: CHARLOTTE PEVNY

▲ Victor Galan at the Hagar Cache site.

◀ Biface 8 from the Hagar Cache.

It's hard to say how old the Hagar cache is, but it appears to be late Paleoamerican. One obvious clue is the highly weathered nature of the artifacts: they simply look old, and the weathering rind clinches the argument. Also, the fine craftsmanship exhibited in these artifacts is typical of Paleoamerican work; morphologically, the pieces could easily have been fashioned into Eden, Scottsbluff, Agate Basin, or even Angostura points. Galan's research, however, is far from conclusive at this point. "I could see this cache being extremely controversial for a long time," he says. "No matter what I write, someone's going to agree, and someone's going to disagree." MT

–FL

researchers a great deal. In addition to contributing their basic metric characteristics to the growing Clovis database, there's the materials the artifacts are made of. Either Clovis groups were extraordinarily mobile, or they enjoyed extensive lithic trading networks—or both. What's clear is that Clovis flintknappers loved high-quality, visually attractive lithic materials, and were willing to go a long way to get them. For example, the Pelland Cache from Minnesota contained blades made of Knife River flint from North Dakota, some 400 mi (670 km) away. Even more impressive is a point made of Edwards Plateau chert found in Colorado's Drake Cache: The nearest source was in central Texas, 575 mi (955 km) distant. Most of the other artifacts from the Drake Cache are made of Alibates dolomite from the Texas Panhandle, several hundred miles distant.

The geographical flavor of caches

Clovis caches also display a distinct geographic pattern of variation. "Clovis caches primarily occur along a gradient from the northwestern United States through the Rocky Mountains, to the Southern Plains and south-central United States," Kilby notes. Northern caches, he says, are more diverse in terms of raw material and artifact types, and tend to include more individual items. "These may correspond to the lithic component of what might be considered a typical Clovis toolkit—a group of tools in which bifaces are emphasized, with points, flakes, and blades present in lesser amounts. These caches are also more often associated with red ocher." The southern examples are not only less diverse, they're dominated by blade technology, and are usually found near known subsistence areas. "These southern caches appear more likely to represent the storage of tools and materials intended for later retrieval," Kilby theorizes, "and may be oriented toward more specialized functions, perhaps even toward specific resources or tasks."

In the final analysis . . .

The results of David Kilby's research are still preliminary, but a few things are becoming clear. For one thing, he has a good answer for one of the fundamental questions of caching, What purposes did the practice serve? From what he's seen, he feels that the social contexts of caching varied considerably. "I believe caches can be minimally divided into two functions: ritual and utilitarian," he states. "Ritual caches may have been associated with burials, or many have served other ritual functions such as offerings, signals, or religious rites. It's unclear if ritual caches were ever meant to be retrieved. In the cases of burial caches, a large group or members of multiple groups may have come together for the occasion. This kind of environment would have been conducive to exhibiting flintknapping prowess and access to raw materials, and costly signaling is worth considering as one aspect of cache function."

On the other hand, he says, utilitarian caches existed basically for material storage, and the people who left them intended to retrieve them at some point. In cases like these, "it might have been in the best interest of the owner for a limited number of people to know the whereabouts of the cache. It can be expected that the fewer people there were who knew of a particular cache, the greater chance that it might never be recovered, and thus become part of the archaeological record." MT

–Floyd Largent

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Colonization of Beringia Workshop

continued from page 3

estingly, he notes that while lithic technologies characterize most of the sites in the region, there may be ceramic evidence from as early as 11,000 RCYBP at the Ust'-Karenga site on the Upper Vitim.

Yan Axel Gomez Coutouly (University of Paris) leaped the Bering Strait with a comparison of microblade and biface industries. His work departs from the common practice of comparing Siberian and Alaskan technologies from data reported in the literature, for in his doctoral studies Gomez Coutouly traveled to museums, universities, and other curational facilities to study archaeological materials *firsthand*. Convinced that a hands-on "regional approach will allow a better understanding of the relationship between culture and technology," he promotes awareness of technological adaptations to locally available raw materials and how they influence reductive strategies.

