MAMMOTH TRUMPET

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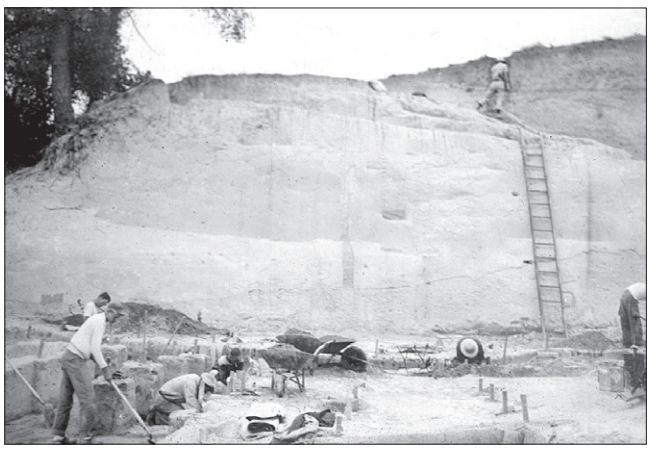
Shattering the Monolith

Our vision of Folsom and later Paleoamericans—they occupied the Allen site in southwestern Nebraska shown here in this 1946 photo—has been distorted because of studies that have been too rigidly focused, says anthropologist Doug Bamforth of the University of Colorado. Rather than single-dimensional bison hunters who roamed the Plains with stone-tipped spears, these people were intelligent hunter-gatherers adept at surviving in a changing landscape. After exhaustively collating data from the Allen site (now destroyed by dammed waters), Dr. Bamforth discovered they resisted the urge to roam, instead periodically revisited their base camp strategically located a day's walk from hunting areas and toolstone quarries. Toolmakers busied themselves principally making stone and bone implements to ease day-to-day living, not just projectile points. And they weren't finicky eaters—their menu included such lowly fare as prairie dog and mussels. In our story that begins on page 4, we'll introduce you to a landmark book edited by Bamforth. It may become the template for studies by the next generation of scientists.



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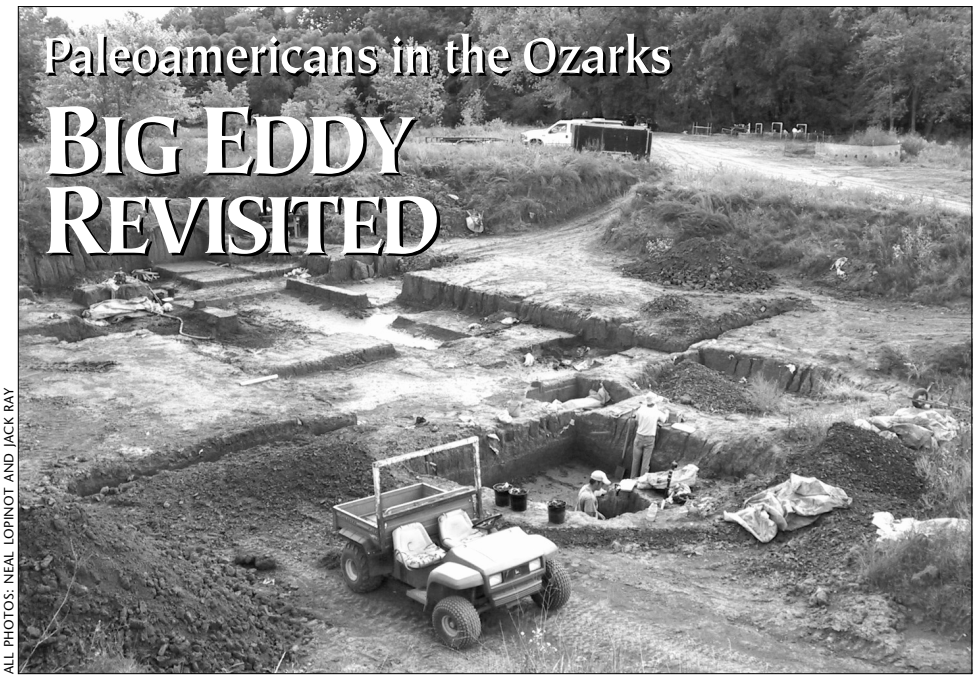
Paleoamericans in the Ozarks

BIG EDDY REVISITED



ALL PHOTOS: NEAL LOPINOT AND JACK RAY

Block I during the last week of the 2005 excavations, viewed from the northeast. Two crew members are shown working in the 4-by-4-m area where a long bone was recovered in 2002. In 2005 a spall flake, siltstone boulder, and two sandstone cobbles were found in the same area.

AT BIG EDDY, work has stopped. The archaeologists who once worked the site have moved on, and their efforts to preserve it from the relentless advance of the Sac River are, for the moment at least, on hold. Neal Lopinot and Jack Ray, the Missouri State University (MSU) archaeologists who first introduced the Big Eddy site to the world, are no longer exploring new areas of this rich, well-stratified site, which may be one of the most important in the Midwest. They just can't afford to.

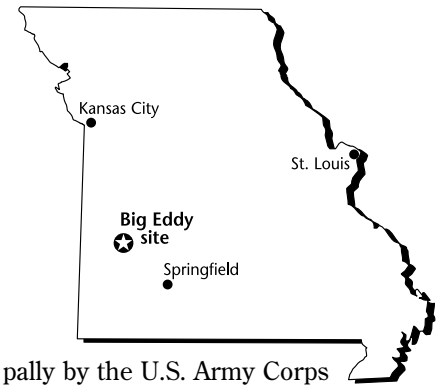
Back at the turn of the century, Dr. Lopinot and Ray were flush with the success of several years of fieldwork at Big Eddy. Since 1997, they'd proven to the satisfaction of the archaeological community that theirs was a premier Paleoamerican site in North America. The stratigraphy at Big Eddy proved to be amazingly clear and undisturbed—a rarity anywhere, a prize in the Missouri Ozarks. Just as important, the site yielded cultural remains spanning the entire prehistoric continuum, from the Mississippian all the way back through the Woodland, Archaic, and Paleoindian periods, with tantalizing evidence of a pre-Clovis component. Apparently for the first time there was well-dated evidence of the interaction between the Dalton and San Patrice cultures of the late-Paleoindian period. Data clarifying the technological transition from

INSIDE

Clovis to Gainey to Dalton were also coming to light. Big Eddy's potential to fill in the archaeological gaps for the region was (and remains) tremendous, which is one of the reasons we documented their finds in a 2-part article back in 2001 (**MT 16-3, -4** "Fragile History: The Big Eddy Site").

Archaeology in the modern world

But then 9/11 happened, and America's cultural priorities shifted elsewhere. Government funds for archaeology became difficult to acquire, and even private support dried up as the economy destabilized. There was a slack period after the 2002 field season; then a successful season in 2005, supported principally by the U.S. Army Corps of Engineers, with supplemental funding from Rolfe Mandel, geoarchaeologist with the Kansas Geological Survey and Executive Director of the Odyssey Archaeological Research Fund. Limited fieldwork was conducted in 2007, thanks entirely to the generosity of Mandel, but Big Eddy is currently lying fallow. This does not, however, mean that the work is over—not by a long shot. Ray and Lopinot are actively pursuing further avenues of funding, and of course the laboratory analyses of the site's treasures are still underway. Slowly but surely, what the MSU team has learned is being disseminated to an interested audience, one cultural sequence at a time.



Since we last reported on Big Eddy, the MSU team has learned quite a bit about the site—not least the fact that the threat of erosion isn't as bad as initially thought. "We originally estimated an annual erosion rate of 1 to 1½ meters per year," says Ray. "The good news is that while the discharges from the Stockton Reservoir upstream are still eating away at the deposits, the erosion has slowed down considerably in the last few years." Lopinot adds, "The older deposits have been covered by slumpage. There's a matting of brush and muck over the older stuff, too, so it's not eroding as fast as it was in the first few years we were there." What this means is that for the moment, the most significant deposits at Big Eddy are still safe, waiting to be excavated and interpreted.

At the end of the 2002 season, the team penetrated those deposits down to the pre-Clovis levels and discovered a partially mineralized long-bone fragment at approximately the same depth as (and about 28 m to the north of) the broken possible anvilstone they discovered in 1999 (see **MT 16-4**). At 15.4 cm long, 2.6 cm wide, and 5–7 mm thick, it remains by far the longest piece of bone ever found at the site. Given its type and condition, it's hard to say much about it except that it's from a large mammal. Might it have come from a bison that was processed, using

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

–Michael R. Waters, Director

Jack Ray (*center*) discusses Big Eddy with Bruce McMillan (*left*) and C. Vance Haynes, while Neal Lopinot chats with bestselling author William Least Heat-Moon. Note the water that has seeped into the open unit due to hydrostatic pressure.

the anvilstone, by pre-Clovis inhabitants? The answer to that question awaits further research—including, hopefully, a new round of fieldwork.

Later discoveries

Another exciting find came at the end of the 2005 season, when a large spall of Burlington chert was recovered from the pre-Clovis deposits—just 2 m from where the long-bone fragment had been found in 2002 and at virtually the same depth. "It was the largest chert flake that we've ever found at the site," Ray notes. The spall, about the same size as the bone, was found lying flat in a bed of fine-grained alluvial sediments. Since such sediments could only have been deposited in a low-energy environment, possibly even a backwater, it's hard to escape the conclusion that the flake is a manuport—deliberately carried by a human to its resting place. Unfortunately the spall lacks a striking platform and bulb of percussion, which are incontrovertible evidence of human-made flakes; so Ray and Lopinot have to admit, however reluctantly, that there's an outside chance it might be a geofact—formed by natural processes.

But a closer look shows that it almost certainly wasn't. Not only is there very little wear on the flake, indicating that it wasn't tumbled along in a stream, but about 20 percent of the edges display either polish or rounding. In one spot a number of tiny flakes have been removed from the edge. All these appear to be indicative of deliberate human utilization, and it's hard to imagine a natural action that might have mimicked the use wear so closely. Add to that its location, so near several other anomalous items, and it seems reasonable to call this an artifact, a tool fashioned by human hands.

Also out of place was a large tabular siltstone boulder found at the same level as the bone and spall flake, about 2 m from both; in plan view the placement of the three items approximates an equilateral triangle. Another oddity consisted of two mano-sized unmodified sandstone cobbles, found on edge and leaning together rather than lying flat. This orientation could have been the result of natural processes—it's easy to conjure up an image of the river slapping them together against a willow root and leaving them in

continued on page 8

Possible artifact and human-modified bone from Big Eddy. A, the large chert spall flake in situ in the pre-Clovis level of the 2005 Block I excavations; B, the spall after laboratory processing. Microanalysis revealed wear patterns consistent with human tool use. C, the long-bone fragment recovered from the pre-Clovis level of Block I during the 2002 excavations; D, the fragment after laboratory processing. It's the largest piece of bone ever recovered from Big Eddy.

A SITE IN SOUTHWESTERN NEBRASKA is giving archaeologists a fresh view of Folsom-age and later Paleoamerican hunters distinctly at odds with that portrayed over the last century. Traditionally, these people who lived near the end of the last Ice Age some 10,000 to 11,000 years ago are seen narrowly as technically sophisticated and highly specialized big-game hunters perpetually roaming the Great Plains. But reanalysis of data collected from the Allen site (25FT50), combined with new and old data collected from other sites on the associated Medicine and Lime Creek drainages, shows there was more to these people than bison and spear points. They appear to have been multifaceted, leading less nomadic but regionally variable lives locally adapted to their environment while returning periodically to specific resource-rich terrain. Recent research elsewhere supports that view (**MT 21-3**, "Folsom on a Mountain Top"; **MT 23-4,** "Marcel Kornfeld: Paleoamerican Subsistence and Folsom in the Rockies").

