MAMMOTH TRUMPET

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Center for the Study of the First Americans
Department of Anthropology
Texas A&M University
4352 TAMU
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www.centerfirstamericans.com

Looking to the Northwest

This life-size icon dominates the Wenas Creek Mammoth site in central Washington State. Found with the 17,000-year-old mammoth skeleton were stone fragments, which may be flintknapping debitage and thus proof of pre-Clovis human presence. For archaeologist Pat Lubinski's team they pose a problem: Can artifacts be distinguished from geofacts? See the story on **page 6.**

In neighboring Oregon, the Willamette Valley is surrendering marvelous specimens of Ice Age megafauna, thanks to ambitious students energized by Woodburn High School biology teacher Dave Ellingson. It's our lead story on **page 1.**

Photo by Lonny Smart, Wenas Mammoth Foundation

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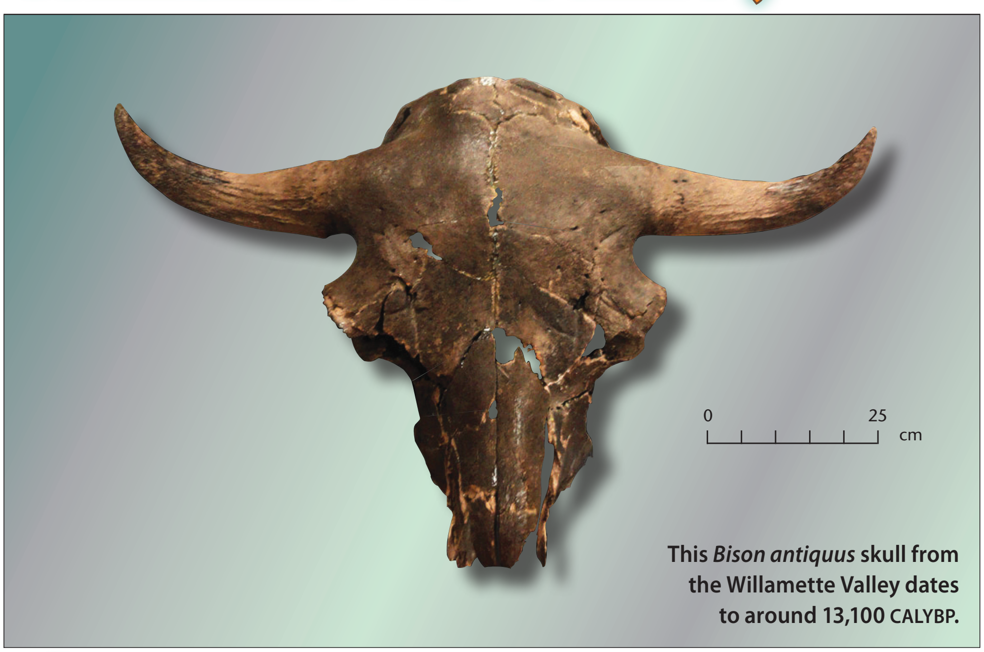
UNEARTHING AN ANCIENT ECOSYSTEM

Megafaunal Remains in the Willamette Valley



DANNY GILMOUR

This *Bison antiquus* skull from the Willamette Valley dates to around 13,100 CALYBP.

ARCHAEOLOGISTS and paleontologists have to dig remains where they're found. To the delight of Oregon scientists and a high school biology teacher, Nature deposited the remains of Ice Age megafauna along the length of the Willamette Valley. This gentle valley in northern Oregon, about 70 km from the Pacific Ocean, runs north-south for about 150 km. Its fertile soil and mild winters tempted thousands of 19th-century pioneers in covered wagons to brave the hardships of the Oregon Trail. Today it's a vista of farms, fields, and forest. A few cities like Portland and Eugene add texture to the sprinkling of small towns.

This peaceful appearance disguises a convulsive past. At the end of the Ice Age, enormous volumes of meltwater from the retreating Cordilleran Ice Sheet filled basins and mountain valleys, creating many Pleistocene lakes. The greatest of these was Lake Missoula, created by an ice dam that blocked the drainage of the Clark Fork River and filled valleys in the Rocky Mountains with 500 cubic miles of water. At present-day Missoula, Montana, the water was 950 ft deep. The ice dam failed many times. The most


ANDY PFANDLER

Gilmour at work in the Willamette Valley.

spectacular failure launched the Missoula Flood, probably the most powerful and destructive flood ever known on this planet. The entire contents of Lake Missoula spilled out and raced southwestward with a flow estimated at more than 400 million cubic ft a second—equal to 10 times the combined flow of all the rivers on Earth!

