



# MAMMOTH TRUMPET

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Center for the Study of the First Americans  
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Cairn-Marked Drive Lane

Jump Point

## How bison hunters planned their kills

Paleoamerican hunters relied on their knowledge of the terrain and disciplined teamwork to slaughter bison. In this jump in Montana, one of many studied by anthropologists Kristen Carlson and Leland Bement, a drive lane lined with stone cairns channeled stampeded bison to a jump point. Animals killed and crippled by the fall were then easily butchered. For our story on evidence of communal hunting techniques used by hunter-gatherers, see [page 17](#).

Photo by Kristen Carlson

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## The Grenfell Bone Rod

### ✓ Testing the Record

**G**REAT DISCOVERIES are sometimes the children of happy accidents—take penicillin, for example, derived from a mold that was serendipitously found to be a potent antibiotic, or Post-Its, the self-adhesive note paper whose refusal to stick permanently to a surface was transformed by a canny marketing staff from a flaw into a sales gimmick. The Grenfell bone rod, which was found by accident in 1883, falls in this category according to John Ives, Professor of Northern Plains Archaeology at the University of Alberta and Director of the Institute of Prairie Archaeology.

An isolated find without associated artifacts, the bone rod puzzled archaeologists for many years over its obscure origins. Curators pronounced it a likely Clovis artifact made of proboscidean bonestock. Ives's team, by applying minimally invasive technology, disproved their conclusions and put to rest contending theories about the composition and age of this Paleoamerican artifact. In the process they demonstrated that scientists, with this analytic tool at their disposal, can learn new truths from artifacts in museums and avocational collections.

### A tantalizing find

The rod was discovered in 1883, at a time of unrest and social upheaval in western



Three views of the Grenfell bone rod (20.7 cm long). The arrow identifies a repaired transverse break.

J. W. IVES, PHOTOGRAPHED COURTESY OF THE CANADIAN MUSEUM OF HISTORY, HULL, QUEBEC

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*Masqueraders and pretenders have confused Plainview typology, Ruthann Knudson tells us as she sets the record straight in the conclusion of her series on the site.*

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Canada. The defining moment was the Riel Rebellion of 1885, or the Second Northwest Rebellion, when Métis people (the descendants of Scottish and French fur traders and First Nations women) rose up to declare their own government under Louis Riel, returned from exile in the U.S. after an earlier rebellion in Manitoba. The Métis people hunted bison in the northern Plains regions in the 1860s and 1870s. After the Canadian government suppressed the 1885 rebellion, the settlement era of ranching and farming began in earnest. Rare, according to Dr. Ives, are artifacts recovered before the Riel Rebellion.

Lieutenant Colonel P. G. B. Lake discovered the Grenfell bone rod while excavating a water hole in a dry slough in southeastern Saskatchewan at a depth of about 2.4 m below the surface. Its location lies within ground moraine south of the Qu'Appelle River.

Biome reconstructions reveal that southeastern Saskatchewan was deglaciated before 12,000 RCYBP (about 14,000 CALYBP) and that the paleo-environment of the Grenfell site was spruce forest or grassland. Human occupation would therefore have been possible at the time of the Clovis culture. Other Northern sites with proboscidean-human associations, such as Manis in Washington State (**MT 27-4**, "Reconsidering the Manis Mastodon") and Schaefer and Hebior in Wisconsin (**MT 13-2**, "Great Lakes people lived 2,000 years with glacier"), yield evidence for human activity close to the retreating Laurentide ice mass. Consequently the discovery raises the question, Was the Grenfell bone rod associated with fluted points found in western Canada, which might confirm the Clovis connection? Ives was attracted to the Grenfell bone rod because if it proved to be the handiwork of a Clovis toolmaker, it could enlarge our knowledge about the paleoenvironment of post-glacial western Canada.

### Groping in the dark

Roscoe Wilmeth in his 1968 paper in *American Antiquity* declares that the Grenfell bone rod is composed of fossilized bone. C. R. Harington and C. S. Churcher, two leading Quaternary

paleontologists, agreed that the bone-stock was from a megamammal, probably mammoth or mastodon, judging by its cortical thickness and lack of articular surfaces.

Wilmeth dated the bone rod to the early-Paleoindian era because Harington and Churcher judged its material was proboscidean long bone and because its morphology was similar to that of

bone rods found at Clovis sites and at the Lind Coulee site in Washington State, a Western Stemmed Tradition site. Over the years rods of bone, antler, and ivory have been found in Clovis assemblages (**MT 27-2**, "What it means to be Clovis: Bone tools, and summing up"), as well as in post-Clovis cultures. "They might better be considered," says Ives, "part of a Northeast Asian material culture sub-

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—Michael R. Waters, Director



strate that arrives in the Americas in an early time range and persists.”

Ives received “early, friendly advice” from Steve Holen, then anthropologist with the Denver Museum of Nature & Science, and his wife, Kathleen, and University of Wyoming anthropologist Marcel Kornfeld that a bison or camel tibia could also provide suitable bonestock. “We just wanted to find out what it was,” Ives remembers. “We didn’t suspect too much one way or the other, but in truth were hoping Harington and Churcher were in fact right.”

At the time of Wilmeth’s investigation, there was no technology for determining the age and material of a specimen without significantly damaging it. “This is critical when we’d like to know about the composition of an artifact,” says Ives, “but don’t wish to harm it through more intensive sampling.” Before joining the University of Alberta and launching the Institute of Prairie Archaeology he had worked for the government as a provincial archaeologist in Alberta and had also investigated collections from Utah. Repeatedly he felt handicapped for want of a method to extract more information from specimens with less invasive technologies. He believes that scientists are ethically obliged to preserve prehistoric artifacts for the simple reason that once lost they can’t be duplicated. “Analytical needs,” he insists, “must always be weighed against long-term conservation prospects.”

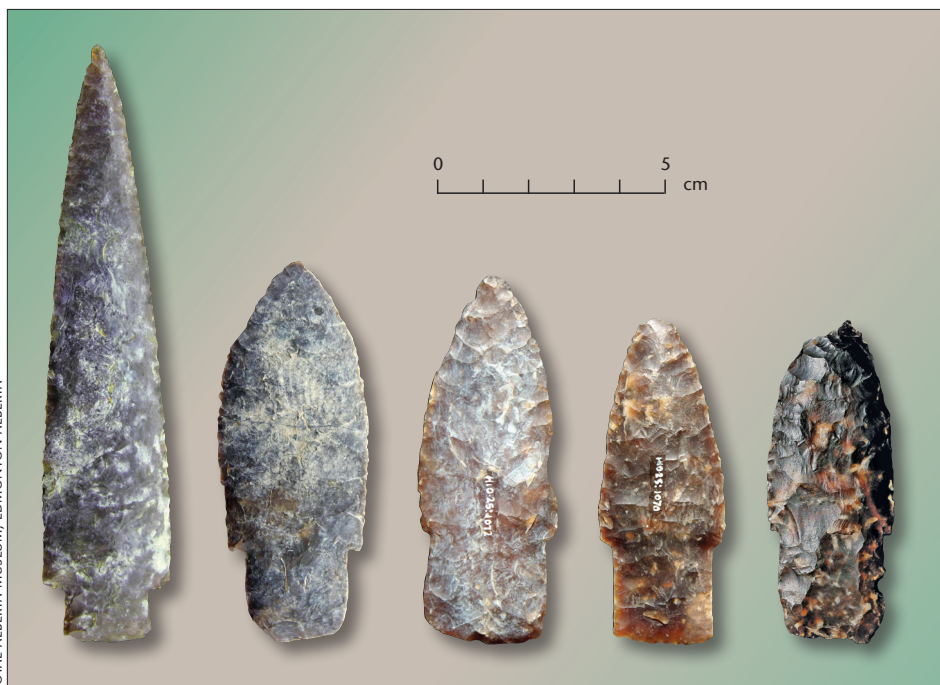
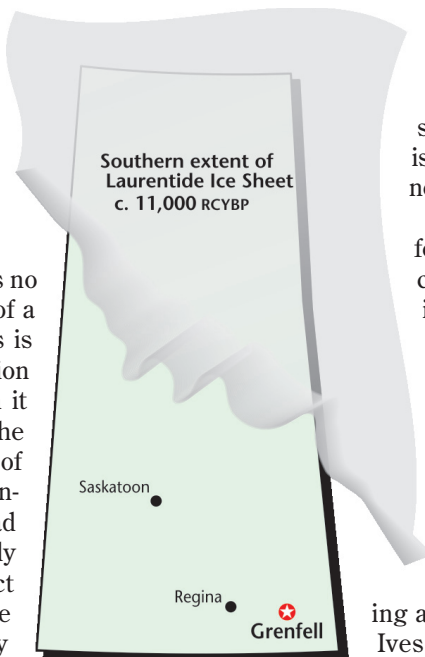
the source animal to the genus level. It distinguishes sheep from goats in “ovicaprid” bones, separates bones of sea mammals into genus-specific groups, and has even been used to determine the raw material in Viking combs. The beauty of ZooMS is that it requires only exquisitely small samples of a specimen and is therefore effectively noninvasive and non-destructive.

In preparing the Grenfell bone rod for ZooMS analysis Ives’s team encountered curation and conservation issues. “For example, we knew there had been some consolidant applied to it in its more than 100 years of curation,” Ives recalls. A transverse break in the rod about a third of the way from the blunt, hafted end had been repaired by conservators. This repaired break provided a point of access for abrading away the external surface and extracting a 1-mg sample of bone powder, which Ives sent to the bioarchaeology lab of Matthew Collins at the University of York

in Great Britain.

Collins analyzed the ancient protein sequence using ZooMS and determined that the genus signature was clearly bovid, not proboscidean. “This told us the raw material was bison,” Ives says. “Bison were a key component of the terminal Pleistocene and early Holocene fauna in western Canada; by early Holocene times they became the dominant herbivore, with large forms (*B. antiquus* and *B. occidentalis*) persisting into the earliest Middle Prehistoric period.” He’s confident that these megamammals yielded long bones with areas of cortex sufficiently thick and straight to construct the Grenfell bone rod. Moreover, he explains that “the ancient protein results are definitely consistent with Quaternary paleontological and zooarchaeological records for the region. ZooMS cannot be specific with regard to Bison chronospecies. Because a bison

**Cody Complex points from Saskatchewan and Alberta, all made from Knife River flint.**



J. W. IVES, PHOTOGRAPHED COURTESY OF THE ROYAL ALBERTA MUSEUM, EDMONTON ALBERTA

### Putting minimally invasive techniques to work

Ives’s colleague, Duane Froese, suggested they apply ZooMS, zooarchaeology by mass spectrometry, an analytical technology that quite recently appeared on the archaeological scene. By detecting characteristic traces of proteins in the electromagnetic spectrum of a bone or ivory specimen, it can identify

of this age would almost certainly reflect a southern genetic clade, we did not pursue further ancient DNA analysis.”