The Allen Site

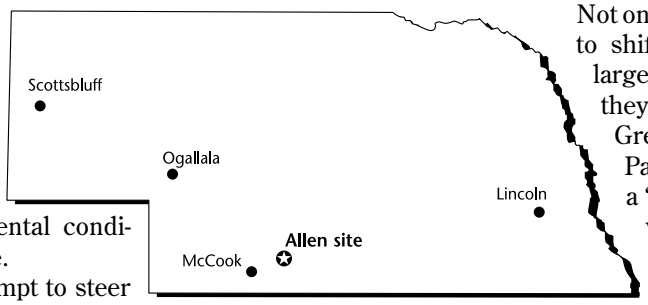
Paleoamericans Seen through a Different Prism

An outcrop of bedrock jasper, toolstone for Plains hunter-gatherers, in the Medicine Creek locality.

LARRY CONYERS

A fresh look at a much-studied subject

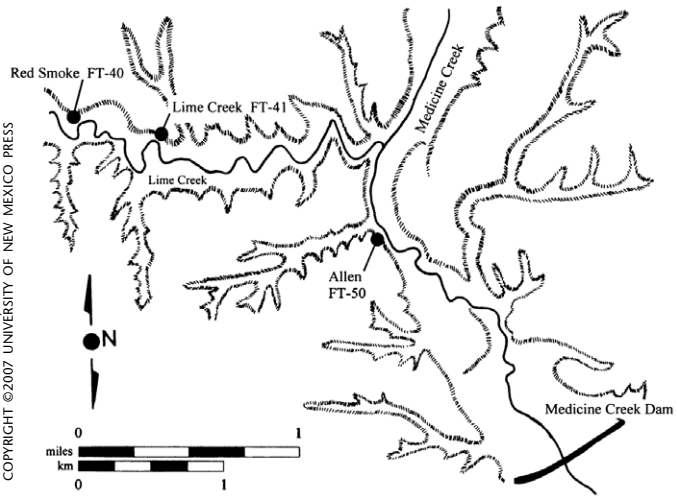
This new portrait is the result of a multidisciplinary effort conducted and refined over the past two decades. It appears in a book titled *The Allen Site: A Paleoindian Camp in Southwestern Nebraska,* a collection of papers edited by Douglas B. Bamforth, a professor of Anthropology at the University of Colorado, Boulder. Bamforth and 10 other researchers contributed to this 2007 volume. Old data and collections are reanalyzed in the 284-page anthology, and new research stresses paleoenvironmental studies such as geomorphology and pollen analysis to flesh out a picture of the rapidly changing environmental conditions at the waning of the Ice Age.



This study is a deliberate attempt to steer away from large bison bone beds that have drawn many past researchers questing to interpret Paleoindian behavior, Dr. Bamforth explains. Their strategy placed highly skewed emphasis on projectile points and large-scale bison hunting as defining characteristics of Paleoindian life, particularly on the Far Western Great Plains. "We have done a lot to interpret the large bison kills, and we have learned a lot," Bamforth asserts. "But I think this has disproportionately pulled archaeological attention into those kinds of sites. I think it is becoming increasingly clear that this approach provides but a small window on Paleoindian lifeways on the Plains."

Not only did his team of researchers seek to shift research emphasis away from large bison kill sites, Bamforth adds, they also focused on a portion of the Great Plains where little is known of Paleoindian life, using as their focus a "well-stratified, well-preserved and well-excavated" site easily compared with nearby comparable-aged sites to provide a more vibrant portrait of Paleoindian lifeways. Analysis from the sites used in this study, Bamforth says, reveals a people who were clearly mobile, but less so than previously thought. They also exploited a variety of environmental resources, including

plants, small animals, and freshwater mussels during a time of great environmental change. Frequently, the study revealed, they returned to sites particularly rich in resources supplying food, shelter, and clothing rather than continually moving forward across the Plains, as analysis of large bone bed sites often suggested. Although researchers found no fiber goods such as baskets and clothing preserved for their study, artifact assemblages including bone tools such as awls and needles to show with "indirect evidence" that occupants of these drainages were processing such goods.



ADAPTED FROM *THE ALLEN SITE: A PALEOINDIAN CAMP IN SOUTHWESTERN NEBRASKA*, EDITED BY DOUGLAS B. BAMFORTH. COPYRIGHT ©2007 UNIVERSITY OF NEW MEXICO PRESS

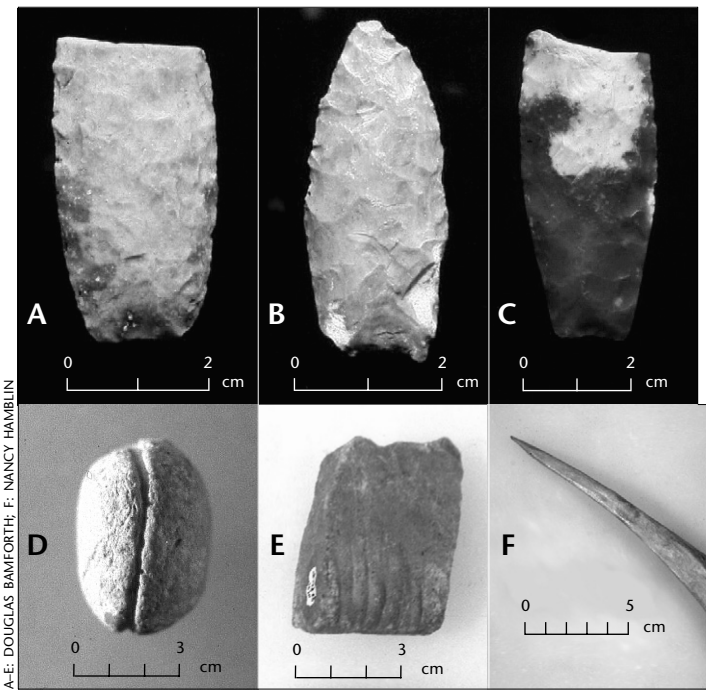
Paleoamerican hunters weren't too proud to stoop

Having mussels and small mammals in their diet chips away further at the concept of Paleoindians as exclusive hunters of bison and other large mammals. "The idea of the Paleoindian specialized big-game hunter harvesting mussels, a tiny amount of food really, just illustrates the range of resources they were willing to exploit," Bamforth notes. "It shows the range of foraging that took place at Paleoindian sites and demonstrates some of the roles that took place in such sites beyond the job of the hunter. It gives us a new focus on the lives of people who lived 8,000 to 10,000 years ago."

Nearly 20 years in development, Bamforth said, the academic and statistically rich book is the outgrowth of an interest he has had in the site since studying about it during the 1980s; it satisfied his hunger for a "hands on" archaeological experience after finishing for his doctorate what he described as a "library dissertation." When Bamforth started teaching at the University of Nebraska, Lincoln, collections from the Allen site were housed there. "Very little was being done with the collections, and it was easy for me to get access," says Bamforth, adding that the Allen site was among many early sites that got pushed backward in significance as research in large bison kills rose to prominence. So the project was launched in about 1991, ultimately aided by significant financing from the U.S. Bureau of Reclamation. But life intervened to slow down the final product. "I had two kids, a job change, and a collaborator or two moved around," he says, explaining the long-term delay in completing the study.

Presenting Paleoindian site reports in book form has been a model for some time, so he chose his format for that reason. "And I think it is a pretty good model," he argues, "if you have an integrated research program such as this." With a multidisciplinary approach, he hoped to focus on exploring "how Paleoindian people reacted to environmental change, and the Allen site lets us look at the kind of environmental change people had to cope with and at least part of the ways they coped with it."

The keystone of the report is reanalysis of data pulled from earlier research at the Allen Site, Bamforth notes in Chapter 8 of the book, where fieldwork was first carried out by different researchers between 1947 and 1949 after paleontologists from the Nebraska State Museum first discovered it. The site was effectively destroyed by erosion following construction of the Medicine Creek Dam and subsequent filling of Henry Strunk Lake in 1951, leaving Bamforth and his team with only the original collections to examine and no chance of revisiting the site. But it was an assemblage that he says produced "a reasonably well documented collection of faunal and lithic material" for use with a broader study. Artifacts from the Allen site collection could be compared with those from the nearby Red Smoke site (25FT40) and Lime Creek site (25FT41) to tease



A–E: DOUGLAS BAMFORTH; F: NANCY HAMBLIN

Artifacts from the Allen site and surrounding area. A, the base of an Agate Basin point. B, a poorly made point that tested positive for blood residue of elk; the blade is polished from being repeatedly stabbed into silica-rich plants. C, a resharpened late-Paleoamerican obliquely flaked point. D, a grooved stone that Bamforth opines is "perhaps a preform for a yo-yo," but more likely served as a bola stone or a net weight. E, a fragment of a metate; the grooves suggest it was used after being broken as an abrader for making artifacts like needles. F, an awl made from the ulna of a wolf or other canid.


CASEY CARMICHAEL

Bamforth at the transit, student Brian Naze looking on, in the 2006 field school at Pine Ridge in northwest Nebraska.

out factors related to adaptive diversity and to understand how different sites fit together on a landscape where creek beds, deeply incised into surrounding loess plains, produce narrow valleys surrounded by steep bluffs and level uplands, Bamforth said.

They traveled . . . but no more than necessary

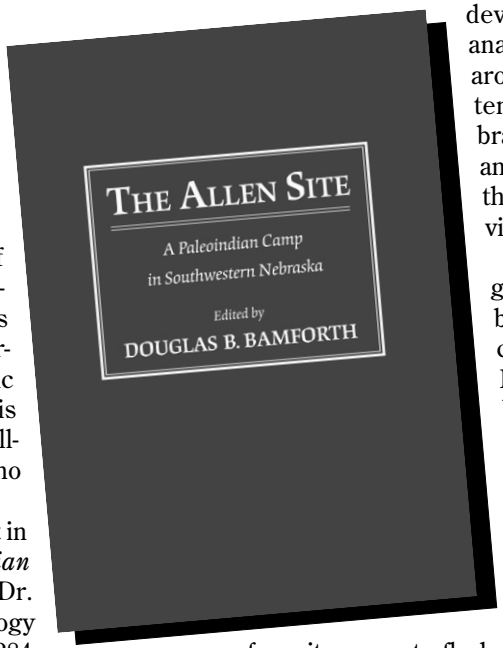
If the traditional Plains nomad bison-hunter theory holds sway, Bamforth reasons, researchers should have found substantial evidence that hunters were carrying exotic toolstone with them and were constantly reshaping tools to maximize their use. But researchers found most of the toolstone they used was a local stone known as Smoky Hill jasper—with quarries located easy walking distance from the sites within the study area. "Our evidence," Bamforth explains, "seems to show that they were moving in much smaller areas than many people have argued they would, and the dominant tools don't fit the [conventional] expectations." The range of artifacts extends beyond spear points to include endscrapers, hide- and plant-processing tools that included groundstone fragments, as well as bone needles and awls for working fiber. He concludes in his book's summary chapter that contrary to traditional views, Paleoindian technology, at the Allen site anyway, was "not dominated by bifaces or by bifacial cores, by extensive efforts to extend tools' use-lives or by anything like a universal large-scale reliance on the long distance transport of raw material."