The gigantic deluge reshaped the Columbia Plateau (**MT 17-3,** "Sentinel Gap: Living on the edge 12,000 years ago"). Blocks of basalt the size of semi-trailers were tossed about like a child's building blocks. The torrent stripped away loess accumulated over millions of years, carved canyons in basalt, and deposited gravel and sediments in unbelievable quantities. The water rushed into eastern Oregon and down the Columbia River. Backed up again at a choke point, the water flooded the entire Willamette Valley to a depth of 335 ft. Geologists estimate that this sequence of events was repeated with varying intensity possibly as many as 80 times 20,000–15,000 years ago.

Time capsules of Pleistocene megafauna

The legacy of this tortured history is scattered Pleistocene bogs that lie buried along the length of the Willamette Valley. In September 2008 the nearly complete skeleton of a bison was unearthed from the bog that had ensnared it. Paleontologists Dave Taylor of the Oregon Museum of Science and Industry and Dr. Alison Stenger of the Institute for Archaeological Studies found that the remarkably well preserved bones belonged to *Bison antiquus*, an Ice Age bison much larger than today's *B. bison* (**MT 26-3,**

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

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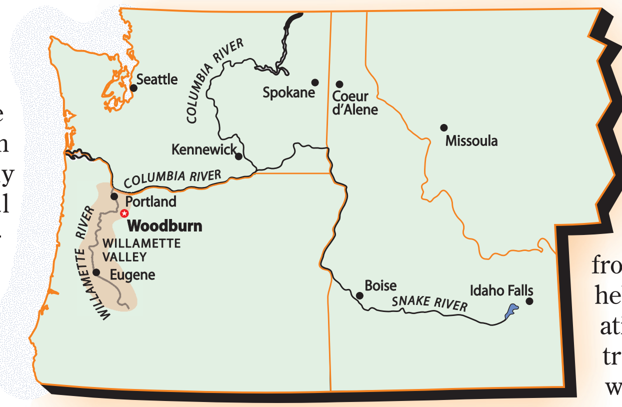
–Michael R. Waters, Director

"Pre-Clovis butchers of *Bison antiquus*"). They found no predatory markings on the bones.

This discovery is all the more remarkable because the team members that excavated the skeleton were freshman students of Woodburn High School biology teacher Dave Ellingson, whose students engage in annual digs. "They have found numerous bison, some of which are mounted in Ellingson's classroom now," says archaeologist Danny Gilmour of Willamette Cultural Resources Associates, who developed a professional relationship with Ellingson during his graduate studies at Portland State University. "We included one of these giant bison in our study featured in *Quaternary Research* (cited as Bison 5), and since then, Dave has found another two bison."



Ellingson tells us that "there aren't many places where you can just show up and start finding extinct animals. They're usually shut off to the community, but this one isn't. I'm trying to create awareness." The Woodburn biology teacher also utilizes the variety of found bones in his comparative-anatomy classes. For instance, he uses hands-on learning to teach students that the femur of a human is similar in structure to the femur of a bison and beaver and some types of birds. "You've got to take advantage of the opportunities that come your way," he says.

Woodburn H.S. in the international spotlight

The extraordinary achievements of Ellingson's students attracted the interest of Professor Alan Cooper, head of the Australian Centre for Ancient DNA at the University of Adelaide. Cooper was recruited from Oxford University in 2005 to head up the Centre with the intention of putting Australia on the international map for ancient DNA research. Cooper journeyed to Woodburn High School specifically to sample the bison skull found by Ellingson's students. Ellingson recalls that Cooper "took a bone from the skull, and a month ago let me know he had successfully sequenced its DNA. He said it was exquisite—one of the best samples he's ever gotten of bison DNA."