Elena Pavlova and **Vladimir Pitul'ko** (Russian Academy of Sciences) updated information on the Yana RHS site, the northernmost site in Siberia. Located on the Yana River at 71° N latitude, Yana RHS significantly dates to 27,000 RCYBP—which means it was occupied before the onset of the LGM—and is therefore evidence of a much earlier adaptation by humans to harsh arctic environments than previously supposed. No prismatic blades or wedge-shaped cores have been recovered from Yana RHS, which predates the microblade tradition of the later Dyuktai culture. However, the site has yielded three Clovis-like foreshafts—one made from wooly rhinoceros horn and two from mammoth ivory. The site has also yielded abundant faunal material including mammoth, horse, reindeer, bison, Pleistocene hare, and wooly rhinoceros.

Sergey Slobodin (Northeast Interdisciplinary Scientific Research Center) described how lithic technologies in western Beringia changed through time and in relation to each other. He cites as the only securely dated technology at 11,000 RCYBP the

IN MEMORIAM

RICHARD E. MORLAN
1941–2007

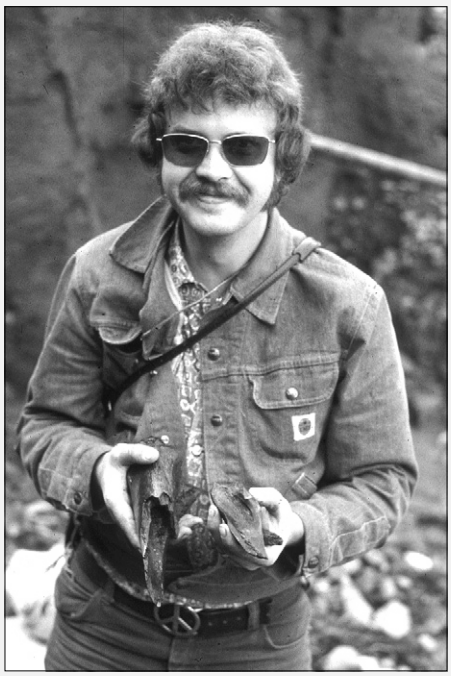
Richard E. Morlan died after a long illness on January 1, 2007, at the age of 65. His career in archaeology spanned more than four decades, during which he authored more than 65 books and articles. He is best known for his studies of Pleistocene archaeology and vertebrate paleontology in the Yukon Territory, Canada, and for his contributions to the field of taphonomy. In the 1970s and 1980s he was a senior member of the Yukon Refugium Project, an interdisciplinary program of field research focusing on the early prehistory and paleoenvironments of the Old Crow and Bluefish basins, northern Yukon.

Dr. Morlan earned his Ph.D. in Anthropology from the University of Wisconsin in 1971. He joined the Archaeological Survey of Canada of the Canadian Museum of Civilization in 1969, and served as Yukon Archaeologist until 1981, Curator of Plains Archaeology until 1989, and Curator of Paleoenvironmental Studies until his retirement in 2006.

Besides his Early Man research, Richard was an expert in the late prehistory of the northern Plains. He co-directed excavations at the deeply stratified Sjovold Creek site, a late-Holocene bison hunters' campsite with more than 20 occupation episodes. Most recently he developed the Canadian Archaeological Radiocarbon Database, a searchable database maintained at the Canadian Archaeological Survey's Web site, and he curated two major exhibits in the Canadian Museum of Civilization's First Peoples Hall, which opened in 2003.

Richard significantly increased our knowledge of the Pleistocene peopling of Beringia, and through his work he inspired a new generation of Beringian archaeologists. He was a friend of the Center for the Study of the First Americans, and he will be missed. MT

–Ted Goebel and Jacques Cinq-Mars



ROBSON BONNICHSEN

Richard Morlan holding a broken large mammal bone, on the Old Crow Refugium Project, Yukon Territory, Canada, June 1975.

non-microblade tradition identified in Component VII at the Ushki-5 site, consisting of bifacial stemmed projectile points, lanceolate bifaces, and such flake tools as endscrapers and gravers. The pebble-tool tradition is harder to define, since no artifacts have been recovered from secure stratigraphic contexts. Moreover, it's often questionable whether items are utilized tools, such as choppers, or just tested cobbles. And oftentimes, says Slobodin, the problem is how to distinguish pebble tools from geofacts: Were they created by inhabitants of the region, or naturally produced by post-depositional processes? The more straightforward microblade tradition consists of wedge-shaped cores, lanceolate and oval bifaces, unifacially retouched flakes and blades, and burins. Conical and prismatic blade cores enter the material record during the early Holocene.