Like many other Paleoindian sites other than large bison kills, the Allen site was used repeatedly over time—and used to its fullest extent, researchers noted. Faunal analysis of materials from Allen site, conducted by Jean Hudson, Anthropology professor at the University of Wisconsin, Milwaukee, showed occupants shared a varied diet ranging from bison to jackrabbit, prairie dog, coyote, bald eagle, goose, and turtle, a rich menu to choose from.

Adjusting to a changing environment

Not only did artifact analysis show clearly that mussels also figured in the Paleoindian diet at the Allen site, it found in mussel remains evidence of gradual environmental shifts occurring

The Book



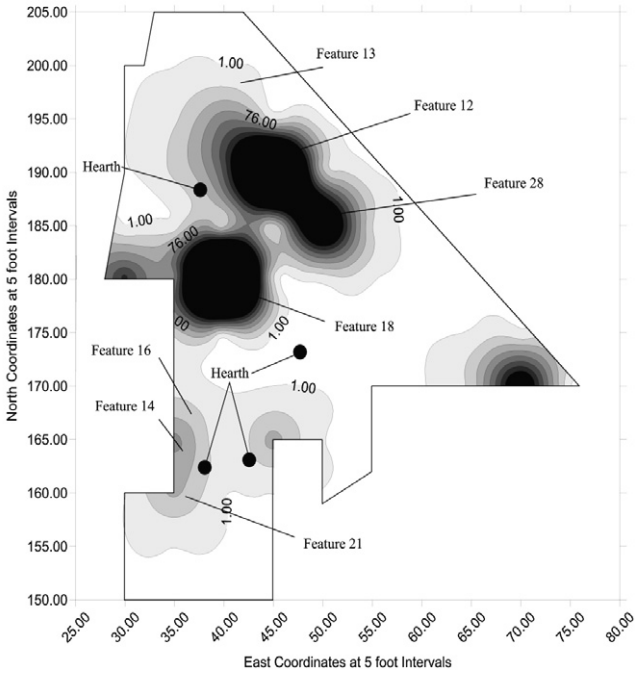
Research on Paleoindians of the Great Plains appears to be at a crucial turning point, with new archaeological research challenging the conclusions of past researchers. Reanalysis of old archaeological sites, as well as new research using new methods and technology, is leading scientists away from the narrow portrait of late–Ice Age people as strictly nomadic big-game hunters. Instead, recent research is painting a broader picture of a people well-adapted to a rapidly changing environment who fully exploited available resources.

A splendid example of such a study laid out in painstaking detail is *The Allen Site: A Paleoindian Camp in Southwestern Nebraska.* Edited by Dr. Douglas B. Bamforth, professor of Anthropology at the University of Colorado, Boulder, the 284-page volume includes papers by Bamforth and 10 other researchers from a variety of fields. The book, published in 2007 by the University of New Mexico Press, contains chapters on previous Paleoindian research, as well as chapters devoted to intense academic analysis of the paleoenviroment around the Allen site and, by extension, of southwestern Nebraska. It also provides extensive analysis of artifacts from sites in the area as well as a detailed review of flora and fauna.

Meticulous materials analysis gives the fresh view Bamforth believes is necessary for a more complete understanding of Paleoindian lifeways. This book will spur researchers to take a more open-minded approach to studying the early Holocene.

Bamforth hopes the volume becomes essential reading for researchers of Paleoindian life and that they will use material from its pages to flesh out their own studies. "We are going to need to look at a whole range of material culture," he insists, "if we are to get an accurate portrait of Paleoindian lifeways." His volume offers "in a small way" another path to follow in this quest.

along these creek drainages. James Chatters, an archaeologist at Applied Paleoscience in Richland, Washington, analyzed 126 fragments of mussel shells recovered at the Allen site and noted a decline in shell size in the site's upper stratigraphic levels, which hints that the "West-Central Plains had begun to dry out by around 8,000 B.P." The Allen site, now destroyed, was radiocarbon-dated with collected charcoal at 10,600 ± 620 RCYBP (about 12,250 CALYBP). Seeking confirmation of the environmental change posited by Chatters, Bamforth investigated stratigraphy elsewhere in the drainage. He chose a nearby site known as the Medicine Creek Cutbank because it was the best analog to the Allen site for undisturbed stratigraphic analysis.



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Giving shape to a mass of raw data: This map, created by Bamforth and his students, shows the distribution density of artifacts at the Allen site. The graphic representation sheds light on how space was allocated for camp activities.

Bolstered with data from the Stafford site on Lime Creek, the team compiled a new environmental record for the area showing how the Paleoamerican environment changed over time and how people adapted to it.

Although the sites also produced older Clovis-age sediments, Bamforth notes that no Clovis-age artifacts were found at any of the sites. From the data emerges a portrait of small family groups, dating back as far as the Folsom age, tapping into a variety of resources in well-wooded and moist drainages. Away from the central base on the main streams, as temperatures rose and moisture dwindled, rich and abundant grasslands on the upper slopes of the drainages gave way to stunted grasslands. Areas directly on the main creek stems would have provided relatively stable base campsites, Bamforth explains, and the same groups of campers likely would have returned to these areas as long as resources (flora, fauna, toolstone) remained plentiful. From these bases, individuals could have moved daily to outlying hunting camps or tool-manufacturing sites.

Sound advice for tomorrow's researchers

These data suggest to Bamforth that researchers should go beyond just looking at hunters and inquire into division-of-labor issues—start asking questions about who was doing what. "The degree of familiarity with the landscape suggested by the Medicine Creek data and the overwhelming dominance of Smoky Hill jasper in the lithic assemblage together suggested a fairly local way of life," Bamforth says in his concluding chapter. Yes, there


E. MOTT DAVIS

An overview of the drainage around Lime Creek. This environment is similar to that surrounding the Allen site before it was destroyed.

are examples of exotic toolstone in the collections, but they are limited and could be explained by individual long-distance forays or trade between groups and individuals whose paths crossed. For Bamforth, it's a possibility "that more clearly explains getting a dozen or two exotic stone artifacts out of 13,000 artifacts than does long-distance movement by whole social groups."

What we've learned from the Allen Site adds significantly to a growing field of studies, making it "increasingly difficult to treat the Paleoindian period as a single, homogeneous construct," Bamforth writes, and adds that "no single archaeological site can stand for all aspects of any human society." It's clear to him that more work needs to be done at other sites to make meaningful comparisons with data from the Allen site. As archaeologists look closely at these kinds of sites, Bamforth is confident they'll find evidence to support changes in the way we view Paleoindian people. Revisiting old data is another promising avenue for Bamforth, because bringing new methods and technology to bear in studying existing collections may "help us see things we haven't seen before in the work others have already done."

Looking at historical research in general, Bamforth says, it's clear we know more about kings and queens than we do about ordinary people because that's what historians most often study. "That problem is similar to archaeologists just looking at projectile points and bison," he explains. "We need to look at all of what's out there when it comes to peoples' lives." The Allen site gives researchers an enlarged field of vision for viewing Paleoindians and they life they lived. And the image emerging is much more varied and richer than pictured by earlier researchers of bison kill sites. MT

–George Wisner

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Suggested Readings

Bamforth, D. B. 2007 *The Allen Site: A Paleoindian Camp in Southwestern Nebraska*. University of New Mexico Press, Albuquerque.

Big Eddy Revisited

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place . . . except that their proximity to the aforementioned objects seems more than a little suggestive. "All these finds were in a 4-by-4-meter area," Lopinot explains, "all in fine-grained sediments, at the top of a meter or so of a fining-upward sequence. This stuff is in the silty clay loam, right about where this landform would have risen out of the floodplain and would have been more habitable." A fining-upward sequence consists of related sediments in which the individual particles get smaller as they approach the ground surface. This occurs as a stream drops a suspended sediment load according to weight; gravels come out first, then coarse sands, fine sands, silts, and finally clays.

In 2007 Rolfe Mandel and his crew excavated 12 2-by-2-m units in the area where all these items were discovered—and found nothing. "It was possibly just a small activity area," Lopinot says. "I just wish we had something a lot more convincing. Personally, I feel the spall flake alone is hard to explain without taking into account human agency." Ray agrees with that assessment. "I like to look at these things as being guns in the ground, but not smoking guns—just fascinating clues that we can't explain."

Plenty old

Although items like the anvilstone, long-bone fragment, flake spall, siltstone boulder, and siltstone cobbles all imply a pre-Clovis occupation, the oldest *confirmed* occupations at Big Eddy date to the early-Paleoindian and two middle-Paleoindian components (Gainey and Sedgwick). There's a sparse Clovis component. Middle Paleoindian is represented by a greater amount of debris and an assortment of tools, including several Gainey points and two Sedgwick points. One of the two Sedgwick points was found curated in Archaic deposits—proof that early Native Americans were just as interested in their ancestors as we are. Post-Clovis Gainey-style points have also been recovered from Paleo contexts.

Where Big Eddy really shines from the Paleoamerican perspective is in the later end of the Paleoindian spectrum. Discrete San Patrice and Dalton occupations have been identified,

the Dalton occupation at the south end of a linear ridge and San Patrice at the north end. "Unfortunately," says Ray, "the south end of the ridge was basically buzz-sawed away by the time we got there. We found a very clean San Patrice horizon to the north, with very little Dalton material."

One unusual feature, a burnt area measuring some 2–3 m across, really stands out. It is clearly a cultural feature and occurred at a level similar to the lowermost portion of the San Patrice horizon. However, it dates well before the San Patrice era. Radiocarbon samples from the bottom and middle of the feature yielded dates of 10,960 and 10,910–10,890 RCYBP, respectively. "Apparently there was a topographic high on that ridge where the early Paleoamericans were cooking something," Lopinot surmises. "They were obviously processing something, but it's hard to say what." He goes on to note, however, that every other soil sample from the feature has yielded one or two chenopod seeds. *Chenopodium*, or goosefoot, a wild plant that produces edible seeds, was one of the first plants to be domesticated in the New World. Its abundance in a Clovis or very early Gainey feature makes Lopinot wonder "if there was a much, much longer history of interaction between humans and goosefoot than previously thought."

Overview of Block I at Big Eddy during the 2005 season.

The future of Big Eddy

Despite Big Eddy's demonstrable significance, there's no telling when it will be possible for the MSU team to return to their dig. But even if the money for further excavating doesn't materialize soon, a great deal has already been learned from Big Eddy. And analyses of the data continue to yield important clues about Paleoamerican lifeways. Says Ray, "Because of the data we have from Big Eddy, we've clarified some of the basic issues of regional cultural history. . . . Big Eddy was the first time Gainey material was well dated. Also, no one had dated San Patrice before in clear context, and we have 8 to 10 good dates. We've also learned a lot about the chronology because we had the luxury of having three top geoarchaeology people working with us: Rolfe Mandel; Ed Hajic, Research Associate with the Illinois State Museum; and Art Bettis, with the University of Iowa Department of Geoscience."