### Its age is a surprise

His team then sent 5 mg of internal bone powder to Fiona  
*continued on page 8*

# The Plainview Site

DRAWING COURTESY OF HISTORIC RESOURCES BRANCH,  
MANITOBA CULTURE HERITAGE AND TOURISM



## A Bison-Butchering Site Shrouded in Mystery, Part II

by Ruthann Knudson

**D**OESN'T EVERYONE KNOW what a "Plainview" point is? E. H. Sellards named the Plainview point in 1945 when he gave a presentation about the newly discovered and excavated Plainview site in Texas at a Geological Society for American meeting. He said that the points were of the "general Folsom-Yuma complex [i.e., Paleoindian], but were a distinct form." Unfortunately, despite everyone's knowledge, there has been little scholarly consensus about what the typical Plainview point is until recently.

In 1947 Alex Krieger described the variability within the Plainview site stone-tool assemblage in detail, with good illustrations of the artifacts, and reiterated that they were a possible "transitional form between Folsom and Yuma." Remember, little was known about Paleoindian points at that time. Krieger said that extended statistical analyses of artifacts from the Plainview site and other apparently related assemblages would be necessary to understand the relationships among them temporally and culturally. He also noted that "we may reasonably expect somewhat more variation in Plainview points than observed in the type-site series. Thus, the length, width, and depth of basal concavity may occasionally range slightly higher or lower than in the type-site series."

The Plainview site has produced a number of dates, none of which is satisfactory. Vance Holliday has concluded that the best assessment of the site age is around 10,000 RCYBP, or 11,600 CALYBP.

### "Plainview," an elastic definition?

I described the entire Plainview site assemblage in my 1973

dissertation (published in 1983), noting the variation in point forms there. I said the assemblage could be segregated into three varieties: I, pseudofluted small points; II, lanceolate bifaces with relatively irregular facial flaking but some remnants

of original biface preforms; and III, lanceolate bifaces that tended to have parallel-collateral flaking and relatively sharp distal points.

Based on my data, in 2002 Noel Justice described the point as a lanceolate form that is basally thinned with short pressure detachments and includes both straight and slightly excurvate blade edges, basal-edge grinding, and horizontal, parallel, and irregular facial flaking—but with considerable variation within those parameters. He didn't mention typical concave bases of these points, but his illustrations display these. He included Plainview within a Lanceolate Plano Cluster that included Plainview, Midland, Agate Basin, and Milnesand forms.

The differentiation of Plainview from Midland and Milnesand has been a mystery that is being worked out as we study more collections from the Southern Plains in Texas and New Mexico. I would not include in this cluster Agate Basin forms, as described in the Wyoming Agate Basin and Colorado Frazier sites, as Agate Basin relates to the Southern Plains. Few points from this region have been identified as "Agate Basin" other than now-historic descriptions of the Portales Complex at the Blackwater site in New Mexico. I suspect these forms have their strongest ties to Great Basin early lanceolate forms with design ideas migrating across the Northern Rockies. The few apparent manifestations of this shape in the Southern Plains may have come across the Southern Rockies or from the Northern Plains. In any event, they have no apparent cultural historical ties to the Plainview materials in the Southern Plains.

When I described the Plainview assemblage I suggested that points then labeled Golondrina Plainview in southern Texas should be just labeled *Golondrina*. Tom Kelly picked that up in 1982 and published a description of the differences between the two point types—the Golondrina label has been used for those points since then. Most of the Golondrina points known today are surface collections, but they have been found in situ at the Devil's Mouth and Baker Cave sites in Texas and San Isidro in Nuevo Leon. There they are associated with a diverse array of plants and animals, the first evidence of intensive foraging in the south Texas Plains semi-arid environment at about 11,600 CALYBP. They are not Plainview.



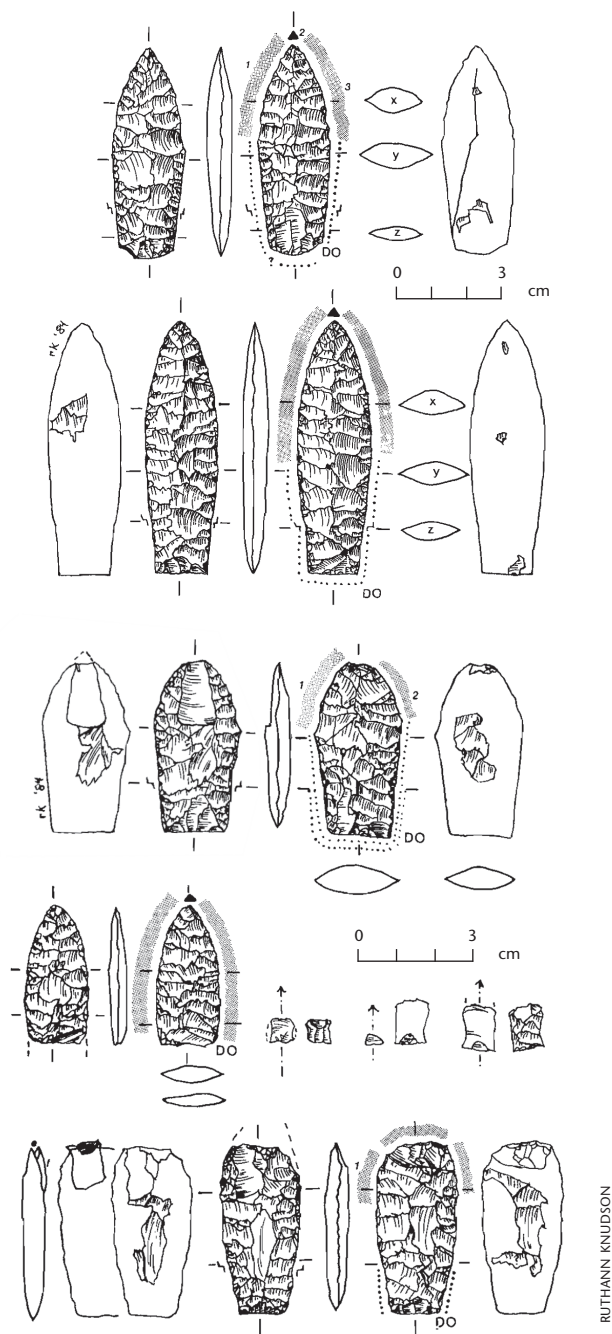
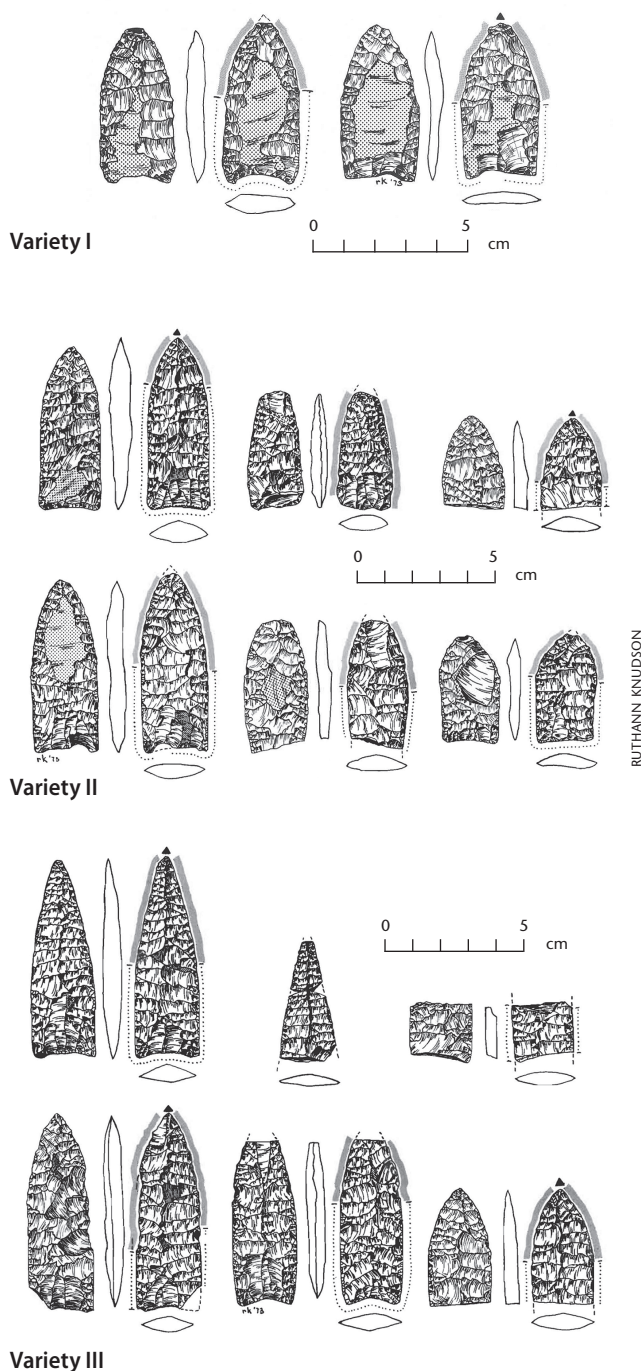


### Other point types muddy the water

There has been a lot of discussion about the relationship of Folsom and Midland points since the 1953 discovery of the west-Texas Midland site, with most of the site points originally referred to as “unfluted Folsom.” In the original publication about the site Krieger and his coauthors noted that the Midland points were “too small, thin, flat, and narrow” to be within the range of Plainview-site point forms. In the early 1990s archaeologists Jack Hofman and Dan Amick concluded that most of the points

ascribed to a Midland type were unfluted variations of Folsom points. More recently, Robert Lassen has reached the same conclusion based on analysis of materials from the Texas Gault site.

While the pseudofluted Plainview Variety I points illustrated here must have a strong inherited technological relationship to Folsom and unfluted Folsom points, I would never label them “Midland.” Both fluted and unfluted Folsom points are found together at a number of sites in the Southern Plains. I suggest that the prehistoric knapper’s decision sometimes to edge a thin flake



Points from the Lubbock site.