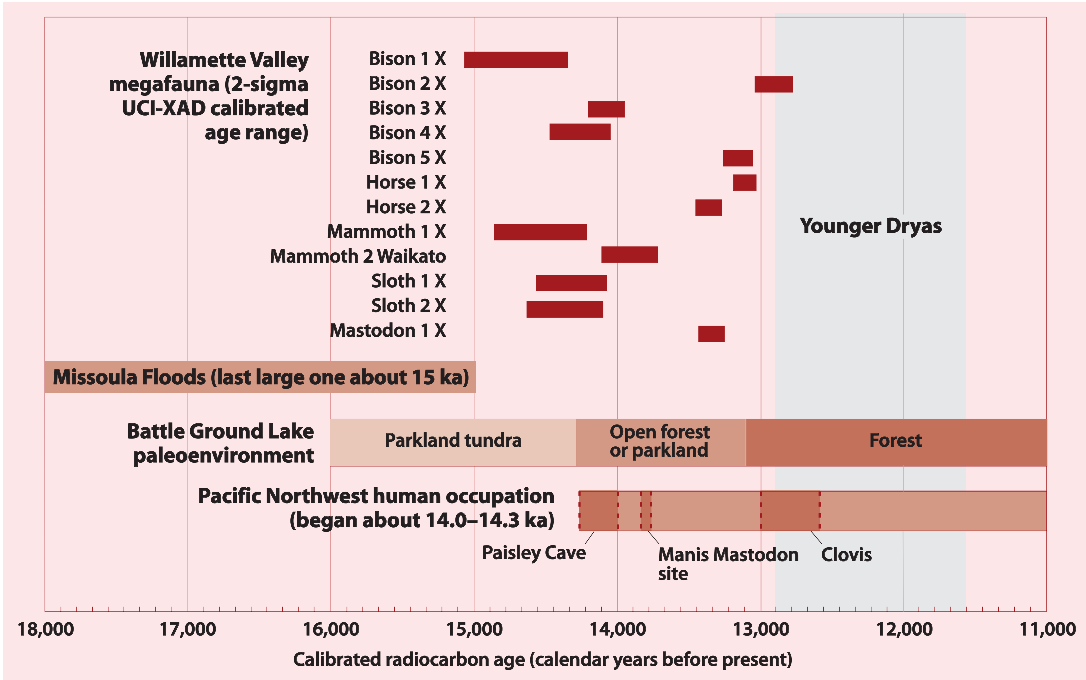
Two different species of bison were present in North America during the Ice Age, *B. antiquus* and *B. latifrons*. *Latifrons* had longer horns. According to Ellingson, that taxonomy may have to be revised. Cooper told him that "based on the DNA it looks like they might be the same species and that *latifrons* was just a variety. He's still working on it and will develop a paper." Ellingson is proud that a good part of Cooper's research stems from what he got in Woodburn. "We're helping students," says Ellingson, "creating community awareness, and contributing to the scientific community as well. We want everyone to take advantage of what we're doing here."

Engaging the community

The success of Ellingson's inspired students is just one example of the rewards made possible by enlisting community support in the search for answers to archaeological questions in the Willamette Valley. Anthropology professor Virginia Butler, Gilmour's graduate instructor at Portland State, remembers when she was contacted a few years ago by a historical society that had found a megafaunal skeleton. "I visited with them," she recalls, "and it occurred to me that there was a project." She was aware that work on megafaunal remains was being carried out mainly by amateurs and historical societies, with early accounts dating to the 1840s, but none rose to the peer-review level; none involved systematically looking at which creatures were there, how old they were, and then getting this work published in an academic setting. Butler explains her plan for accomplishing this task: "I knew that if I could talk a grad student into meeting

ALL: DAVE ELLINGSON

Displays created by Ellingson's students for the Woodburn Public Library: A, bison bones; B, horse bones; C, sloth bones.



Timetable of Ice Age events and megafauna presence in the Willamette Valley.

AFTER GILMOUR ET AL.

with the historical society and going to museums where we have these items curated, while bringing in other scholarship from geology, isotope chemistry and radiocarbon dating, then we'd have a good project." When Gilmour arrived at Portland State University, Butler knew she had found just the student for the project.

When Butler and Gilmour brainstormed topics in 2007 for Gilmour's graduate project, they turned to a task that had sat on Butler's back burner for some time, that of finding someone to collate the megafaunal records of the Valley and impress some order onto them. "As soon as the earliest explorers came to Oregon they were pulling up giant bones," says Gilmour, "and to this day it's very common to see it in the news—farmers digging irrigation ditches or construction workers, digging up large animals. They just found an animal under the football field at OSU."