They've also recovered Dalton and San Patrice material from deposits directly above fluted points, which appears to be the first time that's ever happened in a clear stratigraphic context. Moreover, Big Eddy has provided some fascinating clues about the cultural dynamics of the later Paleoamericans. "What we have in late-Paleoindian times is two different cultural groups, San Patrice and Dalton, that seem to be rendezvousing there for some purpose—one on the south end of the site, the other on the north end," explains Lopinot. "We've seen lots of exotic lithics from well south of the site, including material from Arkansas and Oklahoma. There was apparently some exchange going on, probably for both trade and social reasons."

Ray adds that San Patrice points aren't commonly found in Missouri except at Big Eddy. He notes that "we've found 15 or 16 points representing 500 years or so, pretty much from the middle to top of those late-Paleoindian deposits. I think they were there possibly year-round at times. Certainly Dalton was."

Given findings like these, it's a shame that work has ground to a halt at Big Eddy and in the surrounding area, which also appears to be archaeologically rich. "We conducted a geoarchaeological survey of the Sac River from Stockton Reservoir to the tailwaters of Truman Reservoir, 49 kilometers downstream, and mapped deposits and looked at all the cutbanks," reports Lopinot, "and we found a hell of a lot of early deposits. We recorded 22 late Paleo sites alone, and those only in small cutbank windows. Most of the banks are covered by vegetation.

"I think this pretty much proves that the area, the Big Eddy site especially, was well utilized very early on," he continues. "We certainly have the potential to locate early deposits that might be more convincing. It's just a matter of finding the money." MT

–Floyd Largent

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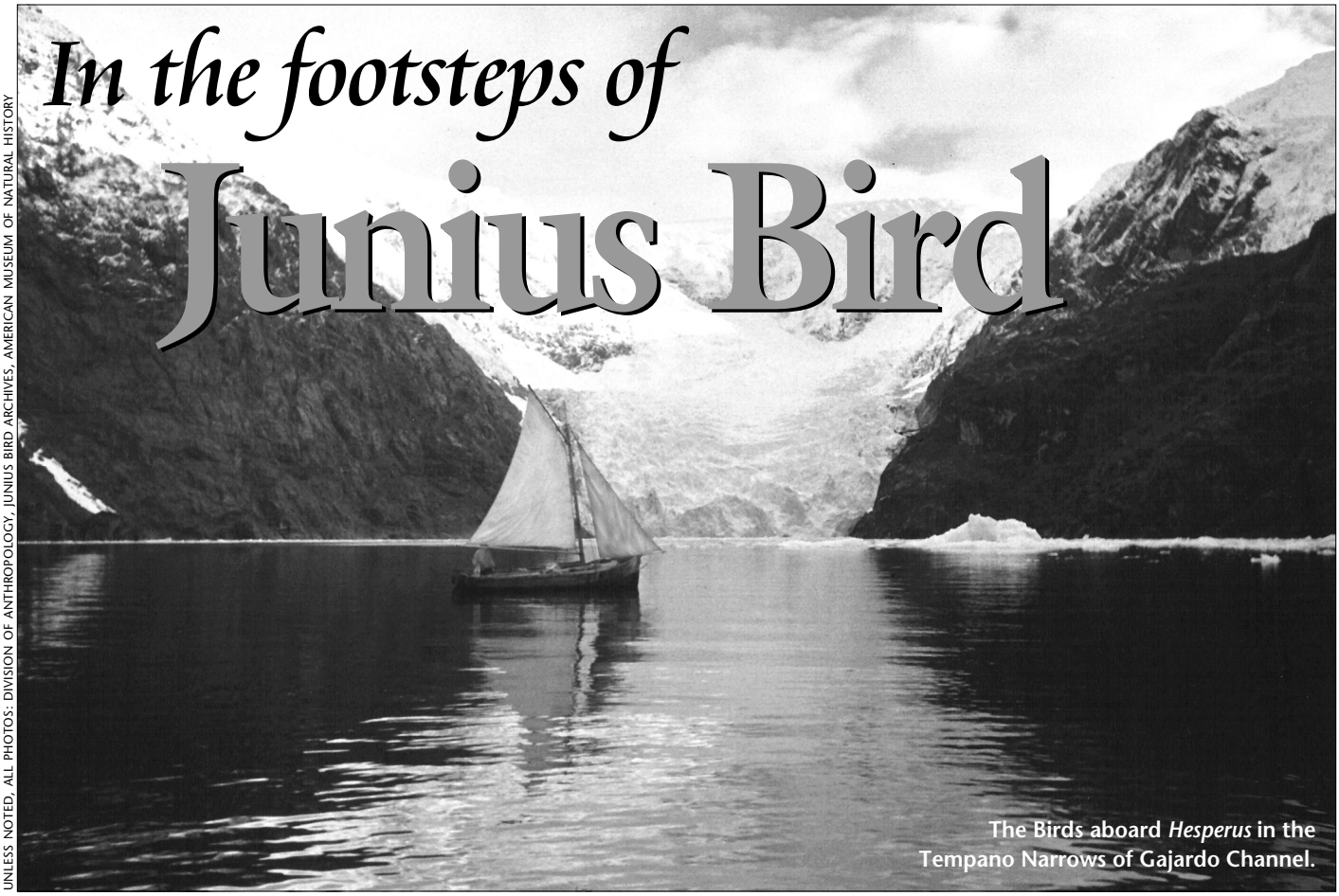
In the footsteps of Junius Bird



UNLESS NOTED, ALL PHOTOS: DIVISION OF ANTHROPOLOGY, JUNIUS BIRD ARCHIVES, AMERICAN MUSEUM OF NATURAL HISTORY

The Birds aboard *Hesperus* in the Tempano Narrows of Gajardo Channel.

Part II: Bird's South American Research

JUNIUS BIRD, the young and energetic research assistant with the American Museum of Natural History in New York City, set out for South America in the 1930s "with the conviction that the prehistoric record was an important part of the story of the human occupation of the Americas" (Bird, *Travels and Archaeology in South Chile*).

When he returned with the proof of his convictions, his findings shook the foundations of emerging early-man research in the Americas. Bird was the first to prove conclusively that humans and extinct Pleistocene mammals coexisted some 13,000 calendar years ago on the windswept plains of Patagonia, an environment that later pollen analysis determined was cold and dry. Later radiocarbon dating placed his finds on a timeline consistent with comparable Paleoamerican finds in North America—raising questions about the timing of human entry into the New World and spurring an academic debate that has lasted for more than half a century.

Although Bird died in 1982, his collections at the American Museum and in Chile are about to undergo intensive study, perhaps the most detailed since they were unearthed, and may produce even more surprises for the archaeological community.

Tom Amorosi, a cultural resource consultant and Research Associate at the Museum, is forming an international team of scientists to intensely study those collections with a fresh view, and state-of-the-art technology and methods, in an effort to tease out more information about the relationship between early man and his environment in South America. Dr. Amorosi also hopes to test some existing archaeological assumptions based on Bird's original research, as well as to refine baseline data that Bird collected. That investigation will be discussed in more detail in the third part of this series.

First, a look at the highlights of Bird's work in South America as gleaned primarily from *Travels and Archaeology in South Chile*.

Fell's Cave

For archaeologists interested in early man research, the most famous of Bird's South American sites is a complex of closely related caves—Fell's, Pali Aike, Cerro Sota, Cañadon Leona, and Mylodon Cave—near the Straits of Magellan in southern Patagonia. Fell's Cave is probably the most prominent, owing to the richness of its contents.

Fell's Cave, located some 50 km north of the Straits of Magellan, is properly considered a rockshelter. Bird lists its dimensions as 36 ft wide, 28 ft deep and 11 ft high. Considered to be a good campsite for early hunters, the shelter sits at the base of a cliff. From its edge, aboriginal hunters looked out

over a broad glacial outwash channel with a clear view of approaching game. Cultural finds in stratigraphy Bird charted confirm that it was an ideal location from the Pleistocene into historic times.

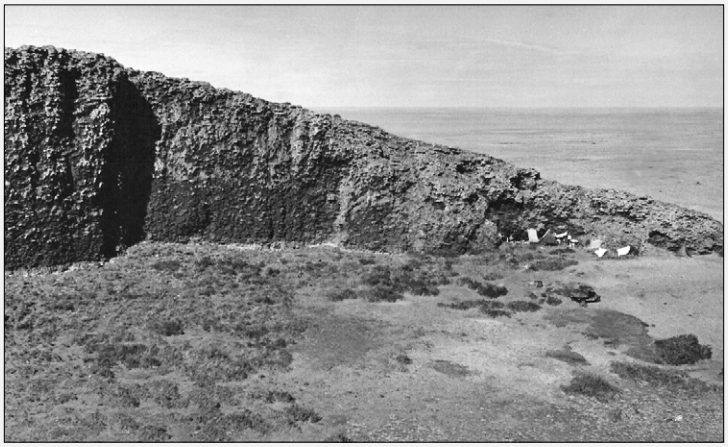
Arrow points and associated debitage on the cave floor first pulled Bird toward intense excavation there. But he didn't view it as a treasure trove. "The cave promised little more than pure exercise, for many tons of stones had piled up against the base of the cliff," he writes. But, Bird added in understatement, "As barrow after barrow load of dirt and broken bones rattled down the sifter, the little things which, added together, tell their story were picked out and laid aside."

Digging deeper, Bird laid aside a variety of artifacts—lithic debitage, stone knives, scrapers, and other tools of bone and stone. At the earliest level of occupation, well preserved under a cap of rockfall, Bird found the bones of extinct native horse (*Hippidion* sp.) and giant ground sloth (*Mylodon* sp.) as well as those of fox, guanaco, and birds in direct association with hearths. From the soft, clayey soil he also recovered several curious stemmed projectile points, "a type of stone spear point that is new to us," he admits.

Points with a South American flavor

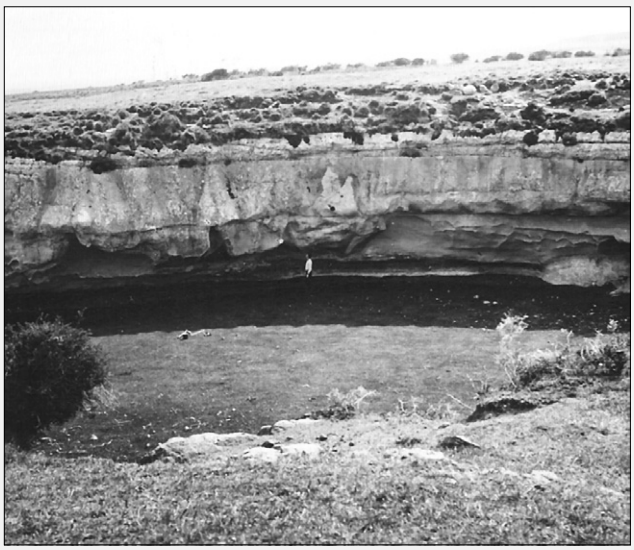
These so-called "fish tail" points are a key cultural marker in the collection. Bird bagged 15 in all from Fell's Cave, and one stem fragment from Pali Aike Cave. Argentine archaeologists

A galaxy of sites



Fell's Cave during the 1936–37 excavation ▶

◀ Pali Aike cave 1936–37 excavation



Peggy Bird at Mylodon Cave ▶

◀ Cañadon Leona shelter no. 5

Fell's Cave fauna

When Bird excavated cultural ▶ Layer V in 1936–37 and found the remains of *Onohippidium* (horse), the association of humans and late-Pleistocene/early-Holocene fauna hadn't yet been established. These photos prove the fact—and verify that the fauna in this case was fossil horse. (Sloth bone was also present.) In these photos Bird compares the scapulas (*near right*) and mandibles (*far right*) of *Onohippidium* and a modern horse (*Equus*) found near the cave site.