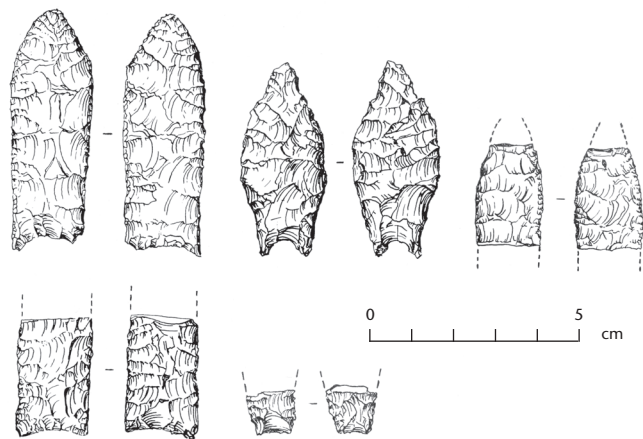
blank to make a point rather than flute the blank before its final edging was a pragmatic reaction to the shape of the raw material available at the time. That was probably true for makers of the artifacts left at Midland, Folsom, Lipscomb, Plainview, Shifting Sands, and a number of other Paleoindian sites in the Southern Plains. Pseudofluting is part of the Plainview site technology—but Plainview pseudoflaked tools are not Midland points.

Then there are Milnesand points. When Sellards first reported on these from the Milnesand site in 1955 he noted that similar points had been found at Blackwater Draw, relatively close in New Mexico to Milnesand. He declared this to be a new type, emphasizing the square bases on the points in contrast to the Plainview site concave bases. There is no good date for the Milnesand material. Both Milnesand and the Plainview site are on the shortgrass Southern High Plains. More recently, Briggs Buchanan, Michael O'Brien, and Mark Collard (in press), complementing Krieger's 1947 suggestion of using extended

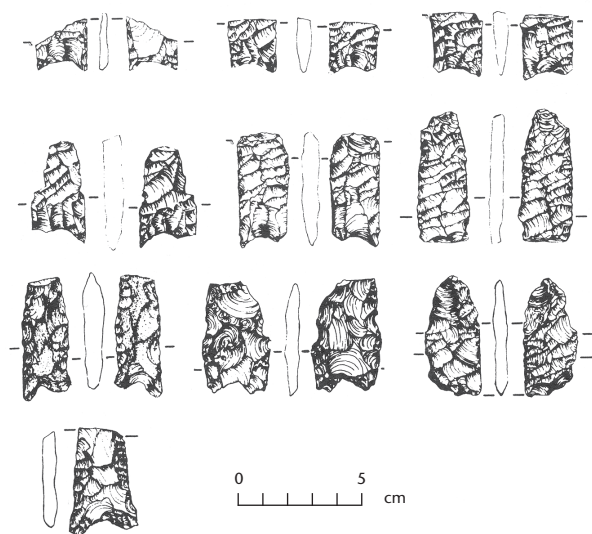
statistical analysis of point forms to create typology, have compared Plainview and Milnesand shapes and recommended that the *Milnesand* epithet be dropped and all such currently labeled forms be included within the *Plainview* type. Following the type-variety system of ceramic classification, the straight-based, relatively thin Milnesand points could be referred to as Plainview-variety Milnesand points until more information about the latter is known.

### An exclusive neighborhood

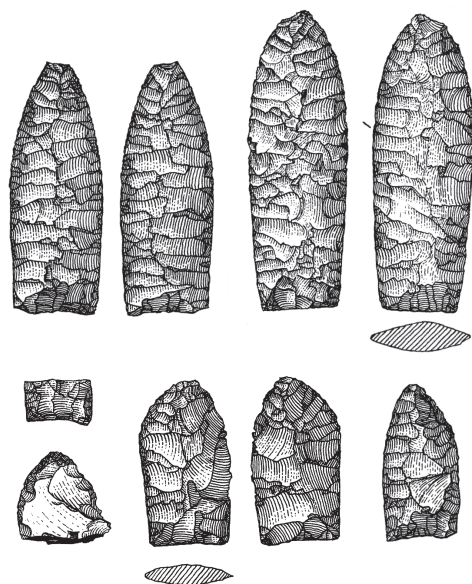
The St. Mary's Hall site in south-central Texas was first excavated by Tom Hester in 1977 when he identified the points there as Plainview. However, during analysis of materials from the Wilson-Leonard site some 120 km from St. Mary's Hall, Anne Kerr and Susan Dial statistically analyzed assemblages with a range of Paleoindian points from south Texas and eastern New Mexico and concluded that there was a St. Mary's Hall type that should



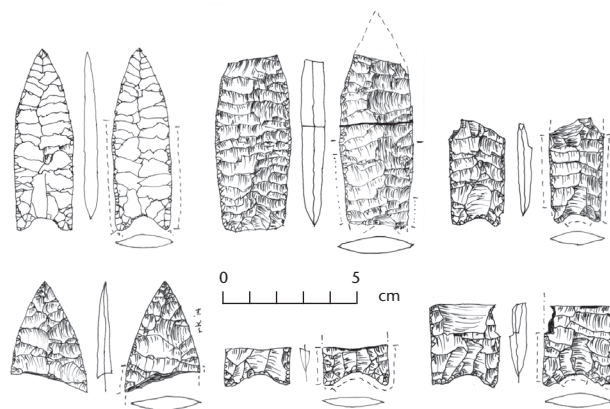
Midland points.



St. Mary's Hall points.



Milnesand points.



Goshen points from the Hell Gap site.

WENDORF ET AL. 1955

HESTER 1990

SELLARDS 1955

RUTHANN KNUDSON



be differentiated from the Plainview materials. Tom Hester concurs, as reported in his forthcoming article (in press). Whereas the Plainview site is on the Llano Estacado of the shortgrass Southern High Plains, both St. Mary's Hall and Wilson-Leonard are in the tallgrass Osage Plains east of the High Plains. While bison were present in the Osage Plains, there was a more diverse flora and fauna there than on the High Plains. St. Mary's Hall points are not within the range of Plainview site points.

In 1994 Eileen Johnson invited me to draw/analyze five bifacial lanceolate points that had been found in feature FA5-17 at the Lubbock Lake site in association with *Bison antiquus* remains and a few other flaked-stone artifacts. The feature was securely dated at  $9950 \pm 120$  RCYBP, or 11,500 CALYBP. Although these were initially called Plainview points, I persuaded Eileen and Vance Holliday that the contracting stems on the points were very different from Plainview-site points. The Lubbock points appear to be reduced bifaces that have a straight base with very slight shoulders, strong grinding across the base and well up the contracting edges, and are made from Alibates agatized dolomite, Edwards Plateau chert, Jemez obsidian, and Pedernales chert. They have been resharpened but not recycled and have marked edge wear. Without calling the points a new type, we labeled them Lubbock points as a mnemonic device—which other people have taken to be a new point type. The forthcoming paper by Buchanan, O'Brien, and Collard supports the differentiation of Lubbock and Plainview point types.

The Goshen Complex is a Northern Plains phenomenon that is becoming better defined as new sites are found. The point was named by Henry Irwin in the 1960s for bifaces in a small component at the Hell Gap site in southeastern Wyoming. The Mill Iron site in southeastern Montana is a large Goshen camp and butchering site, and there are Goshen points at the Jim Pitts site in western South Dakota and Kelly Forks Work Center in the Idaho panhandle, in the Colorado high elevation Upper Twin Mountain *Bison antiquus* bone bed, and in sites and surface collections throughout Montana, North Dakota, Alberta, and Saskatchewan. I have come to call many of the "Clovis" points found north of the US-Canada border "Canadian Clovis," i.e., Goshen. There has not been much de-

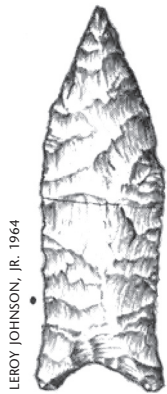
tailed analysis and comparison of these points, and no extended statistical analysis within the wide Goshen world of the northern Plains.

There are such marked similarities in shape between the Mill Iron Goshen points and some of the bifaces from the Plainview site that Vance Haynes considers them a single Plainview-Goshen type. My evaluation of the two assemblages is different, as outlined in both of our papers in the forthcoming *Plainview* volume; I think they are separate types. The Mill Iron site is now dated from  $10,450 \pm 15$  to  $10,175 \pm 40$  RCYBP, or about 12,500 CALYBP.

### A wrinkle: Different toolstones knap into different shapes

Paleoindian assemblages in the intermontane West and Plains are characterized by a variety of lanceolate bifacial points that

were apparently used as killing implements as well as cutting tools. There are only a limited variety of ways you can make a ballistically balanced killing tool capable of penetrating a thick hide and killing an animal. As people's knapping traditions moved away from the Western Stemmed or Clovis traditions of the 13th millennium before present, the widespread North American Native population apparently became more regionally adapted. They developed some regionally distinct technologies that were adapted to the stone resources in their landscape while continuing to use



LEREOY JOHNSON, JR. 1964

Golondrina point (approx. 8 cm overall length).

inherited technologies to create a killing tool. I think that was the case when Mill Iron was created, so that lanceolate bifaces in the Northern and Southern Plains could be fashioned to reflect similar designs but were still regionally distinct cultural manifestations. There were probably well-established trade and knowledge exchange networks north and south, as well as east and west, that dealt with tool designs as well as knapping materials. I agree with Krieger that modern typologies should reflect cultural historical reality insofar as we can discern that today. Thus, I think Plainview is a distinct Southern Plains lanceolate


## Suggested Readings

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bifacial design set that includes variations reflecting the local knapping materials available.

The “Plainview” label has been applied to points found across North America since the 1950s. I think we have found sufficient archaeological evidence since then to recognize regional variants of Paleoindian bifacial lanceolate points and give each its own name within each region. Perhaps we should recognize a Plainview, or (better) lanceolate bifacial point, horizon at about  $11,500 \pm 100$  CALYBP across western North America.

So what is Plainview? It is not Golondrina, Midland, St. Mary’s Hall, Lubbock, or Goshen. Based on information from the Plainview and Ryan’s site (70 km south of Plainview), Plainview points are a Southern High Plains, shortgrass-prairie, big-game-adapted bifacial lanceolate projectile form that pragmatically varies in final shape depending on the materials available when

the knappers were flaking the tools. They come in at least three varieties, more if the Milnesand straight-based forms are subsumed under the Plainview rubric. Because the Plainview name has been in the literature since 1947, the term has been used from Nevada to Wisconsin to the Northwest Territories—but the Paleoindian basally thinned lanceolate bifaces are only **Plainview** forms if they are found in or originated from the Southern High Plains. That’s my story and I’m sticking to it. 

—Ruthann Knudson

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## The Grenfell Bone Rod

*continued from page 3*

Brock, then the research chemist at the Oxford University Radiocarbon Accelerator Unit. She reported a nitrogen content (%N) of 3.0, which confirmed the presence of sufficient collagen for AMS radiocarbon dating.