Irina Ponkratova (Northern International University) updated her audience on the Ushki-5 site. Excavations conducted in 2004–2006 revealed a dwelling and associated hearth feature in Component VII. Bifacial tools and beads were located within the dwelling; duck bones, and salmon scales and vertebrae were recovered from the hearth feature.

Focusing on eastern Beringia

Jeff Rasic and **Bob Gal** (National Park Service) neatly assembled ethnographic and archaeological evidence to define adaptations used within the Sluiceway Complex, which includes sites in the northwestern interior of Alaska such as the Sluiceway-type site, Tuluaq Hill, and Caribou Crossing dated to approximately 11,200 RCYBP. Rasic and Gal hypothesize that groups of hunters revisited optimal locations, based on their knowledge of migratory routes, to take large numbers of big-game animals like bison and caribou.

Charles Holmes (Gudgel and Holmes Associates) compared the microblade and burin technology found in the oldest component of the important Swan Point site, located in the Tanana Valley, with late-Pleistocene Siberian traditions. **Barbara Crass** (University of Wisconsin, Oshkosh) explored the use of green bone, instead of wood, as fuel at Swan Point. To gauge its effectiveness she has burned large fires using bone as fuel.

Four researchers related how they use environmental reconstructions to better understand land-use patterns of the terminal Pleistocene. **Brian Wygal** and **Katie Krasinski** (University of Nevada, Reno) explained how, from paleobotanic evidence they obtained from a peat bog near two sites they are investigating in south-central Alaska, they inferred different strategies early Alaskans developed to cope with the changing environment at the Pleistocene/Holocene transition. **Daryl Fedje** and **Quentin Mackie** (Parks Canada and the University of Victoria) developed landscape models which "combine conventional and high

resolution topographic and bathymetric data" in conjunction with "investigations of karst caves and ancient shorelines" to identify maritime adaptations within the Haida Gwaii archipelago, British Columbia.

The Beringian big picture

The day 2 workshop concentrated on synthesizing archaeological data of Beringia and its relation to climatic and environmental changes. Summarizing western Beringian data, **Sergey Vasil'ev** (Russian Academy of Sciences) emphasized the broader role Beringia played in the colonization of the Americas.

Using our newly enlarged understanding of oscillations, or variations, in the late-Pleistocene climatic record as a starting point, **Stuart Fiedel** (Louis Berger Group) gave his interpretations of human colonization of Siberia and Beringia. First he explains that the onset of the LGM occurred at approximately 25,000 CALYBP, not 21,000 CALYBP. If, as currently theorized, extreme cold impeded human colonization in the far northern reaches of Siberia, this should be reflected in the archaeological record; however, at 31,000 CALYBP the Yana RHS site—the northernmost site in Siberia—appears to have been occupied during a *cold* period. Archaeological evidence of human settlement increases dramatically from 19,000 to 17,000 CALYBP, corresponding with a warmer interval. Although the warmer climate of the Bølling interstadial (14,700 CALYBP) coincided with the decline of Pleistocene horse and an increase in wapiti (elk) populations, the early colonization of Alaska occurred at roughly the same time. Finally, Fiedel suggests that at about 13,300 CALYBP, wapiti began a southern migration out of Alaska through the Ice-Free Corridor "at the same time as Clovis ancestors."

CHARLOTTE D. PEVNY

(*Left-right*) David Madsen, Andy Hemmings, Mike Waters, Bill Dickens, and Sergey Vasil'ev discuss aspects of Clovis overshot technology in use at sites like Buttermilk Creek and Gault.

Drawing on the well-preserved faunal record at sites such as Broken Mammoth, Mead, and the Gerstle River Quarry in interior Alaska, **David Yesner** (University of Alaska, Anchorage) traced environmental changes that altered the complexion of the vegetation regime, which in turn was responsible for successive changes in the primary food source of hunters, from Pleistocene mammals such as mammoth and horse, to large game like bison, supplemented by waterfowl and other "aquatic taxa," eventually to wapiti, and ending with a focus on caribou.