Detail of ground sloth and ▶ horse remains found at the cave mouth, Layer 5.

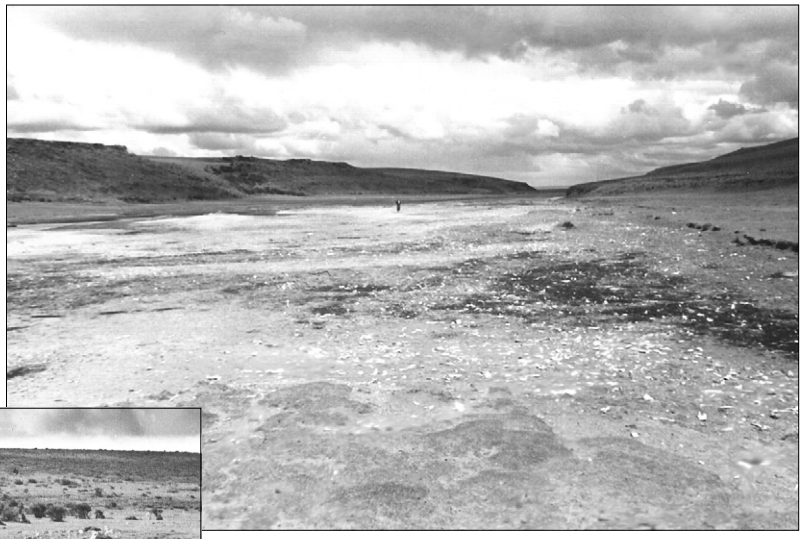
◀ Pedestal *Onohippidium* and ground sloth (*Mylodon* sp.) remains found in Layer V in 1936–37.

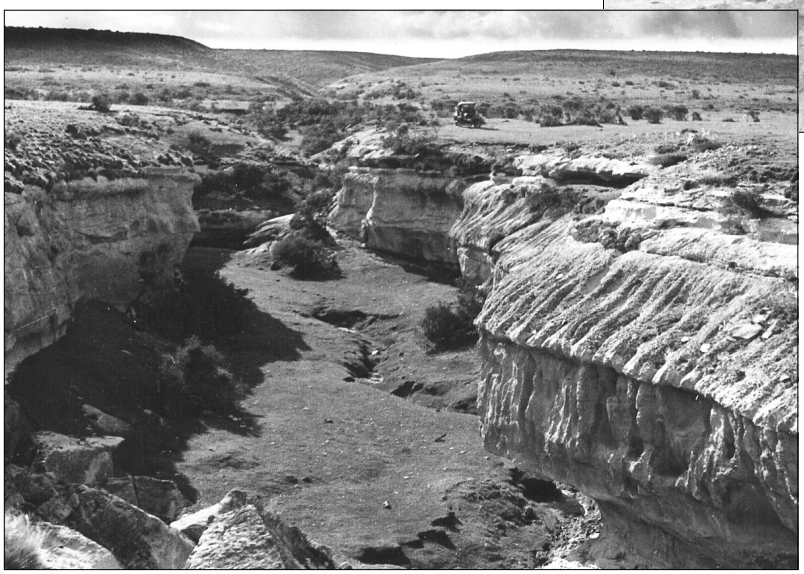
who are the most familiar with these points (**MT 21-3**, "Paleoamericans in Patagonia") describe them as generally smaller than North American Clovis points. They are also differently formed, with very pronounced stems that sweep slightly outward like a fish tail.

Early South Americans made them from large lithic flakes, rather than from preform blanks favored for Clovis-point manufacture. Clovis points generally show severe overall flaking. Fish-tail-point makers, on the other hand, formed an edge on a flake by marginal retouching. Occasionally these points have fluted bases, which some archaeologists interpret as a cultural link to Clovis points and the people who made them.

Supporting the purported relatedness is difficult, however, because sites yielding Clovis and fish-tail points, although separated by many thousands of miles, are remarkably similar in age.

Bird was cautiously optimistic about his finds and quite conservative with his age estimates for the oldest part of the site. Since radiocarbon dating was not available at the time, he used various lines of reasoning, including geological shoreline changes and estimates of rates of refuse deposition, to conclude that the earliest occupation of Fell's Cave was about 6,000 years ago. But three radiocarbon samples taken from the deepest level in the 1960s, registering dates of 10,800 ± 180 RCYBP on bone, and 10,720 ± 300 and 11,000 ± 170 RCYBP on charcoal, solidified the antiquity of early man in southern South America.





▲ Rio Chico river basin, North Arye Station. Wind has scoured the sand from the dry bed, leaving rocks exposed.

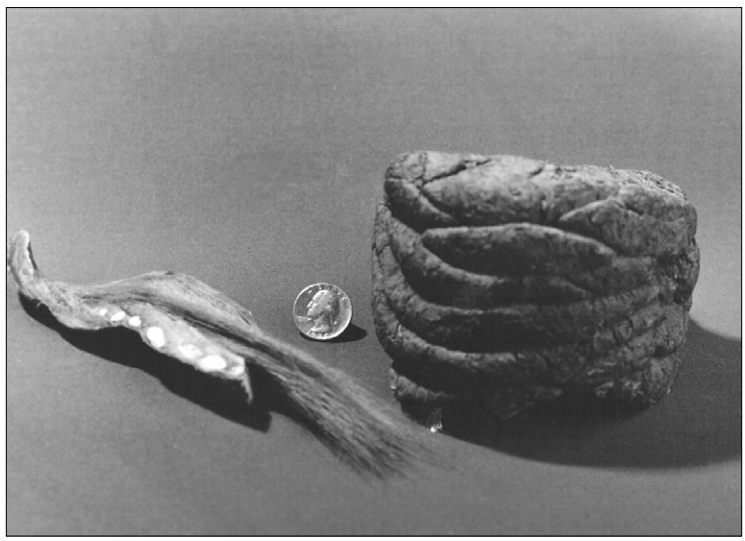
◄ Cañadon Leona canyon, where the site is located.

Fish-tail points were not the only artifacts Bird found during his excavations at Fell's Cave. From its deepest layers, he also extracted circular rubbing stones and assorted stone scrapers. Fell's Cave also yielded, in close proximity to extinct fauna, discoidal stones whose use has never been determined. Bird collected a variety of bone tools as well, primarily flaking tools.

Ancient faunal remains too old to be true

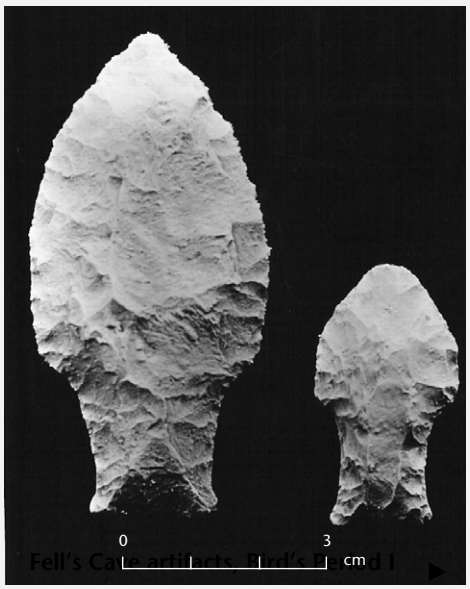
Bird was also excited, and more than a little disturbed, by faunal remains he was finding at the lower depths, particularly the native horse. He writes that "the domestic horse did not exist in the Americas before the Spanish came, and if these bones should prove to belong to an animal introduced by Europeans, all our conclusions on our previous work were wrong." Although he was convinced that 400 years "was all too short a time to account for all the material we had uncovered," nonetheless he admits that "those horse bones gave us momentarily something of a shock." It was common knowledge that the ancient horse was known to exist in South America in "times long past," Bird says, "but as far as I know no one had proved that it still existed when even the earliest people lived here." Later examination showed that the ancient American native horse, *Parahipparion saldiasi,* was indeed hunted and eaten by the early occupants of Fell's Cave.

Excavated material held other surprises, too. Examining carnivore remains from Fell's Cave, Juliet Clutton-Brock identified domestic dog (*Canis familiaris*) at the lowest level. "No member of the genus *Canis* is indigenous to the Patagonian subregion, so the implication from its presence in the animal remains from Fell's cave is that the first human settlers brought with them the domestic dog," she concludes. Although her conclusion is the prevailing working assumption today, Amorosi and Argentine paleontologist and carnivore expert Francisco J. Prevosti intend to challenge it: In late 2007, they examined tooth material earlier studied by

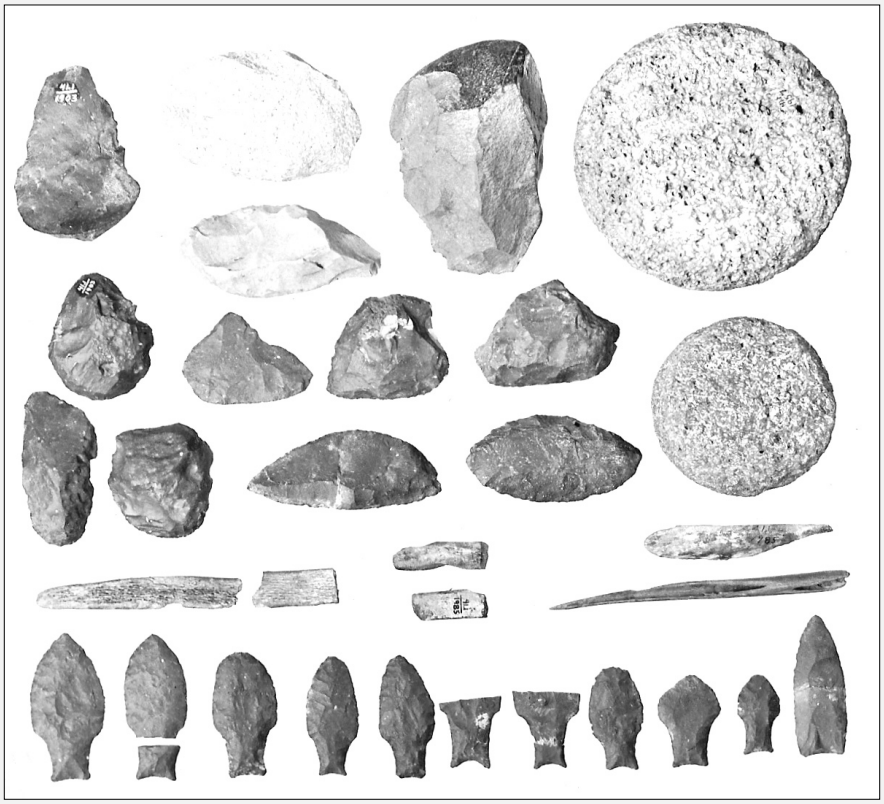


Ground sloth skin and dung from Mylodon Cave.