While the team was photographing and 3-D scanning the bone rod, the repaired break again broke. The incident proved lucky, however, because the original parts of the artifact weren’t harmed and the break made it possible to remove a fragment of bone with dental implements. Off went the specimen to Oxford.

Ives and his team were startled by the calibrated AMS date reported by Brock: 8400 CALYBP, “much later than the Clovis era,” says Ives. The date places the specimen at the time of transition from the end of the Early Prehistoric or Paleoindian period and the beginning of the Middle Prehistoric period.

### A product of Cody Complex toolmakers?

The age of the Grenfell bone rod dates it toward the end of the Cody Complex period, but association with this culture

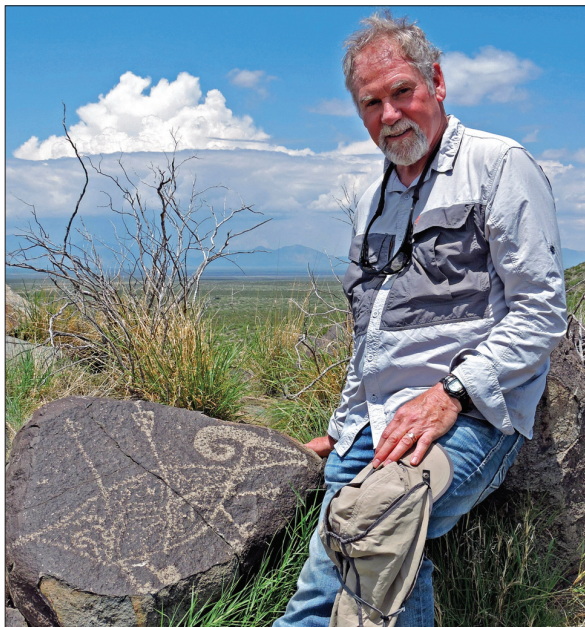
Ives near the Mescalero reservation, 2015.

is uncertain. “There are some other coeval, late-Paleoindian occupations in Saskatchewan, with Lusk-like points,” Ives explains. “Cody Complex points are more common in Saskatchewan and Alberta, however, and the Grenfell specimen falls in a region not so far from the Knife River Flint sources in North Dakota.” A significant number of Cody Complex points in western Canada

are also made of that raw material, so it’s reasonable to entertain the possibility that the Grenfell bone rod may be a Cody Complex artifact. But because no associated artifacts have been found, this hypothesis can’t be confirmed.

“In a broader Paleoindian sense,” Ives continues, “the Cody Complex in certain ways is a last expression of a larger Paleoindian phenomenon in which there was a focus on beautiful raw materials, exquisite knapping skills (many of us think some Eden and Scottsbluff points are among the most beautiful stone tools ever made), and long-distance transport of exotic raw material.” It was also a time of diverging toolmaking practices across

Canada. During the fluted-point era in western Canada, Clovis, Folsom, and small basally thinned or fluted points are unlike fluted points found elsewhere: They are dominantly made of local toolstone. As fluting technology gave way elsewhere, the use of exotic raw materials diminished and regional differences appeared in point morphology and toolstone sources. But in the Cody Complex period what appears in western Canada is markedly different: According to Robert Dawe, Assistant Curator of Archaeology at the Royal Alberta Museum, 28% to 42% of the points and Cody knives in Alberta are made from Knife



River Flint, obtained from sources 800–1600 km distant. “If the Grenfell bone rod came from Cody Complex use, it’s a bit like an echo of the earliest fluted-point era,” he says. “Most of the megafauna are gone, but there are still large chronospecies of bison, along with a very strong aesthetic sense surrounding raw stone materials and extraordinary craftsmanship, movement of




exotic toolstone over great distances, and a late instance of this elegant bone technology.” Ives suggests that this phenomenon has social implications that are evident in the dynamism of terminal-Paleoindian peoples.

### Recovering the past responsibly

The Grenfell bone rod echoes the earlier era of fluted points, but the case made by Ives’s pursuit of its provenance is that “they occur in the fluted-point time range, but they occur later too.” In his work on the Grenfell bone rod, Ives makes an even stronger case for the need for archaeologists to attend to existing collections in an ethically responsible manner. In the course of his investigation he confesses to becoming swept up. “It became intriguing to me. In the literature we’re seeing a number of other signature artifacts coming to stand for the Clovis era besides the fluted points: overshot flaking, macroblades and osseous technology (ivory, antler or bone), and it seemed worth reinforcing that we have the capacity to test these things inexpensively with little destructive effect, to find out how old they are and what they’re made of.”

Ives isn’t the only voice declaring that scientists can find delving into museum collections as rewarding as an archaeological dig. In 2011 Steve and Kathleen Holen set out to resolve a contentious association of mammoth and fluted-point preform that dated to 1931. The preform was reportedly recovered from under the remains of a mammoth unearthed near Angus, Nebraska (MT 28-1, “Angus mammoth: Archaeological or tampered paleontological site?”). A geologist estimated the age of the site at 300,000 years; a paleontologist agreed with the geologist’s estimate and pronounced the mammoth a mid-Pleistocene species. Although the claim was dismissed by most scientists, at the time there was no technology available to date the site. The Holens put the mystery to rest by dating sediments surrounding a remaining mammoth rib in situ using optically stimulated luminescence: 75,000–80,000 CALYBP was the result, far too old

to be a credible context for the preform, which under examination proved to be a genuine artifact, probably of post-Clovis age. The disparity in age between the mammoth and the artifact made the alleged association impossible. “It took years to resolve this controversy because we didn’t have the technology,” says Holen. Today the Holens are poring over museum collections of Ice Age megafauna remains in search of green-bone fractures (MT 23-1, “Early bone flaking on the Great Plains”), cutmarks on bone (MT 28-1, “Pre-Clovis butchered ground sloth in Ohio”), and other evidence for human predators that may have been overlooked by original investigators.

John Ives makes an equally strong case for the need for ethically responsible archaeologists to reexamine existing collections to “make certain we are applying the best available techniques to assess them, rather than taking for granted we know all that we need to know about them.” 

—Katy Dycus

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**A**LMOST FROM THE MOMENT of its discovery on the bank of the Columbia River in Washington State in July 1996, the ancient skeleton of Kennewick Man commanded the attention of scientists, Native American communities, and public media. This volume, the collaborative effort of physical and forensic anthropologists, archaeologists, geologists, and geochemists, interprets for us the scientific significance of this remarkable find. Its lucid narrative style documents an exquisite example of the triumph of interdisciplinary scientific inquiry.

*Kennewick Man: The Scientific Investigation of an Ancient American Skeleton* will satisfy discerning professionals. Informed readers, too, will be swept up in the absorbing story of the discovery of the remains and their years-long curation, and

## KENNEWICK MAN

### The Scientific Investigation of an Ancient American Skeleton

Edited by Douglas W. Owsley and Richard L. Jantz

the elaborate detail that scientists have been able to discern about Kennewick Man—diet, habits, health, and his place among other known early Americans, this human being who walked the land of the Pacific Northwest nearly 9,000 years ago. See the rear cover of this issue for information on how to order your copy.

Douglas W. Owsley is the division head for Physical Anthropology at the Smithsonian Institution, National Museum of Natural History, in Washington, D.C. He has identified remains from news-making crime scenes, mass disasters, and war zones. In addition to forensic casework, he is conducting extensive research on historic and prehistoric populations of North America. Richard L. Jantz is professor emeritus of Anthropology and director emeritus of the Forensic Anthropology Center at the University of Tennessee. His primary research focus is metric variation among modern humans.

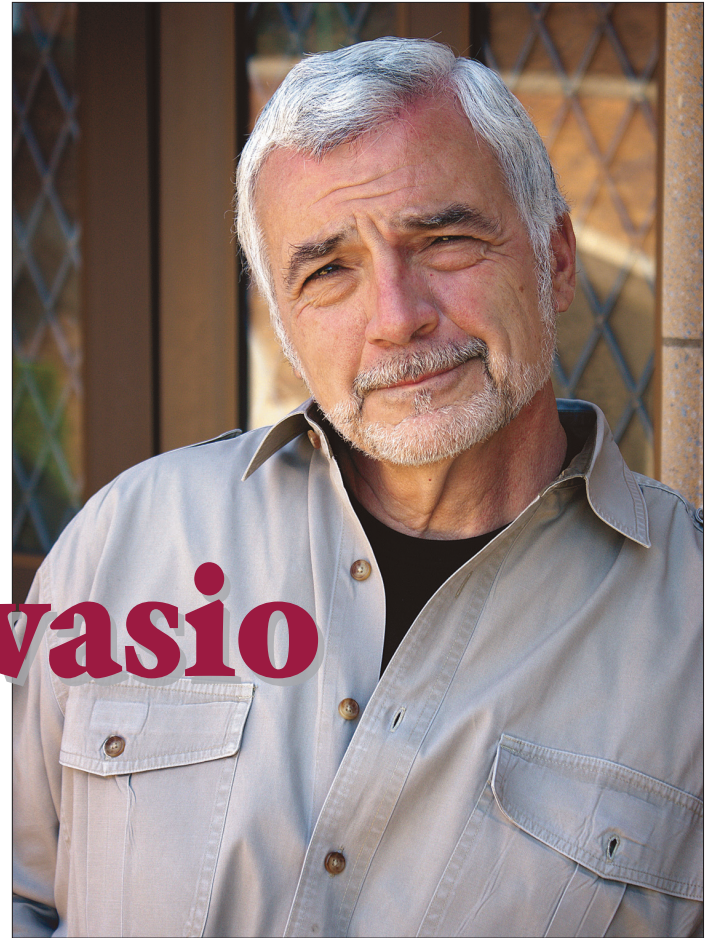
**F**ORGET DICK AND JANE. Anthropologist Jim Adovasio, currently of Florida Atlantic University, cut his intellectual baby teeth on his mother's collection of books on geology, paleontology, and archaeology.

Born in 1944 in Youngstown, Ohio, he developed a keen interest in archaeology by the age of four or five, encouraged by his mother, Lena Adovasio, a quadruple major who urged her son to focus on the field that first beckoned to him. His B.A. in Anthropology from the University of Arizona was soon followed by a Ph.D. earned at the University of Utah for analyzing possible assemblages from more than 40 archaeological sites in the Great Basin, southwest Texas, and the Plateau. From this initial foray into unlocking the mysteries of fiber artifacts such as textiles, baskets, ropes, and cords, in the course of half a century Adovasio has built a reputation as the world's leading authority on analyzing these invaluable fragile materials.