Scott Elias (University of London) places colonization against the backdrop of rapid environmental change and suggests that the inhospitable landscape of Beringia during the LGM "posed an insurmountable barrier to human population." Elias believes that the lack of trees, and consequent scarcity of firewood, prevented settlement of Beringia during the full glacial.

The clean-up hitter was **John Hoffecker** (University of Colorado). Citing past impediments including a paucity of stratified sites and problems with ^{14}C dating that have been surmounted, Hoffecker believes there is now enough evidence to propose "an archaeological stratigraphy for Beringia." His chronology corresponds to the division between the early Late Glacial Interstadial, the terminal Late Glacial Interstadial, and the Younger Dryas. The Dyuktai culture belongs to the early Late Glacial Interstadial, while traditions such as Denali and Mesa belong in the Younger Dryas. Although he suggests the terminal Late Glacial is distinctly Beringian, he admits it's not as easy to characterize as the other two units.

Rolling up their sleeves in work groups

Following presentations on the second day, folks separated into focus groups based on individual interest and worked through lunch and into the afternoon in round-table discussions aimed at defining research priorities. Later that afternoon the subgroups reconvened to report their findings to the other groups.

The geology/geomorphology group prioritized future investigations of early archaeological sites in Beringia. They reviewed the contextual evidence at known Paleolithic sites, selected locations likely to contain buried or stratified sites, and estimated the logistical effort that will be needed to access and survey these areas.

The paleoenvironment/paleoecology group examined environmental reconstructions and extinctions as they relate to human adaptations.

The technology group charted a plan of study to correlate and document the differences between Siberian and North American taxonomies, especially their blade industries.

After a day of intense study and discussion, participants were ready to break for dinner. They were treated to a Texas-style barbecue and a lecture by Dale Guthrie on Late Paleolithic art.

The final day of the workshop was spent touring the Buttermilk Creek site, located adjacent to the Gault site in central Texas. Mike Waters, the principal investigator at Buttermilk, reviewed the stratigraphy and geoarchaeological data. A short hike up the ridge helped everyone work up an appetite for a picnic, and the parklike setting was the perfect place for it. After two days indoors, the warm Texas sunshine was welcome.

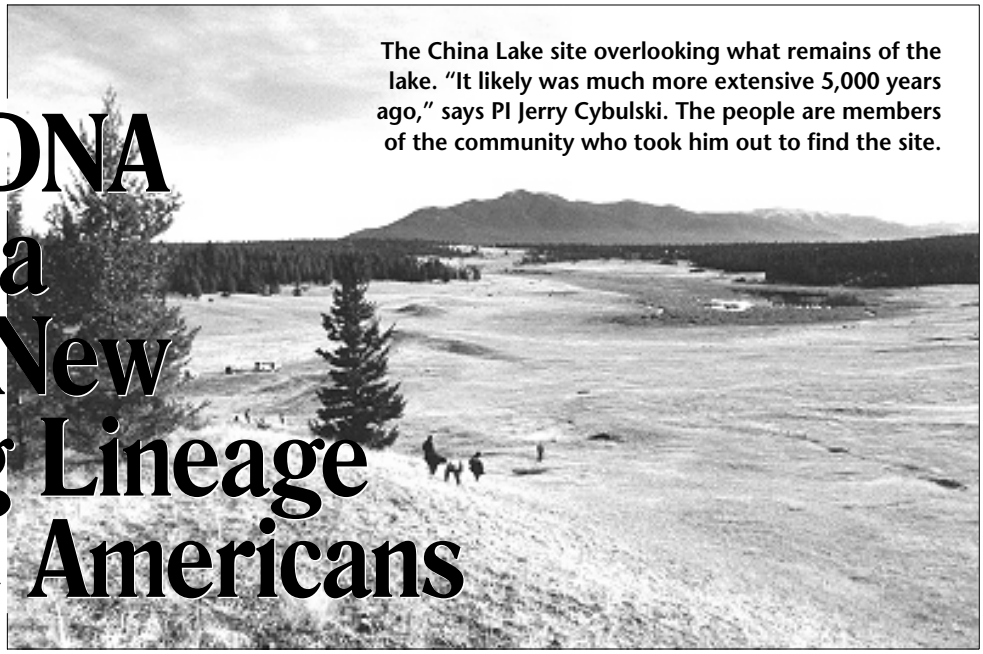
Hard work rewarded

The weekend, we'd say in Texas, was "chucky-jam-full." Participants seemed honestly satisfied with the results of the workshop, and undoubtedly justifiably pleased with themselves for making it happen. Their hard work panned out.