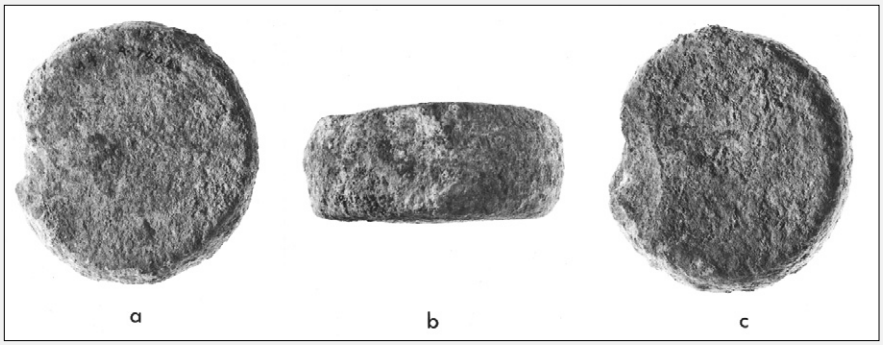
The artifacts



◀ These are the actual "type" specimens that defined the Fell's or Fishtail projectile-point type. They are 2 of the 16 points Bird recovered from Fell's Cave.



Fell's Cave artifacts of Bird's Period I, ▶ lithic (projectile points, endscrapers, sidescrapers, a chopper, and discoids) and bone (awls and tools for flaking stone tools)



◀ Fell's Cave discoidal grinding stone

Clutton-Brock and concluded the tooth morphology of the specimens from the lowest cave level is more akin to fox than to domestic dog. A report on their findings is in preparation.

Pali Aike Cave

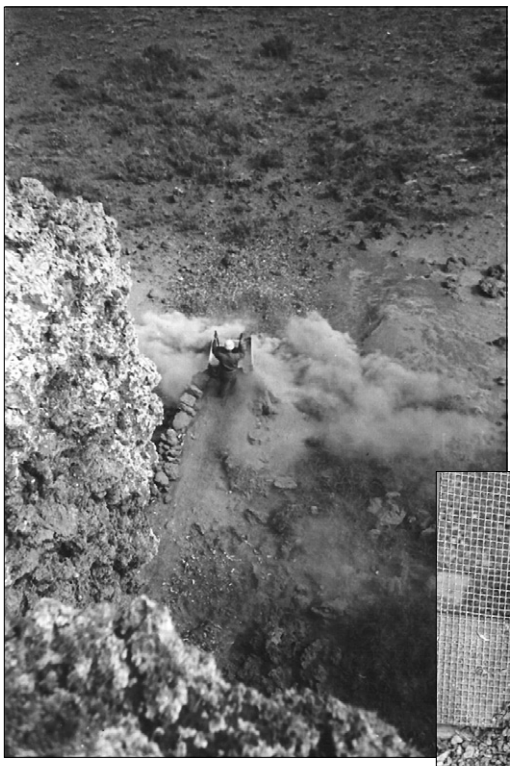
Pali Aike Cave, 26 km east of Fell's cave, is of volcanic origin. It lies at the base of a lava hill in a spectacular lava field overlooking several small volcanoes. Quite appropriately, the cave on this fire-blasted landscape takes its name from an extinct Aonikenk Indian phrase meaning "place in which the devil lives." The last eruption there was about 7,500 years ago.

Although the cave is sheltered from prevailing winds, it lacks a nearby source of water. Bird describes the cave as having a floor 46 ft long and about 20 ft wide. The ceiling tapers from 13½ ft at the entrance to 6 ft at the rear. At its lowest levels, the cave yielded stone and bone tools, mixed with the broken bones of an extinct horse and giant ground sloth. Other animal remains included guanaco, fox, and birds such as the rhea. One stemmed fish-tail fluted point, similar to those found at Fell's Cave, also surfaced.

Based in part on projected rates of refuse deposition, Bird estimated the cave's age at about 7,500 years old. Subsequent

radiocarbon dates taken from a bulk sample of sloth, horse, and guanaco bones put the age at about 8,600 years old—a date that some archaeologists believe may have been skewed by a contaminated sample and is therefore too young.

Bird also found what he calls a "cache" of giant sloth bones covered with stones. The closest artifacts were a stone knife, debitage, and a scraper. Bird speculates that the sloth either may have died during a nearby volcanic eruption and been covered by stones thrown into the cave by the eruption, or may have been killed by humans, who then buried it under rocks to protect the carcass from predators. Bird leaned toward the latter theory on observing that some of the bone had been burned.



◀ **Bird at Pali Aike using his screen in the 1936–37 field season, at a time when few archaeologists were using sieves or screen stations. Bird may have been one of the first scientists to consider using this simple and now rather obvious recovery technique.**

▼ **Amorosi comments on this historical photograph whose point "is not so immediately obvious. This photograph is demonstrating the use of what might be ¼-inch wire mesh at Fell's Cave during the 1969–70 field season. The point here is that most of the archaeological world is not yet using sieve stations or screens to recover cultural materials. . . . Bird was already implementing sieving or screening stations since his 1930s field work."**

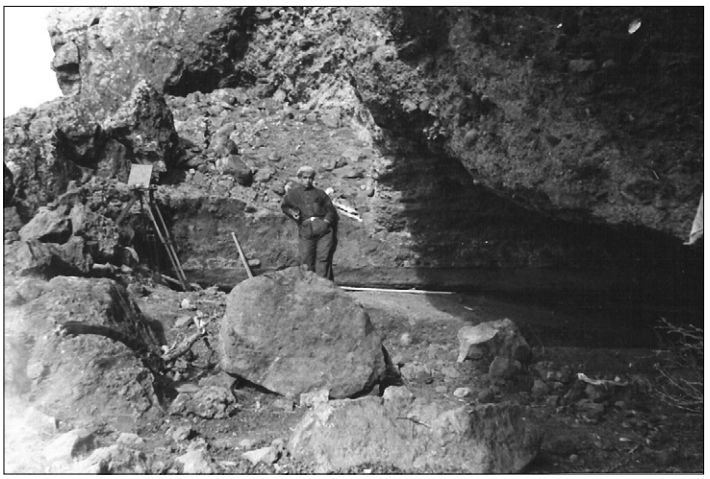
The cremated remains of three humans also were discovered buried at a deep level in the cave. Their age is undetermined, however, because they have not been independently radiocarbon-dated. (Human remains found at nearby Cerro Sota Cave share the same dating problems as those from Pali Aike.)

Although Bird's practices were primitive when measured by today's standards of methods and technology, archaeologist Vera Markgraf insists that the work he did on those caves has not lost its significance. Having examined Bird's material 50 years later to develop an 11,000-year paleoclimate record for the region, Dr. Markgraf says that Bird's research, because of the richness of the material he collected, "still represents one of the most important sequences of man in southernmost South America."

Building on Bird's foundation

Bird's findings in 1934 were an unqualified watershed event. Since then, fish-tail points have been found at sites throughout Central and South America, including Ecuador, Panama, Costa Rica, and Argentina. Chilean and Argentine archaeologists have excavated a considerable number of Pleistocene sites in lower South America since Bird first explored there, and they came equipped with new methods and a depth of understanding from half a century of discoveries that Bird couldn't possibly have envisioned. Quite understandably, Ruth Gruhn is quick to caution, many of Bird's findings have been eclipsed. "The dirt has really flown down there," she notes. "Researchers have to be acutely aware of that" when reexamining Bird's collections.

The CSFA volume *Where the South Winds Blow* details some of the sites recently unearthed. Adovasio and other researchers have suggested that the discovery of sites older than Fell's Cave, such as Monte Verde at about 14,000 calendar years old, point to several migrations into the New World, possibly through different points of entry. Continuing to support the theory that Clovis people spread from North America to South America has been made increasingly difficult by recent reexamination of the Clovis time range, which determined that the Clovis culture appeared, flourished, and came to an abrupt end, all in a period as brief as 13,125–12,925 CALYBP (**MT 22-3, -4,** "Clovis Dethroned: A New Perspective on the First Americans"). But multiple migrations could easily account for the rapid diffusion of technology—the idea of a fluted point—rather than a rapid surge



Pedro Ojeda, Bird's assistant, at Fell's Cave

Bird's Model T Ford at Pali Aike, a 2-oxpower truck.

of Clovis people from the north to the south.

Among Bird's achievements in South America, Fell's Cave attracts the most attention and therefore overshadows his other considerable accomplishments—witness the staggering amounts of material he collected during expeditions. He is credited with documenting a 5-period cultural sequence, spanning almost continuous occupation from the late Pleistocene until prehistoric times, of the southernmost extremity of the New World. His work also led researchers to find stratigraphic evidence of distinct climate change and new artifact inventories, most notably a leaf-shaped point form that came to be known as the Ayampitin point. The breadth of his finds extends to short triangular-bladed and stemmed dart points, small arrow points, and limited traces of pottery linking this area to the Ona tribe.

An archaeologist with an omnivorous appetite

He also went on to explore maritime traditions of the area, eventually devoting considerable time and effort in northern Chile. In Peru he took a specific interest in textiles because he believed they contained "a surprising range of information" that couldn't be obtained by studying other kinds of common artifacts. His contribution to textile studies is legendary, as are his collections housed at the American Museum of Natural History. The New York Times in 1996, reporting on an exhibit at the museum on textiles called "Art for Science' Sake," considered it a monument to Bird's obsession with textile crafts.

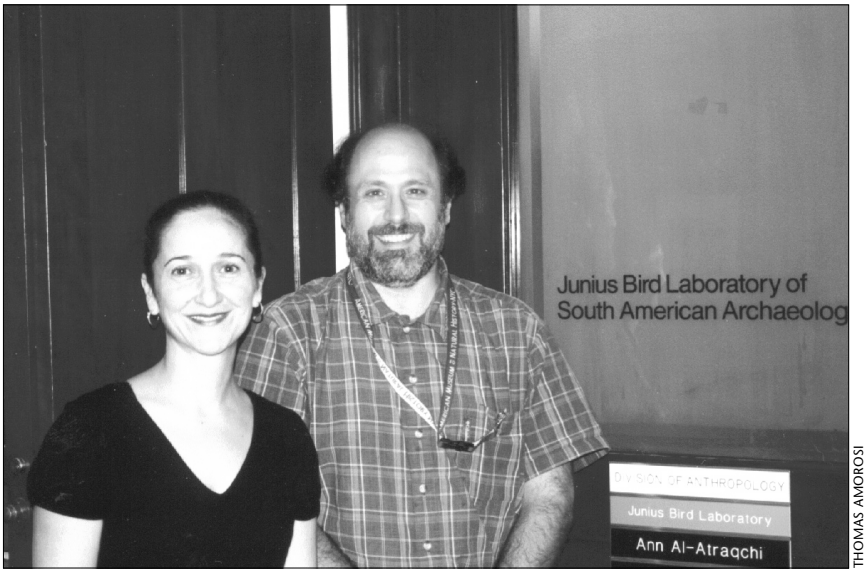
His research, for example, led to a definition of the change-over from twining to weaving techniques on the Peruvian coast; he also explored the influences of the loom on stepping up cloth production in Peru, and broadened extensively our knowledge of intricate textile design and weaving techniques of pre-Columbian craftsmen. His work has also inspired researchers to focus more keenly on recovering textiles and other perishable artifacts, to help broaden interpretations of how late-Pleistocene humans lived and interacted with their environment.