## *A Focus on Meticulous Methodology*

# Jim Adovasio

and the site into the epicenter of a raging debate about when the First Americans appeared. The Clovis-First paradigm, a child of the 1970s, hung on through the 1980s in the face of mounting evidence of earlier occupations that emerged from far-flung locations throughout the Americas. Monte Verde in Chile and Meadowcroft are the sites most frequently cited as evidence that Paleoamericans arrived in the New World before Clovis. They're also the sites most vehemently challenged by Clovis-



### **A stake through the heart of Clovis-First?**

Inextricably intertwined with Adovasio's name and fame is Meadowcroft Rockshelter, a deeply stratified multicomponent site covering an area of about 65 m<sup>2</sup> beneath a sandstone overhang. It lies southwest of Pittsburgh, Pennsylvania, on the north bank of Cross Creek, a small tributary of the Ohio River. First discovered by the late Albert Miller on property that had belonged to his ancestors since 1795, the site was brought to Adovasio's attention in 1973, when he was looking for a suitable location for a field training site for undergraduate and graduate students in anthropological archaeology and in a host of related fields. He began excavating it in 1973. Eventually it became the focal point of a long-term multidisciplinary investigation.

From the beginning the site, though modest in size, sparked high levels of interest and more than its share of controversy. Meadowcroft Rockshelter has generated 85 articles, book chapters, monographs, and papers—and the investigation is far from completed. The project, considered a state-of-the-art closed-site excavation, identified 11 strata of widely varying thicknesses that span the longest intermittent occupational sequence now known in the New World, spanning at least 16,000 radiocarbon years.

Early radiocarbon dates at Meadowcroft thrust Adovasio

First adherents. Despite extensive testing by four radiocarbon laboratories, controversy still surrounds 13 radiocarbon dates from the deepest levels at Meadowcroft and at the broader concept of pre-Clovis in general.

New sites with pre-Clovis dates have become burdened with site-validation criteria nearly impossible to satisfy. To battle-scarred Adovasio, these ludicrously rigorous standards seem to have been contrived with the notion that claimants were simply seeking to make a name for themselves. Festering bitterness wells to the surface when Adovasio reflects on the current state of criteria for validating archaeological sites, which, in a matter of 70 years, have "somehow managed to complete a bizarre circuit connecting Hrdlička and Holmes to Rube Goldberg, ontological parsimony and Ockham's Razor be damned." (Aleš Hrdlička and William Henry Holmes, influential anthropologists early in the 20th century, were united in insisting that Ice Age megafauna and humans didn't coexist in



the New World. Holmes is famous for setting severe standards for analyzing early human remains.)

Although Meadowcroft was discovered before Vanderbilt University archaeologist Tom Dillehay published his findings, his Monte Verde site in Chile is considered the first serious challenge to the Clovis-First model. Its deep excavations represent the earliest directly dated human occupations in the hemisphere and appear to depict a semi-sedentary, broad-spectrum adaptation different in all respects from later Clovis occupations.

Dillehay, who has himself suffered attacks from doubters and scoffers, believes critics rejected the evidence for a pre-Clovis occupation at Meadowcroft Rockshelter because they failed to understand and appreciate Adovasio's painstaking attention to detail. "When colleagues consider early sites like Meadowcroft Shelter," says Dillehay, "they almost always look only to the radiocarbon dates. Unrealized to the vast majority of the discipline is the sophisticated interdisciplinary and careful methodology that Jim applied to this site." It was precisely this meticulous application, he maintains, that revealed any nuances and vagaries at the site that required more attention and questioning by Adovasio and his research team as they dealt with the older, deeper cultural deposits. Dillehay delivers a stinging rebuke to critics of Meadowcroft Rockshelter who, if only they had studied and understood Adovasio's methodology at the site, "could have answered some of their own often absurd questions about it and would have been much more accepting of the pre-Clovis deposits there."

"Given the early dates from Meadowcroft, Gault/Friedkin, Page-Ladson, and several localities in South America," Adovasio concludes, "I believe the initial peopling of the New World occurred shortly before or very shortly after the LGM [Last Glacial Maximum]. With the collapse of Clovis-First, we can now address the genetic, linguistic, and cultural diversity of the early colonists of the New World with fresh eyes. I believe it is imperative to examine the diversity of these earliest inhabitants in terms of their technology, subsistence strategies, and general life styles. It is also patently clear that their role in Pleistocene extinctions must be rethought."

### Unlocking the secrets of perishable artifacts

Inherently fragile, fiber artifacts from ancient American sites

are a rarity, and too often archaeologists with little experience in handling, preserving, and analyzing these perishable materials have ignored them at best and discarded them at worst, failing to recognize the insights they can provide into the lives of ancient peoples. Fiber artifacts make it possible to date a site with extreme accuracy (MT 27-1, -2, "The FIBER of their being: Direct dating fiber artifacts").

Adovasio and colleagues have refined the techniques for dating fiber artifacts and wrung valuable insights from textiles that were obviously made by humans, thereby establishing a minimum age for sites where these items were discovered. As expertise in dating fiber artifacts improved, results showed that human ability to manufacture usable products from plant fiber began much earlier than formerly supposed.

Meadowcroft Rockshelter has contributed perishable artifact evidence to support radiocarbon dating that corroborates other evidence for a pre-Clovis presence. A piece of bark, which appears to be deliberately cut, was retrieved from the lowest levels of the site. The bark dated to the astonishing age of  $19,600 \pm 2400$  RCYBP, a date that still awaits confirmation. Adovasio also uncovered sophisticated basketry at Meadowcroft that produced pre-Clovis dates.

Artifacts derived from plant fibers can be directly dated by a more accurate method than by association with other datable objects like wood and charcoal. Early methods of dating plant fibers required that the entire artifact be reduced to ash, a severe measure that many archaeologists avoided for obvious reasons. New technology, however, dates plant fibers using only

**Adovasio handing an underwater camera to diver Jessi Halligan, who is photographing underwater features on the continental shelf off the Florida coast.**



a minute sample, thus preserving the bulk of the artifact for a time when even more advanced dating methods may become available.

"While Jim is probably best known for his work on the earliest Americans," says David Madsen, a colleague from the University of Texas, "his life's work is the analysis of prehistoric textiles and what basketry, nets, twine, and matting say about how prehistoric people lived. He is as particular about these analyses as he is about his fieldwork, and I have no doubt he has looked at and described virtually every textile piece in every major museum in North America. Moreover, he remembers them all. I have no doubt that he is the leading expert on prehistoric textiles in America and is certainly among the leading

textile experts in the world. If I have any question about any textile piece from any place or any time, my first call is to Jim and he is sure to know the answer.”

“The role of non-durable artifacts in the life styles of Ice Age populations around the world has been, for a variety of reasons, drastically underestimated,” says Adovasio. “My continuing interest in the First Americans stems from the foregoing appreciation of their non-durable technology and is also driven by methodological considerations.”

### Exploring the late-Pleistocene shoreline

When much of the world’s seawater was captured in miles-thick continental ice sheets during the late Pleistocene, lowered sea levels exposed coastlines as much as several hundred meters beyond our modern shorelines. As the ice melted, sea levels rose as much as 75–120 m and the land, no longer crushed beneath tons of ice, heaved up in isostatic rebound. Adovasio believes it’s reasonable to assume that early Americans exploited this now submerged land along the water’s edge, but finding evidence of inundated occupations is a daunting task (**MT 30-4**, “Looking for sites at the water’s edge”).

Hemmings (left) and Adovasio during the 2009 field season exploring the continental shelf off the Florida coast.



Adovasio stood at the forefront of scientists eager to extend their reach to possible archaeological sites on the submerged continental shelf. In 2007 he submitted a proposal to the National Oceanographic and Atmospheric Administration to research the area west of St. Petersburg, Florida, where he and colleague Andy Hemmings intended to study the ocean floor in the expanse between the LGM beach and the modern shoreline in search of prehistoric river channels and sinkholes (**MT 29-3**, “Paleolandscapes of the South Atlantic Bight”).

In the first year Adovasio, Hemmings, and their team located the remains of the LGM shore, a series of sinkholes that may contain archaeological materials, and the channel of the paleo Suwannee, an extension of the existing Suwannee River across the Continental Shelf. Combining sub-bottom profiling and side-scan sonar technology for a better view of the submerged topography pushed the limits of existing technology (**MT 26-1**, “Prehistoric Florida submerged: Finding cultural clues on the Continental Shelf”).

In 2009, they discovered how to increase resolution and simultaneously reduce by half the time needed to collect data. Adovasio and his team were now able to view in real time the seafloor and what lay upon it. Since undersea archaeological research is quite expensive (the crew consisted of one research diver and eight archaeologists) and boat time and equipment rentals are steep, they worked on a 24-hour schedule, diving during the day and monitoring remote-sensing gear at night.

One piece of equipment, a “towfish” sensing device that was

towed behind the boat, became such a plaything for dolphins that they eventually put it out of commission. Submarine archaeology is science practiced the hard way. Despite battling limited air supplies and dealing with the complications involving decompression following deep dives, the team went on to discover chert bedrock adjacent to ancient river channels, likely locations for Paleoamerican sites.

### Another look at Old Vero Beach

Little known outside archaeological circles, Vero Beach in Florida has fascinated scientists since 1916, when the remains

of “Vero Man” were discovered eroding from the wall of an irrigation canal. Florida State geologist Elias H. Sellards’s discovery of the bones in association with the remains of extinct mammals led him to believe they were the oldest human remains ever discovered in the Americas.

Nearly a century later, Adovasio and Hemmings began a new round of fieldwork and analyses of the Old Vero site, which they describe as “the first locality to seriously challenge the received wisdom of the early 1900s that humans and Ice Age animals were not contemporaries on the New World landscape.” Their interest evolved from their earlier studies of the continental shelf.

Three seasons of meticulous fieldwork beneath a utilities-equipped shelter erected over the excavation site and served by an extensive drainage system have yielded exciting discoveries that include a bit of preserved cordage, which dates from at least 9,000 CALYBP. Since then, more plant-fiber artifacts have been discovered and are currently being analyzed.

Sadly, the chemical treatment administered to preserve the few curated bones of Vero Man makes it impossible to radiocarbon date them. The rest of the bones are either scattered among 22 institutions or lost. Although no more human bones have come to light, a bone bed at the site yielded the bones of *Bison antiquus* and other as yet unidentified animals that show signs of deliberate burning, which strongly suggests a human presence. Under the auspices of the Harbor Branch Oceanographic Institute and Florida Atlantic University, the 2017 field



season using modern scientific methods promises to discover exciting new evidence.