Plans are in the works to hold a second smaller workshop sometime in 2007, where the research priorities identified by the three focus groups will be further developed.

–Charlotte Pevny

Ancient DNA in Canada Reveals New Founding Lineage of Native Americans



The China Lake site overlooking what remains of the lake. "It likely was much more extensive 5,000 years ago," says PI Jerry Cybulski. The people are members of the community who took him out to find the site.

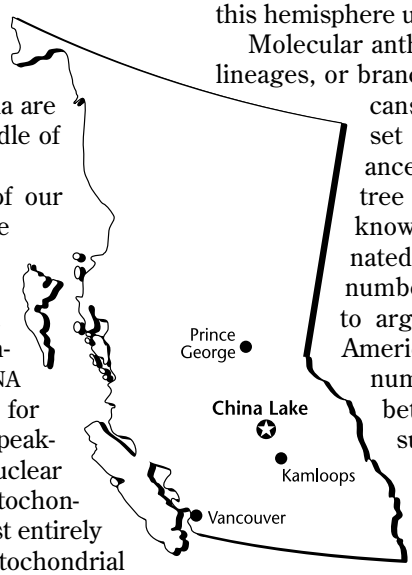
J. S. CYBULSKI, COURTESY OF THE CANADIAN MUSEUM OF CIVILIZATION

IN HUMAN REMAINS 5,000 years old found in British Columbia, scientists have discovered a mitochondrial haplogroup—the signature of ancient ancestry—previously unknown in the New World. The results of their study, and the astonishingly cooperative spirit of the local band of Native Americans, have revitalized our search for the First Americans.

About mitochondrial DNA and haplogroups

Most of us have heard of "mitochondrial Eve"—the great-great-etc. grandmother-of-us-all that lived nearly 200,000 years ago in eastern Africa. We understand that "Eve" is a literary allusion that symbolically refers to the original mother of our species, but we may not be so sure what mitochondria are or what they have to do with solving the riddle of the peopling of the Americas.

Mitchondria are essential components of our cellular machinery. They are located in the cytoplasm of the cell and appear originally to have been independent organisms that developed a symbiotic relationship with early cells. The best evidence for their ancient independence is that they have their own DNA. The DNA of mitochondria turn out to be very useful for tracing our ancestry even though, strictly speaking, it isn't "our" genetic blueprint. Unlike nuclear DNA, which we inherit from both parents, mitochondrial DNA, or mtDNA, come to our cells almost entirely from our mothers. (This is why we have a "mitochondrial Eve" instead of an Adam.) This is important because it means there is no complicated mixing and diluting of the genetic signal from one generation to the next. It does not, of course, mean that the mtDNA do not change over the course of time. In fact, mtDNA have a relatively high rate of mutation, but this too is an advantage for tracing our ancestry, because each new mutation is a sort of tag that is applied to all the descendants of the woman in whom the particular mutation occurred. So each new mutation constitutes a new potential branch of the family tree.



The accumulation of mutations in your mtDNA reflects the uniquely divergent paths taken by your maternal ancestors. All our paths converge in Africa about 200,000 years ago. The paths of modern Native Americans appear to converge in eastern Asia (possibly Mongolia) between 15,000 and 20,000 years ago. But does that mean the first Americans did not enter this hemisphere until then? Not necessarily.