Bird carried the same interest in craftsmen—in their techniques, possessions, and quality of life—into the field of pre-Columbian metallurgy as well. Perhaps best known is his paper on the "Copper Man," a prehistoric miner killed in a cave-in of a mine shaft in the Atacama Desert in northern Chile. Bird paints almost an on-the-scene view of a miner armed with wood-hafted stone hammers and llama-skin ore-carrying bags. The range of Bird's research is astounding, augmented by trips to South American sites he initially explored and periodically revisited. The extensive bibliography of his writings is singularly impressive.

The entire range of Bird's collection, from artifacts through floral and faunal remains, textiles, and human remains, has provided researchers with a treasure trove of possibilities to explore. Amorosi and his colleagues will plumb its depths in their mission to expand our understanding of early man in South America.

We will examine the Amorosi's plans for review of Bird's collections in Part III of this series.

–George Wisner



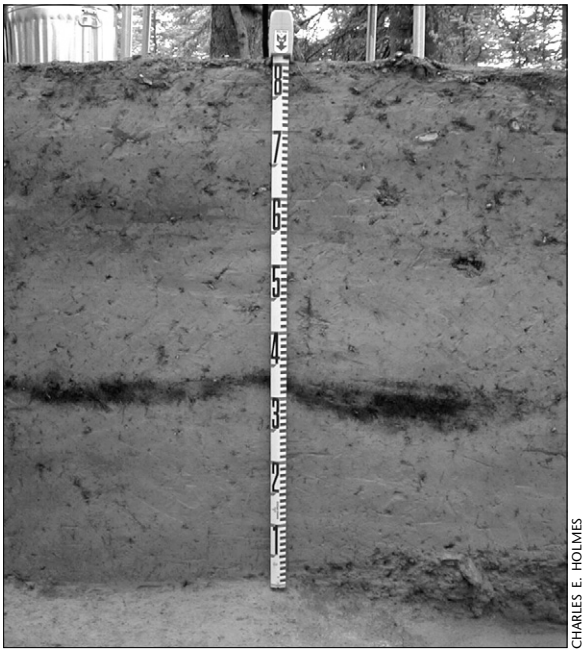
THOMAS AMOROSI

Sumru Aricanli, Senior Scientific Assistant at the Division of Anthropology, AMNH, with Tom Amorosi.

Clues from the Ashes

A Closer Look at Swan Point

BARBARA CRASS



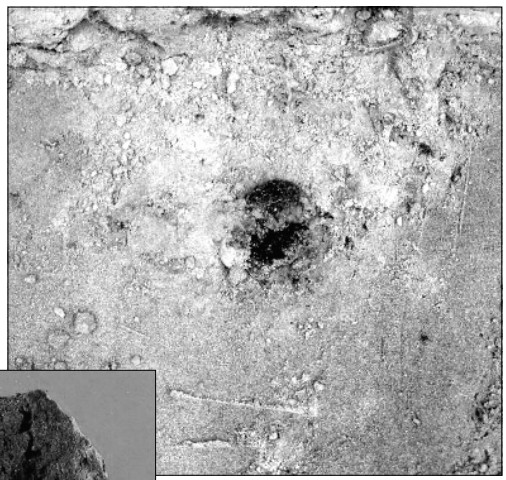
CHARLES E. HOLMES

▲ Profile of the hearth in CZ-3, dating to 10,570 RCYBP, that produced small animal bones, fish remains, bird bones, and (so far) tens of thousands of gastroliths.

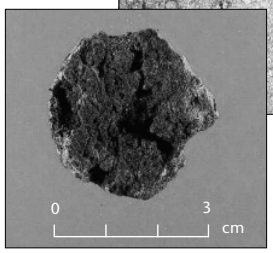
◀ A corner of the hearth area in CZ-44. Visible are lithics, ivory, and large pieces of burnt bone residue.

AT APPROXIMATELY 14,000 years old, the Swan Point site in Alaska's Tanana Valley is easily one of the oldest human occupation sites in North America. Together with its sister sites Broken Mammoth and Mead, all of which are clustered north of the confluence of the Tanana River and Shaw Creek, Swan Point offers an intriguing window into an era when the First Americans were still adapting to the New World. Back then, no oceanic gap separated Siberia from Alaska; a vast periglacial landscape stretched unbroken from East Asia into what is now Canada. The entirety of it was populated by kindred peoples—some of whom forged their way east onto a new continent, some of whom did not.

For more than a decade, Alaskan archaeologist Charles E. Holmes and his colleagues have been teasing secrets from the soil beneath the boreal forest at Swan Point. We first took a look at their findings in 2005 (**MT 20-1,** "Early Americans in Eastern Beringia: Pre-Clovis Traces at Swan Point, Alaska")—well before the revelation by Waters and Stafford that Clovis definitely wasn't the first culture to occupy the Americas (**MT 22-3, -4,** "Clovis Dethroned: A New Perspective on the First Americans"). In the meantime, the site continues to relinquish data about the distant past, thanks in part to new technologies and techniques that weren't even thought of a few years ago. Some of these data are quite literally rising from the ashes—those of ancient campfires, left behind by some of the first people to step onto the continent.



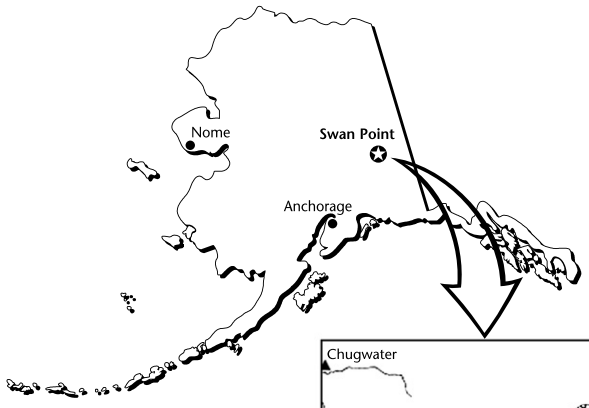
BOTH: BARBARA CRASS

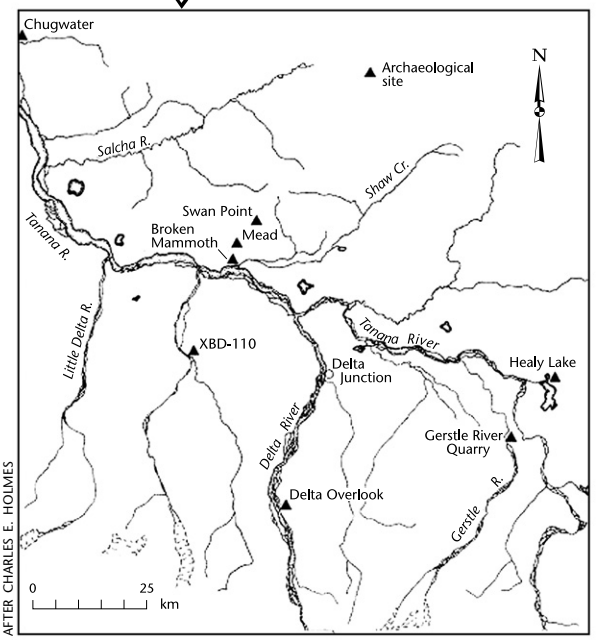


A concentration of burnt bone residue in situ in CZ-4; it was later removed and analyzed. A piece of burnt residue (*inset*) removed from Swan Point's CZ-4 is ready to be ground up and analyzed at Oshkosh.

Confirmation, in spades

Since last we visited Swan Point, an additional 17 m^2 of the site has been excavated. Four additional hearths have been identified, one in the oldest and deepest level, Cultural Zone 4 (CZ-4). One of the hearths in overlying CZ-3 has yielded a charcoal date of 10,570 RCYBP, just a bit younger than Clovis (11,050–10,800 RCYBP, per Waters and Stafford). That hearth





AFTER CHARLES E. HOLMES

also contained small mammal bones, fish remains (the first found at the site), numerous fragmented bird bones, and thousands of gastroliths—small stones swallowed by birds to aid digestion.

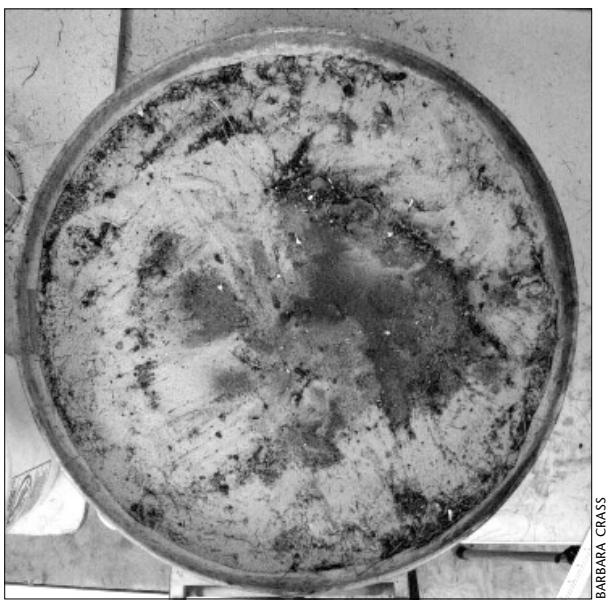
The copious organic materials from this CZ-4 hearth yielded three radiocarbon dates (from carbonized fatty residues, charcoal, and a mammoth molar), whose calibrated dates range from 13,800 to 14,200 CALYBP. Lithics were also abundant. "We recovered hundreds of microblades, a dozen microblade cores, and additional burins with spall refits," reports Dr. Holmes. "We can now demonstrate the complete microblade production sequence from biface blanks, initial ridge spall platform preparation, frontal spall removal, subsequent platform rejuvenation or 'ski' spall removal, down to the final exhausted core. The production technique is unmistakably Dyuktai/Yubetsu." Dyuktai/Yubetsu is a widespread lithic technology that was first identified at early sites in Japan and later in Siberia.

Why is this important? Because it solidly ties together ancient peoples living in Asia with their contemporaries in Alaska and Canada. Back when Swan Point was initially occupied, Eurasia and North America were all one big landmass, connected by the relatively narrow (i.e., 1,000-mile-wide) Bering Land Bridge. The Land Bridge and adjacent territories formed what archaeologists now call Beringia. As Holmes makes clear, "Recent research at Swan Point has verified the strong cultural connection between western and eastern Beringia through identical lithic technologies—that is, the Dyuktai/Yubetsu microblade production technique with associated burins. Similar large animal remains, for example, red deer, or elk, bison, horse, and mammoth are recorded in [both] Siberian sites and at Swan Point." In other words, as we've long suspected, at least some of the people who colonized the New World crossed over on the Bering Land Bridge from Asia.

While no sites demonstrably older than Swan Point have been identified in the area, Holmes is confident they exist. "It continues to frustrate me that another site with a Swan Point Dyuktai component hasn't turned up," he admits. "I say it's just a matter of time before one is discovered, possibly a site older than Swan Point. It wouldn't surprise me to hear of sites in the range of 15,000 to 16,000 CALYBP turning up. If the dating proposed for the Yana RHS site holds up, then even older sites are possible." Yana, an extensive scatter of lithics and bone tools located well above the Arctic Circle in Siberia, has been dated to 25,000–28,000 RCYBP. It's certainly one of the earliest human occupations in Siberia, and may represent the first serious human foray into Beringia (**MT 19-3, 4; MT 20-1,** "Yana River, Siberia: Implications for the Peopling of the Americas").