"It is worth stressing that Meadowcroft and subsequent projects which I directed in various parts of the world were first and foremost methodological exercises," says Adovasio. "They were designed to stretch the envelope of empirical data recovery and not necessarily to prove any particular postulate or point of view. The current work at Vero Beach and other locations in central Florida continues this methodological emphasis."

### Fifty years of meticulous methodology

Since 1970, Adovasio has published more than 500 books, book chapters, manuscripts, and technical papers, and has been the recipient of numerous honors and awards. The Smithsonian Institution awarded him a post-doctoral research fellowship in 1971 followed by a Certificate for Academic Achievement in 1972. He received an honorary D.Sc. from Washington and Jefferson College in 1983 and won an Outstanding Achievement Award from Mercyhurst College Alumni Association in 1993.

In 1996, he won the Pennsylvania Historic Preservation Board's Award for Archaeological Research at Meadowcroft Rockshelter and the J. Alden Mason Award for Career Contribution to Pennsylvania Prehistory. His peers elected him a fellow for the American Association for the Advancement of Science in 2002.

#### Notable appointments

Martha Sharp Joukowsky Lecturer for the Archaeological Institute of America (AIA), 2007.

AIA lecturer, 2008–present.

Stone Lecturer for the National Lecture program of AIA, 2011–12.

Renner Lecturer for the National Lecture Program of AIA, 2012–13.


Manton Lecturer for the National Lecture Program of AIA, 2015–16.

Distinguished Lecturer in Archaeology, various colleges and universities, 1975–present.

Although Adovasio has racked up an impressive record of accomplishments in First Americans studies, he doesn't consider himself a Paleoindian specialist. "I have worked on mammoth bone houses in Ukraine, Roman sites in Israel, historic sites in Pennsylvania and Texas, and just about everything in between," he tells us. All his amazingly diverse archaeological investigations have one objective in common. "No matter where I worked or whatever the age of the sites I worked on," he emphasizes, "I viewed them primarily as methodological exercises—opportunities to expand the envelope of field and laboratory protocols." This was the only reason he developed a contract program while at the University of Pittsburgh. "The Cultural Resource Management Program (CRMP) at Pitt was the largest college- or university-based CRM program in the U.S. during the 1970s and 1980s," he explains. Its primary function was not to amass grants and overhead, but rather "to use contract projects as vehicles to refine field methods and thereby train students in cutting-edge techniques."

"Jim's fieldwork is among the most meticulous, careful research I have ever witnessed," David Madsen states. "Everything he does is measured, mapped, described, and photographed nine ways from Sunday, and one can be sure that the context of anything he reports is as he says it is. I once referred to his approach as 'Mars Lander archaeology.' By that I mean that he feels that if one can only go to a far, unknown place once, at great expense, one should collect all the data possible without regard for preconceived ideas that might limit what one might find. In the case of archaeology, it is only possible to excavate a site once, as it is a destructive process, so it is Jim's belief that it is critical that everything be recorded in as fine a detail as possible."

### The future of First American studies

"While I do not agree with the late Lew Binford's position that there is no limit to the answers which we can extract from the ground," Adovasio tells us, "I do believe that we should constantly be seeking new and more rigorous ways to get at new data. I shall continue to engage in field and laboratory research involving the First Americans as well as later populations for as long as I am physically and mentally able to do so. In hindsight, after a now more than 50-year-long career in anthropology, I am probably most pleased with the fact that while many have contested my conclusions about the First Americans as well as other topics, no one has seriously questioned my methods." 

—Martha Deeringer

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Adovasio, J. M., R. L. Andrews, and R. C. Carlisle 1977 *Perishable Industries from Dirty Shame Rockshelter*. Miscellaneous papers of the Idaho State Museum, No. 7, pp. 1–22. Adovasio, J. M., O. Soffer, and J. Page 2007 *Uncovering the True Roles of Women in Prehistory*. Left Coast Press, Walnut Creek, CA.

**T**HE MITOCHONDRIAL HAPLOGROUP X is aptly named. It has been at the center of controversy and seems to present us with a mystery worthy of an episode of the X-Files. It's one of the five documented haplogroups of indigenous American Indians, and molecular geneticists include it among the founding lineages of the first Americans. So far so good, but the controversy and mystery lie in the fact that the variant of haplogroup X found in America, X2a, has never been identified in eastern Asia—the supposed homeland of those First Americans.

Two separate groups of researchers with very different agendas explain this mysterious absence by proposing dramatically different histories for X. For one group, it is the genetic hallmark of a transatlantic migration of the western European Solutrean culture that supposedly preceded the Beringian migration of the ancestors of American Indians (MT 28-2, "Do Clovis origins lie in Paleolithic Spain?"). For the other, it is evidence for a much later pre-Columbian migration of Hebrews who became the builders of the mounds in mid-continental North America. Biological anthropologists Jennifer Raff of the University of Kansas and Deborah Bolnick of the University of Texas, Austin, unravel the mystery behind haplogroup X2a in the October 2015 issue of *PaleoAmerica*, the journal published by the Center for the Study of the First Americans.

### What is haplogroup X2a?

Haplogroup X2a is a lineage of mitochondrial DNA found only in North America. Mitochondrial DNA (mtDNA) is different from the nuclear DNA that determines so much of who you are. (Bolnick cautions against overemphasizing genetic determinism, lest we "lose sight of the complexities of individual identity.") Mitochondria are organelles in the cytoplasm of your cells with their own DNA. You inherit your mitochondrial DNA solely from your mother, so tracing back your mtDNA heritage follows only the maternal half of your lineage. Still, it is a powerful tool for tracking human migrations from the original radiation of humans out of Africa to the most recent movements of people fleeing violence in their homelands or seeking economic opportunities in far off countries. But what do you do when an mtDNA lineage, such as X2a, hasn't left a clear trail? Raff and Bolnick frankly admit that X2a poses just this kind of dilemma: "There is no clear record of the evolutionary history of X2a in any population."

The X2 haplogroup, the ancestor of the North America X2a haplogroup, is found at low levels throughout much of the world. Raff and Bolnick note its occurrence in the Near East, South Caucasus, Europe, Siberia, Central Asia, and North Africa. The presence of X2 among the Altai of Siberia was initially thought

to be the obvious source population for the first Americans, but Raff and Bolnick point out that geneticists more recently have determined that those "lineages are not ancestral to those of North Americans, and the presence of X2 there appears to be the result of recent gene flow from the west."

This absence of a clear source population for X2a has opened the door for two alternative suggestions for the origins of this portion of the American Indian gene pool. Both base their ideas principally on extrapolations from the regions where X2a is found in North America today. According to Raff and Bolnick, it is found "at the highest frequencies in Great Lakes populations and at lower frequencies in the Plains and Pacific Northwest." Since X2a is at its highest frequency in eastern North America,

## Mitochondrial Haplogroup X Evidence for Ancient Transatlantic Migrations to the Americas?

it's presumed that this must be where it has flourished for the longest period of time and therefore, or so the argument goes, the region where the earliest migrants sharing this haplogroup arrived in North America.

### A pre-Columbian Hebrew migration to America?

In one scenario critiqued by Raff and Bolnick, X2a "is the result of an ancient Hebrew migration from the Middle East to North America approximately 2500 cal BP." This idea, popular with the proponents of a variety of pre-Columbian voyages to America, is handily refuted by Raff and Bolnick on the basis of "four key findings." First, "X2a is not found in the Middle East." Second, "none of the X2 lineages present in the Middle East are immediately ancestral to X2a." Third, the estimated date for when the documented lineages of X2a began to diverge one from another, 14,200 to 17,000 CALYBP, "significantly precedes the hypothesized migration from the Middle East," but corresponds quite well to the well-documented initial arrival of humans into the Americas. And fourth, "haplogroup X2a was present in North America far earlier than the hypothesized Hebrew migration." Kennewick Man, dating from 8690–8400 CALYBP, belonged to haplogroup X2a (MT- X, "Kennewick Man's DNA reveals his ancestry"), so it obviously can't have arrived only 2,500 years ago.



## The Solutrean Hypothesis

In the other scenario, which Kennewick Man might appear at first to support, haplogroup X2a came to North America by way of a migration of Solutrean voyagers across the North Atlantic (**MT 28-2**, “Do Clovis origins lie in Paleolithic Spain?”). In support of this notion, Dennis Stanford and Bruce Bradley have pointed to the relatively high frequency of the X2 haplogroup in the Orkney Islands near Scotland. However, just as the Siberian Altai X2 haplogroup can be shown not to be ancestral to X2a, so Raff and Bolnick observe that the Orkney Island X2 varieties also are not ancestral to North American

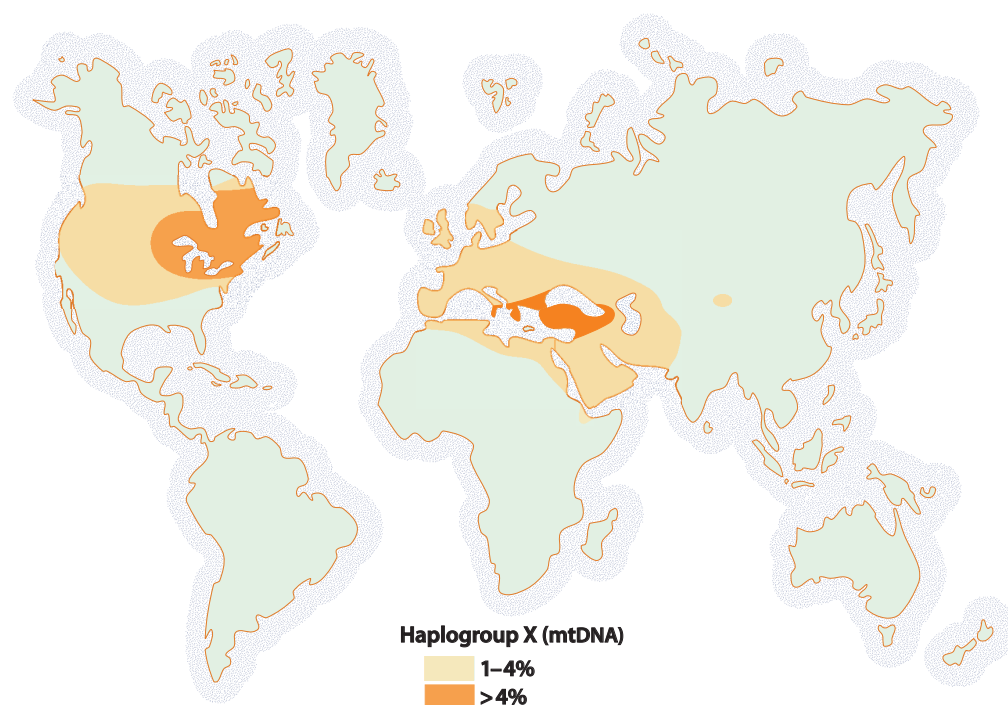
the Pacific coast, so by Oppenheimer, Stanford, and Bradley’s “own logic, this finding supports a Beringian, not Solutrean origin for X2a.”