Molecular anthropologists have identified five distinctive lineages, or branches, in the mtDNA of living Native Americans. Each branch represents a mutation (or set of mutations) in the mtDNA of an ancient ancestor. These branches on the human family tree are referred to as haplogroups. The five known Native American haplogroups are designated by the letters A, B, C, D, and X. This small number of haplogroups has led some researchers to argue that the ancestors of modern Native Americans came here in small numbers, in a small number of migratory pulses (possibly just one), between 15,000 and 20,000 years ago. Others, such as Andrew Merriwether, have pointed out a major problem with this argument. Writing in his contribution to *The First Americans*, Merriwether notes that it is "likely that lineages may have entered the New World and gone extinct anywhere up until European contact, and even more likely after contact." This alternative view recognizes that the haplogroups present in modern American Indians likely represent only a subset of the total number of haplogroups that once existed in North and South

America. An unknown number of branches may have been pruned in the preceding millennia, and many more may have been lost during the catastrophic period of European contact, when the population was decimated by introduced diseases and warfare. If there were more haplogroups in pre-Columbian America, then our estimates for the number of migrations and their antiquity would have to be revised—in the direction either of more migrations, to account for the greater diversity of haplogroups coming to America, or an earlier date of arrival, to account for the evolution of that diversity in America, or both.

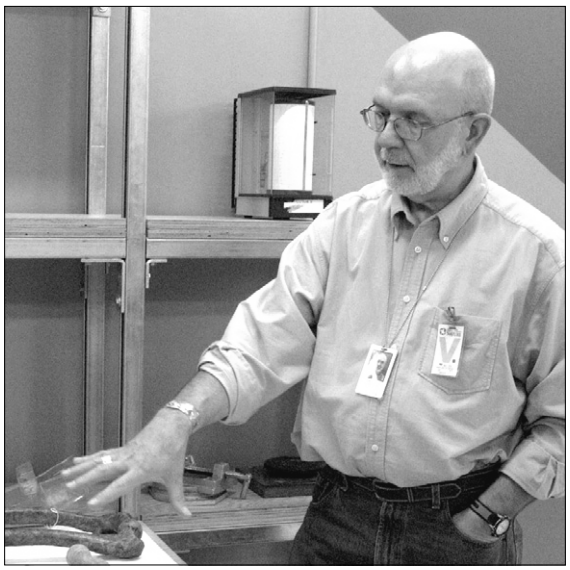


PHOTO BY PETER FRANK. COPYRIGHT 2003; REPRODUCED WITH THE PERMISSION OF THE CANADIAN MUSEUM OF NATURE

Jerry Cybulski discusses the China Lake skeletal remains.

A new letter in America's mtDNA alphabet

Until recently, the proposition that there were lost haplogroups in America's past was purely theoretical. Now, however, molecular anthropologists have succeeded in recovering mtDNA from ancient bone, thereby making it possible to sample the genetic diversity in America long prior to the arrival of Europeans.

In the April 2007 issue of the *Journal of Archaeological Science*, molecular anthropologist Ripan Malhi of the Department of Anthropology at the University of Illinois Urbana–Champaign, and colleagues from the University of California–Davis, the Canadian Museum of Civilization, and the Canoe Creek Band of Salish Indians, report the discovery of a haplogroup previously unknown in America from two individuals found buried in a common grave at China Lake in British Columbia. These remains are 5,000 years old, and mtDNA recovered from the bones belong to haplogroup M. Like the other five Native American haplogroups, M has its roots in Asia, so it is consistent with the accepted model of the peopling of the Americas that has Asian groups migrating across Beringia, or along the Pacific rim, and into North America. This discovery, however, calls into serious question other aspects of the traditional model. Dr. Malhi and his co-authors write, "Our discovery demonstrates that a more genetically diverse group of migrants colonized the Americas than previously thought and supports the hypothesis that significant undocumented genetic diversity likely still remains in the Americas." In other words, the discovery of a previously unknown haplogroup not only demonstrates that ancient America was more genetically diverse than modern native America, it also increases the likelihood that more undiscovered haplogroups remain to be revealed by additional research.

J. S. CYBULSKI
COURTESY OF THE CANADIAN MUSEUM OF CIVILIZATION

The site at China Lake. According to Cybulski, "It was the first time in 20 years that anyone with knowledge of the site's existence had been there!"

Scientists and Native Americans working together

The discovery of a haplotype new to ancient America is a remarkable breakthrough in its own right, but one of the most extraordinary aspects of this research is the partnership between anthropologists and Native Americans in the study of ancient North American human remains. In the wake of the Kennewick Man imbroglio (**MT 19-2,** "Kennewick Man Decision Upheld by Court of Appeals"), you could be forgiven for expecting conflict between scientists and Indians rather than cooperation and compromise. In order to understand how this was achieved, it's necessary to review the history of the investigation.