Out of the ashes

Hearths have always offered a wealth of information to the careful archaeologist, so it's no surprise that the CZ-4 campfires at Swan Point have recently given up great treasures. Now, these particular treasures aren't something your average layman would value; they consist of the carbonized fats saturating the hearth fill. This is more than just cooking grease, though: the residues appear to come from bone-fueled campfires, the fuel being the remains of animals like elk, horse, bison, and mammoth. This particular avenue of research has been pursued primarily by archaeologist Barbara Crass, who's been working at Swan Point in a variety of capacities since 1993. Assisted by a team of



BARBARA CRASS

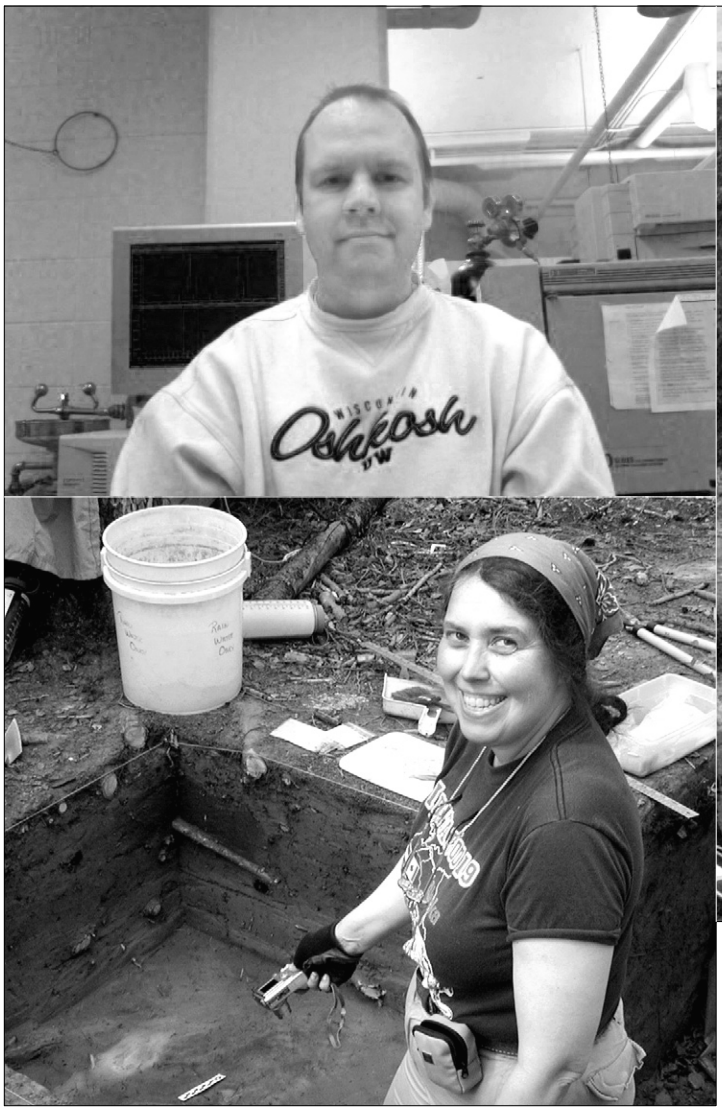
Burnt bone residue in situ from an experimental burn in a controlled laboratory set up (clean sand packed in a galvanized tub, with thermocouples buried 2 cm below the surface to measure the temperature of burning).

undergraduate researchers, Dr. Crass, archaeologist Jeffrey Behm, and chemist Brant Kedrowski (all of the University of Wisconsin–Oshkosh) have recovered a surprising amount of data from the residues in the CZ-4 hearths.

The bones burned by the ancient occupants of Swan Point would by necessity have been fresh; as Crass puts it, "What's fueling the fire is the fat in the bones. Heavily weathered, broken bones would have little fat due to decomposition and insect infestation." But did those fresh bones come from prey actually hunted by the people living at Swan Point, or were they simply collecting bones from other sources, such as animal kills? Probably both, Crass says. "I believe bones from prey animals not needed for other uses were tossed into the fire—you wouldn't want them cluttering up camp any more than hunters do today. After all, there were short-faced bears and other nasty carnivores around. However, I doubt that prey animal bones alone would have provided sufficient fuel for prolonged fire use. So depending on how long fires were kept burning, they would almost assuredly have needed additional bones, which I assume they gathered from previous kill sites." Dry bones or wood are needed to start such a fire, but fresh, "green" bones, with their high fat and grease content, can be added once the fire's been established. "Given a choice," Crass says, "they would have gathered fresher, fatter bones for fuel, similar to our preference for gathering solid dead wood rather than rotten wood."

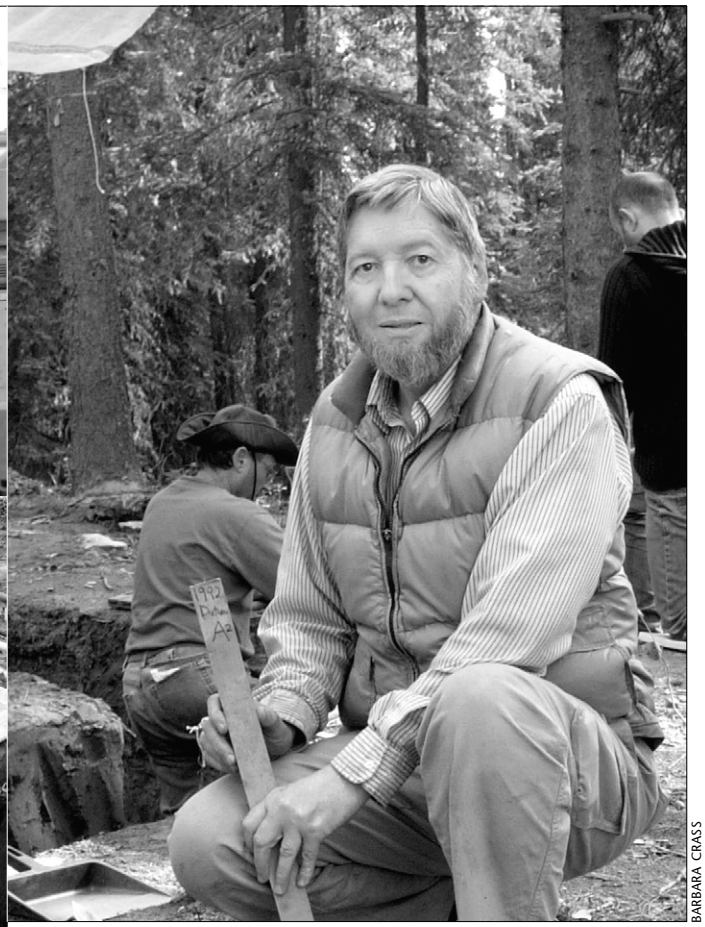
The oily remains of such fires might seem all but useless at first glance—but they're not when considered from a chemical perspective. As experimental chemist Brant Kedrowski recalls, "Barbara Crass and Jeffrey Behm approached me one day with an analysis problem that sounded interesting. They described having greasy residues of burnt material from Swan Point, and wondered if it could be analyzed chemically. I had some experience with gas chromatography–mass spectrometry, and thought it might be a useful technique for analyzing these materials. It has turned out to be a very fruitful collaboration."

Students in both fields played an important role in that collaboration. "Undergraduate researchers were involved in every aspect of this project, and are listed as coauthors on our recent publications," Dr. Kedrowski points out. "Barbara mentored students in field school trips to Swan Point to acquire the samples that were used. Barbara and Jeff got students involved in the experimental burning of bones that were used as controls



BRANT KEDROWSKI

CHARLES E. HOLMES



BARBARA CRASS

The principals of the Swan Point project (*cw from upper left*): Kedrowski in the lab with the tools of his trade, a gas chromatograph and mass spectrometer; Holmes at Swan Point during the 2005 field season; Crass at Swan Point during the 2005 field season.

in our analyses, while I worked extensively with students on the chemistry portion of the project, preparing and analyzing samples to determine their lipid profiles. I think that the student involvement and learning that took place in the project were as significant as the data and results we obtained."

New light on old bones

The residues from the CZ-4 hearths at Swan Point consisted of organic fats, or lipids, intermixed with inorganic materials; one of Kedrowski's big challenges was extracting the lipid portions of the samples before they could be analyzed. Once that was done, it was fairly straightforward to determine the identities and concentrations of fats in the samples. "From my perspective, the most challenging aspect of this project has been interpreting the results of our analyses. The interpretation of archaeological lipid profiles is tricky, because the fats are almost always degraded from their original states. The challenge lies in trying to look at the fats as they exist today, and extrapolating back to determine what they might have looked like many years ago to determine their origin."

But the analysis of lipids from Swan Point is even more complex because they're hearth lipids. "Lipids from archaeological hearths suffer additional degradation due to the intense heat they face," Kedrowski explains. "The chemical analysis of hearth lipids is a new area of study, and we're entering some unexplored territory with this project. Our approach has been to learn as much as possible from the existing work on potsherds, and add to it by generating and analyzing experimental hearth lipids." In other words, they've been creating their own experimental bone fires, and closely studying the results.

BARBARA CRASS

An experimental outdoor burn in Crass's yard in Wisconsin. Megan Glazewski (currently a graduate student in Michigan) is taking the internal temperature of the fire.

What they've discovered is that the Swan Point hearth lipids are consistent with those of both large ruminants and monogastric (one-stomached) herbivores. While no determination can yet be made as to genus or species, representative examples of the ruminant tribe include bison, deer, elk, moose, and caribou. Monogastric herbivores living in Alaska at the time included horses and mammoths.

Kedrowski is optimistic that as they continue to learn more about the degradation processes that hearth lipids experience, they'll get better at narrowing the scope of possible sources—possibly down to genus or species level. "There's a lot of work that still needs to be done," he readily admits. "We're considering building a database of lipid degradation profiles from a variety of species to assist in our analyses, which will help. We're also looking at lipids from both bone fires and dung fires, since these would have been good sources of fuel at the Swan Point site. Finally, we're exploring some new instrumental techniques that could provide us with more detailed information on the chemical composition of the lipids we isolate. In the long term, we're hopeful that what we learn about hearth analysis at Swan Point will be applicable to other sites, and serve to advance the field of archaeochemistry."

The work in the Tanana Valley continues along several fronts. "Barbara Crass, Ben Potter, and I will resume testing and excavations at the Mead Site in 2009 with the goal of a multi-year project," Holmes promises. "The possibility exists that Mead may possess archaeological components as old as or older than what has been found at Swan Point. We intend to test this possibility."

Meanwhile, Crass, Kedrowski, and their colleagues are forging ahead in their ground-breaking work on hearth lipids, performing experimental burns and refining their techniques so they can identify the residues at a more specific level. While some might consider their discoveries little more than an interesting sidebar to more conventional methods, their research may have the potential to set archaeological site interpretation on its ear . . . much as the advent of radiocarbon dating did back in the 1950s and 1960s. Imagine testing a hearth sample from a site where no physical elements besides stone tools remain, and being able to determine exactly what prey animals the people there were hunting—even though not a hide, hair, or bone remains!

A few years ago, that might have been considered impossible. But change is inevitable, especially in archaeology. It may seem exotic now, but a few years hence, archaeochemistry might become what trowels, radiocarbon dating, and laser transits are today: just one more handy tool in the modern archaeologist's kit.

–Floyd Largent

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