Moreover, as Raff and Bolnick observe, the absence of evidence of X2a in Siberia is no more mysterious than its absence in West Eurasia. They write that “associating X2a with ‘West Eurasia’ is like saying ‘Solutreans evolved in Africa’: each statement refers to a location where the ancestral population is thought to have lived long ago, but that location is not relevant to the question” of how X2a made its way into North America. They conclude that “at this time, there is simply no evidence that X2a

evolved in the Near East, Europe, or anywhere in West Eurasia.”

Raff and Bolnick argue that “until we have better geographic sampling of ancient DNA from the relevant time periods” the only way for us to determine “anything about X2a’s history is by studying it within North America or by making inferences based on the geographic distribution . . . of other founder haplogroups in the Americas.” There have in fact been numerous studies of this kind, and, as Raff and Bolnick report, they have all arrived at the same conclusion: “Haplogroup X is likely to have originated in the same population(s) as the other American founder haplogroups” and entered America via Beringia.

The incidence of mtDNA haplogroup X among world populations.



X2a and are therefore “irrelevant to the genetic prehistory of the Americas.”

In a recent paper published in *World Archaeology*, Stephen Oppenheimer, Stanford, and Bradley present other arguments in support of a Solutrean connection to America’s X2a. They note that X2 lineages presumed to be ancestral to X2a have not been documented in Siberia, but instead show up in Egypt, Iran, and North Africa, places that they point out are “on the opposite side of the globe from Beringia across the North Pole.” Moreover, the distribution of X2a in North America indicates that “the highest regional frequencies, modern branch-diversity” and ancient DNA support is in “eastern Canada and the Great Lakes region.” From these observations, Oppenheimer and his coauthors conclude that the Solutrean hypothesis “offers the only credible route-explanation for the unique, substantial presence of West Eurasian-derived . . . X2a in the Great Lakes region of north-east America.”

Of course, now that Kennewick Man has been shown to belong to haplogroup X2a, the aDNA support for an Eastern center of dispersal is completely undermined as Raff and Bolnick make clear. Now, “the oldest and most basal X2a lineage” is on

## Did any Solutrean people actually belong to the X haplogroup?

The Solutrean hypothesis argues that the presence of the X haplogroup in both eastern North America and western Europe indicates an ancient connection between these regions. But it begs the question, Was the X haplogroup even present in western Europe during the late Pleistocene? Although no team has yet recovered ancient DNA from a Solutrean skeleton, new research examining the genomes of not-quite-so-ancient Europeans increasingly suggests it was not.

Iosif Lazaridis, a molecular geneticist in the Department of Genetics at Harvard Medical School, along with 119 other scientists representing institutions from more than 30 countries, sequenced 9 ancient genomes of Europeans, which they compared with other published ancient genomes and 2,345 genomes of contemporary humans. Their analysis was published in the September 18 issue of the journal *Nature*. They concluded that the contemporary European gene pool developed only in the last 8,000 years. They did, in fact, identify “a stream of Siberian gene flow into north-eastern Europe,” but this appears to have occurred sometime after 8,000 years

ago. Summarizing the results of the work of the Lazaridis and other teams, Raff and Bolnick conclude that “the genetic connections we see between Native Americans and West Eurasians today do not indicate connections between Native Americans and western Europeans in Pleistocene times.”


### A mystery solved

For Raff and Bolnick, there is no real mystery behind the distribution of the X2a haplogroup when it

**Bolnick (foreground) and research fellow Raff selecting human skeletal elements at TARL for aDNA micro-sampling back in the lab. This sampling visit was one of several undertaken by Bolnick and her team as they compile aDNA samples in creating genomic profiles of various prehistoric populations of Texas.**



is considered within the context of everything else we know about the genetic history of the American Indians. The “intermediate lineages linking X2 and X2a” appear either to have been lost in modern populations, or they occur in such low frequencies that they have not yet been identified. But the absence of firm evidence for X2a or its immediate ancestor in Siberia in no way proves that it must therefore have arrived in America by way of a transatlantic migration, whether 2,000 or 20,000 years ago.

Raff and Bolnick think the simplest explanation for the presence of X2a in ancient America is that it arrived as part of the genetic mix carried by the small groups of people that occupied Beringia during the Last Glacial Maximum. Repeated studies of ancient and modern DNA demonstrate that this founding population “was descended from peoples in eastern Siberia who were related to the ancestors of both contemporary East Asians and contemporary West Eurasians.” Raff and Bolnick readily acknowledge, however, that new discoveries someday may provide the missing evidence for a Solutrean or even a Middle Eastern connection. Yet they make it abundantly clear that “no such evidence has been found, and the Beringian migration model remains the best interpretation of the genetic, archaeological, and paleoclimate data to date” (see **MT 28-3**, “Alternative views of the Solutrean theory”). 

—Brad Lepper

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## Inside the Complex Mind of the Paleoindian Bison Hunter



Bison bone bed uncovered by Bement and Carlson at the Badger Hole site.

LELAND BEMENT

**W**AS THE SOCIAL COMPLEXITY of prehistoric societies contingent on adopting agriculture and a sedentary lifestyle? Or were hunter-gatherers equally capable of creating complex societies? Anthropologists Kristen Carlson and Leland Bement have thrown their hat into the ring in favor of thinking hunter-gatherers, who thrived by creating cooperative alliances among groups and adopting an efficient strategy for preying on the prime food source, the bison. Their research on organized bison hunting on the Plains of North America during the Pleistocene/Holocene transition counters the stereotype of the opportunistic bison hunter. Instead, they argue that hunter-gatherer groups engaged in large-scale kill events, which were developed and refined by a complex society of groups that relied on one another and used their collective knowledge of bison behavior and topography to their advantage.

Carlson and Bement published their study, "Organization of Bison Hunting at the Pleistocene/Holocene Transition on the North American Plains," in the May 2013 issue of *Quaternary International*. Leland Bement, Research Archaeologist at the

University of Oklahoma, has been working for the Oklahoma Archaeological Survey for over 20 years. Dr. Bement's primary focus is on hunter-gatherer societies on North American Plains. Although over his career he has studied cultures of different time periods, his work for the Survey has focused on Paleoindian bison kills and hunting organization. Kristen Carlson ("K.C." to colleagues and friends) concentrated her graduate studies on large-scale Paleoindian communal killing of bison. Central to her research is analyzing bison jumps and GIS analysis of drive-lane systems. Dr. Carlson is Assistant Professor at Augustana University in Sioux Falls, South Dakota.

### A deadly efficient new strategy of hunting

By the beginning of the Younger Dryas, about 10,800 RCYBP, these societies had begun to shed the tactic of the "small-scale, pond-side, single-animal kill" widely used before, and instead began to use arroyo traps, dune traps, corrals, and jumps to conduct their kills on a much larger scale. By 5000 RCYBP this mode of killing was widely employed, and it all arose from understanding basic bison behavior. These bison kills were originally thought to have been only a means to obtain meat, hides, and bonestock for tools, but Carlson and Bement, together with other researchers, now view these kill sites from a social angle. Departing from the belief that these kills were made by groups that trekked long distances, they speak of cyclical nucleation—the idea that a multi-band society gathered at a specific time and place. These congregations might have engaged in feasting, selecting mates, trading, and exchanging information, social

functions that wouldn't have been available to isolated bands. These sites where bands congregated typically contain far more artifacts than a typical assemblage. They often include artifacts made of exotic materials, a higher percentage of items of cultural value, and tools in various stages of completion or being reworked. These large meet-ups would have been timed for a specific season to ensure abundant resources to feed a gathering of this size. This would require extensive knowledge of the environment and bison migration.

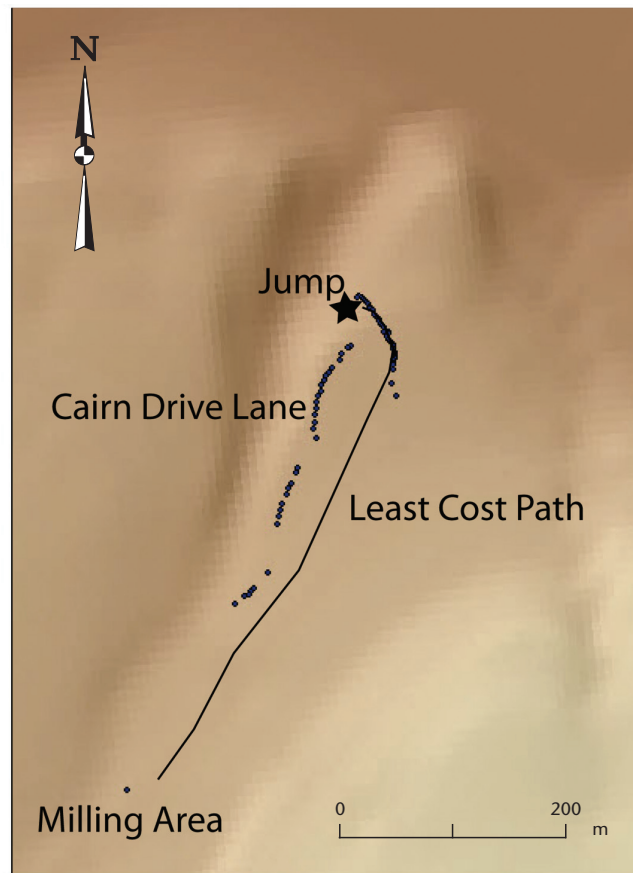
### You jump, I jump, right?

Carlson and Bement's model is backed by their research on herd manipulation at cliff jumps on the Northwest Plains, as well as arroyo traps employed on the Southern Plains. Both large-scale kill techniques were rooted in knowing local topography and understanding bison behavior. Carlson's master's thesis served as the background work for the team's study on the Northwestern Plains bison jumps.

They studied eight bison jump sites from Alberta in Canada to Texas. The majority of these lie in the Northern areas of

Alberta, Montana, and Wyoming; the singular Bonfire Shelter (possibly the oldest known bison jump site) stands alone near Del Rio, Texas. Each of these sites comprised a bison milling area and a drive lane leading to a cliff obscured from view by topographical features. These drive lanes, pathways created by hunters to steer the bison herds from the milling area to the cliff, were marked by cairns. Plains archaeologists originally believed that the cairns served to conceal hunters who would suddenly leap up, shouting and flapping hides to startle bison and funnel them into the drive lane. Current thinking theorizes that these cairns most likely anchored twigs and brush. To poor-sighted bison, the swaying ob-

**This example of a Least Cost Path analysis by Carlson shows how the hunters placed stone cairns between the milling area and jump site to move the bison herd along the drive lane of least resistance.**



FROM LELAND BEMENT

ject may have seemed life-like and would have served as well to shoo them back into the drive lane as a hunter waving his arms. Festooned cairns would also free up hunters to assist at the bottom of the jump, where they would slaughter any bison that survived the fall over the cliff edge.