The China Lake site was discovered in 1982 when a skeleton was accidentally uncovered during road construction. The bones were collected by an archaeologist from Simon Fraser University. Later, radiocarbon dating of a sample of the bone indicated the remains were buried between 4325 and 3525 B.C. In 2002, physical anthropologist Jerry Cybulski became interested in the site and asked permission of the Canoe Creek Band to conduct an investigation. Harold Harry, a band member and ultimately a co-author of the study, actively assisted in relocating the site and in identifying other sites in the vicinity. According to Malhi, Harry and fellow band member Scott Cousins were integral members of the research team.

Dr. Cybulski invited Malhi to join the team in the hope that he might be able to recover mtDNA from the bones. Malhi recalls the experience of working on the project: "The Canoe Creek Band is a wonderful community to work with. The band members have a strong interest in learning about their history through scientific inquiry. We have been able to work with them to design a research program that allays the concerns about DNA studies of the participants and provides results that are interesting to both the community members and the researchers."

Part of the compromise involved reburying the China Lake human remains by the Canoe Creek Band in May 2006. Malhi

and Cybulski attended the reburial ceremonies. The experience made it clear to Malhi that the band members care deeply about these ancient people, whom they regard as ancestors in spite of the six millennia that separate them and the differences in their mtDNA. He remembers that "you could feel the relief of band members after the reburial."

Following multiple paths to knowledge

Malhi is a co-author of a paper published in a recent issue of the journal *Evolutionary Anthropology*, which reports the results of an informal survey of individuals who identify themselves as Native American, all members of more than 30 different bands or tribes across North America. They were given a questionnaire exploring issues related to possible collaboration on genetic research. Although Malhi and his co-authors make no claim that the survey is representative, the results are instructive. Of the 83 individuals who responded to the survey, only 45 percent disapprove of the study of DNA from human burials. More than 40 percent indicate that one of the greatest benefits of genetic research would be "learning more about our history." Clearly, this represents the attitude of the members of the Canoe Creek Band with whom Malhi and Cybulski worked. Malhi and his co-authors conclude that "Native Americans are not as polarized about issues involving genetic research as might be suggested by Native American activists."

RIPAN MALHI

Ripan Malhi

This suggestion that many Native Americans are not opposed to working with archaeologists is corroborated by a more comprehensive survey of 508 federally recognized tribes from 32 states conducted by bioanthropologist Teri Hall and attorney Jeanette Wolfley. The results of the survey were published in the March 2003 newsletter of the Society for American Archaeology, *The SAA Archaeological Record*. Dr. Hall and Wolfley indicate that "'universal repatriation' is not unanimously advocated by American Indians and Alaska Natives, and no consensus on reburial issues can be identified among tribes/villages." Moreover, a significant minority of tribal representatives, nearly 20 percent, support research on human remains—even when it involves destructive testing such as radiocarbon dating and genetic testing.

These results indicate that productive cooperation between archaeologists and Native Americans is possible, in spite of the incendiary rhetoric of some American Indian activists. More surprisingly, when human remains are at issue, reburial is not an inevitable outcome.

Canadian archaeologist George Nicholas, in an editorial "On mtDNA and archaeological ethics" published in 2005 in the *Canadian Journal of Archaeology*, identifies a number of challenges surrounding the study of DNA from ancient Native American human remains. Nonetheless he concludes that if researchers and their host communities "negotiate protocols that promote an equitable arrangement for the study and dissemination of scientific data," the result will be "archaeological research that is as ethical as it is innovative."

The paper co-authored by Malhi, Cybulski, Cousins, Harry, and others is a landmark contribution to American archaeology, both for its results and its collaborative methods. Malhi emerged from the study "inspired by the band's sense of community and interest in learning about their history through multiple paths of knowledge." All of us should be inspired by the efforts of these researchers and this community to allow these two long-dead early Americans to speak to us in what archaeologist and Choctaw Indian Dorothy Lippert has called their "voice made of bone."

–Bradley T. Lepper
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The opinions expressed in this article are those of the author and do not necessarily reflect those of the Ohio Historical Society, with whom he is employed as a Curator of Archaeology.

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Suggested Readings

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