Knowing the lay of the land would have been extremely important for conducting cliff jumps. Bison won't merrily jump off a cliff just because a couple of cairns tell them to go that way. Each of the eight sites Carlson studied had a cliff that was hidden or obscured within the landscape. Even if bison leading the herd down the drive lane saw the cliff at the last possible moment (usually not until the last 10 to 15 m of the drive lane) and

**Some of the bison-kill sites referenced in Carlson and Bement's QI article (see "Suggested Readings").**

tried to stop, the momentum of the animals behind would have propelled the lead animals over the edge, with the rest of the stampede following suit.

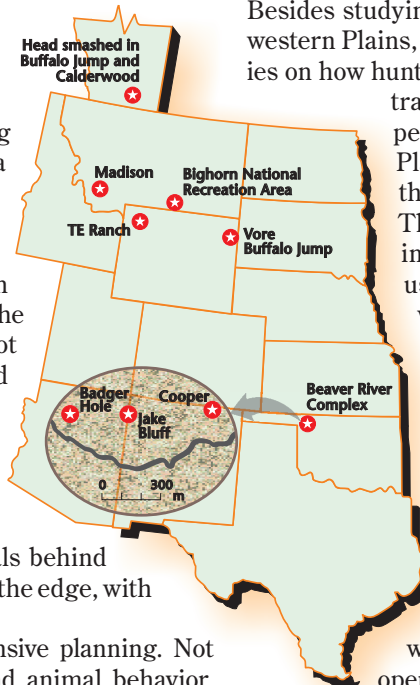
Creating these pathways required intensive planning. Not only did these hunters need to understand animal behavior, they also needed knowledge of the local topography. By working together, these band societies created a preplanned route for a

least resistance.

### Bone beds mark a variant strategy

Besides studying how herds were manipulated on the Northwestern Plains, Carlson and Bement also completed case studies on how hunting groups of the Southern Plains used arroyo traps to their advantage. Dating to the Clovis period, arroyo traps predate the Northwestern Plains cliff jumps and are currently considered the earliest form of large-scale bison hunting. They employ a similar system of drive lanes, but instead of using cairns to define the lane they used existing arroyo walls. Today most of these walls have been obliterated by thousands of years of erosion. The science duo therefore collected much of their information by studying intact bone beds at the three sites of the Beaver River Complex in western Oklahoma. Bement investigated two of these locations, the Jake Bluff site and the Cooper site; Carlson and Bement together did the fieldwork at the Badger Hole site.

The suite of sites spans 700 m of the Beaver River. During their heyday they were dead-end arroyos with steep walls that opened up onto the Beaver River floodplain. A herd maneuvered into the arroyo would be abruptly stalled at the dead end. Lead animals attempting to turn around would be





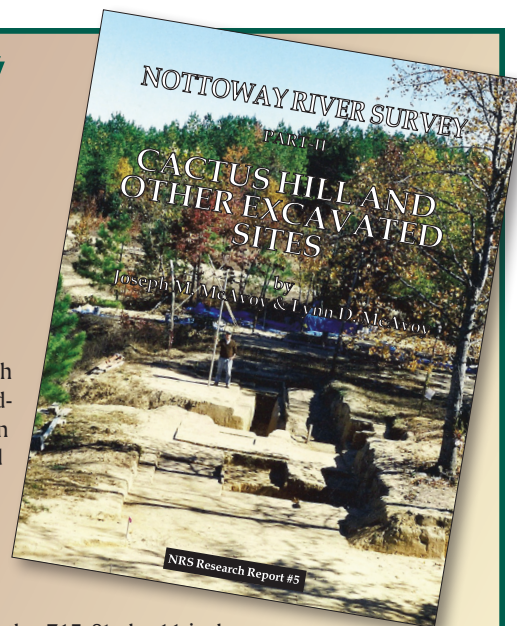
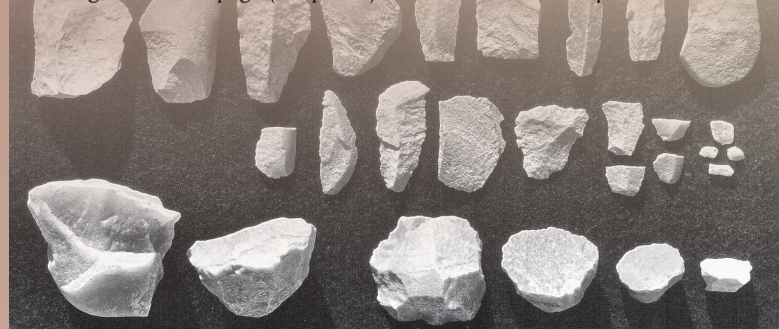
# NOTTOWAY RIVER SURVEY

## PART-II

### CACTUS HILL AND OTHER EXCAVATED SITES

The Nottoway River Survey announces a new book by Joseph and Lynn McAvoy on research into the pre-Clovis, Paleoindian, and Archaic periods of southeastern Virginia in the mid-Atlantic region of eastern North America. Emphasized are new data including radiocarbon dates and other multidisciplinary findings from the NRS excavations in the pre-Clovis and Clovis cultural levels of the well-known Cactus Hill archaeological site.

The 12 chapters of *Nottoway River Survey, Part-II* are introduction and summary, an update on 22 years of NRS pre-Clovis and Paleoindian research, and nine chapters on site excavations centering on the 210-page (Chapter 5) Cactus Hill site final report.



Among the 715 8½-by-11-inch pages are 105 tables, 310 B&W figures, and over 590 photographs, drawings, and graphs. This book is recommended for researchers, teachers, and archaeologists engaged in CRM work in the East. It is an invaluable reference tool for anyone interested in North American pre-Clovis and Paleoindian cultures.

For price and ordering details for *Nottoway River Survey, Part-II*, log on to website

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overwhelmed by the rest of the stampeding herd still rushing forward. Thus was created a perfect opportunity for hunters to attack.

These three sites, which contain the remains of numerous

kills, date to the Clovis and Folsom periods. The Clovis-age Jake Bluff site has been dated to  $10,821 \pm 17$  RCYBP, which falls after the last known Clovis mammoth kills and identifies it as one of the youngest Clovis sites in North America. The minimum number of individuals (MNI) butchered at the kill sites (Jake Bluff, Cooper, and Badger Hole) ranges from 10 to 29 bison. The Jake Bluff site even contains the butchered remains of a black bear.

All the kills occurred in early summer or late fall, and the herds that were harvested consisted mainly of bison cows, juveniles, and calves. During the year bison cows and bulls only come together during the rutting (mating) season, from July to early August. Calves are typically born nine months later in either April or May. Males don't begin to mate until around the age of six, so they typically stay with the cow/calf herd until they're ready to join the bull herd.

Hunters most likely planned their kills during the bison migration season. According to Bement, Beaver River Complex hunters may

Carlson working in a bison bone bed at the Badger Hole site.



LELAND BEMENT





have deliberately focused on cow/calf herds because they understood and respected the menacing temperament of bull herds. From studies of ethnographic records, Bement concludes that “cows with calves are easier to manipulate, and they’re not as dangerous to the hunters as a group that is dominated by bulls. That doesn’t mean they didn’t hunt the bulls during certain times of the year. Their techniques would work for bulls as well, it’s just that cow/calf herds for most of the year were larger groups of animals, and they’re just not as cantankerous as the old bulls.”

### One door shuts, another opens

The considerable planning evident in preparing and executing large-scale bison kills in the Northwestern and Southern Plains of North America reinforces Carlson and Bement’s belief that these hunter-gatherer bands benefited from a complex social network. To understand the local topography, to know different ways to manipulate bison herds, and to organize the cooperative effort of member bands would have required advanced cognitive skills and the authority of a hierarchical social structure.


In the few years since Carlson and Bement published their article they have received a lot of positive feedback. Researchers around the world are now incorporating Carlson and Bement’s model in studies of large-scale herd manipulations in their own countries. “We’ve had real good responses for our techniques,” said Bement. “And what’s happening on the North American Plains relates to situations in other areas, with other animals, ranging from reindeer to onagers.”

Although analyzing these large-scale kills help answer questions about the social aspect of Paleoindian band

**Bement excavating at the Badger Hole site.**



LELAND BEMENT

societies, it also raises many more questions. For example, Northwestern Plains sites included complexes of camps and kill sites, but camps were absent from many of the Southern Plains sites. For Bement, this means that hunters were living farther away from kill sites, which in turn suggests that kills weren’t the cohesive element for these groups. Although groups were hunting in one location, they were apparently congregating elsewhere for a completely different purpose. “The people are there for some other reason,” says Bement, “and it provides some very testable hypotheses to move on and try to figure out. Okay, so where are the people staying, and what else is going on?” 

– Jessy Schroeder

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### Suggested Readings

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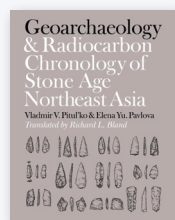
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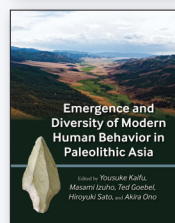
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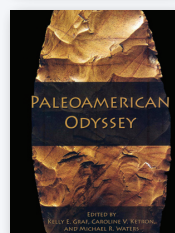
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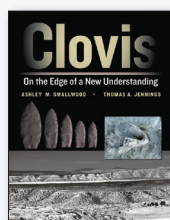
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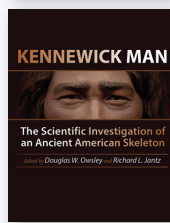
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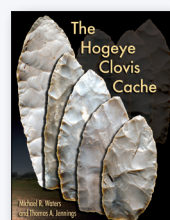
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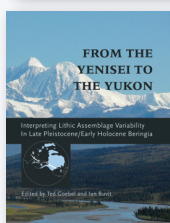
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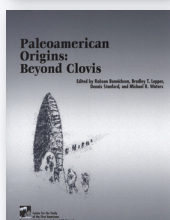
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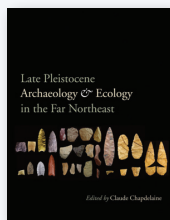
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