Enter Ellingson: "And what was this animal buried under the OSU football field? A mammoth. They thought I was the local expert. I went and helped dig it up. Here's the funny thing—the bones were found almost directly under the seat for my season tickets, because I'm a season holder for OSU football! I've been sitting on this mammoth skeleton all this time." He says he keeps telling people he isn't an expert. Perhaps that explains why he enjoys the company of local amateurs and enthusiasts. "We enjoy trying to share the message. Oregon has a lot of bones that have been discovered and will be discovered. Not just mammoth and bison and sloth, but other things out there that are able to tell stories. That's what we want to do, tell stories. It's a puzzle. You find this bone and ask, What animal was it? When did it live? When did it die? What was the environment like?"

Ellingson helping excavate mammoth remains found under the bleachers of the Oregon State University stadium.

DAVE ELLINGSON

Similar questions fuel Butler and Gilmour's professional collaboration. Theirs is a prime example of linking professional knowledge and understanding with community engagement. "That interest is so great for this particular project," Butler says. For instance, the Tualatin community has slanted its tourism toward megafaunal extinction. Butler and Gilmour's radiocarbon dates appear in the promotional literature and on panels and exhibits. Butler states that "our project didn't have much funding, but the community had such a 'can do' spirit, and these questions tend to attract good people." This same generosity of spirit worked in Gilmour's favor when he sent samples to the University of Arizona. Because the university is associated with the National Science Foundation, the NSF-Arizona AMS Facility in the Department of Physics supported Gilmour's project by processing all his samples free of charge.

Toward a professional standard

While Butler and Gilmour maintain that public interest and support are valuable to archaeology, the ultimate goal should be to produce work in a professional context. Butler acknowledges the need to practice sound science: "We won't convince our professional colleagues that we have a kill site or something of that order unless we take extreme care in recovery and documentation methods." Hundreds of fossils have been found over the last 100 years, but most of them are gone. Gilmour laments the fact that "all we have is small records, 'so and so found a leg of a mammoth along this river in 1928,' but where is it now? Who knows?"

Butler and Gilmour agree that by creating a chronology of radiocarbon-dated bone samples, they can acquire a wealth of information even if the samples weren't collected in the most scientific manner.

Making use of existing collections speaks to a conservation ethic that, according to Butler, all scientists should practice. "Archaeology and paleontology have spent lots of time in the last 150 years collecting things, and our museums and institutions hold this record," she says, "so we need a really good reason to go excavate. I stress this to my students because their picture of archaeology is field work, but if you can answer a question with collections that are already in museums, that's what you should do because this record is finite." This is another reason we need to fund museums and make the public aware of the scientific value inherent in collections, to make sure they continue to be important repositories for future scientists who approach them with new questions and new technologies.


ANDREW FOUNTAIN

Butler exploring a Neolithic chambered tomb in Wiltshire, England.

Butler echoes the advice of the archaeology team of Steve and Kathleen Holen, who study museum collections around the U.S. (**MT 28-1,** "Angus Mammoth: Archaeological or tampered paleontological site?"). They examine old collections in search of human-modified bones or artifacts that either weren't recognized or were dismissed by early investigators.

Although much information can be gathered from existing collections derived from a less than perfect context, Butler insists that a scientific context governed by rigid quality-control standards is essential before entering an informed debate about major questions currently being argued by First Americans scholars, for example, Which was the principal agent responsible for megafaunal extinction, human involvement or a change in the climate and environment?


ANDY PFANDLER

Archaeologists (*left–right*) Michael Daniels, Danny Gilmour, and Matt Goodwin excavating a 1-by-1-m unit.

Gauging the role of humans in megafaunal disappearance

Addressing megafaunal remains recovered in the vicinity of the Willamette Valley, Butler finds the evidence for human-megafauna interaction and the role that humans played in megafaunal extinction weak. "The debate of human and climate is a difficult one to disentangle and establish direct causation," she explains. "If humans are involved, you look for things like kill sites—evidence that humans hunted them down and butchered them, but none of the animal remains we documented showed evidence for human butchering or modification. So at least all the animals we've closely examined appear to have died a natural death. Given these larger issues of causation, it'd be difficult for us to say that humans were involved in megafaunal extinction when there's so little evidence."

Even greater problems arise that complicate the task of determining human involvement in megafaunal extinction. Few sites in North America show evidence for human hunters. In one such site, the Manis site on the Olympic Peninsula of Washington state, what appears to be a bone projectile point was found embedded in the rib cage of a mastodon (**MT 27-4,** "Reconsidering the Manis Mastodon"). Using DNA analysis, a team led by CSFA Director Mike Waters determined that the point was itself fashioned from mastodon bone. The rib and projectile were radiocarbon dated at 13,800 calendar years old, which means that the site predates Clovis. Although the site suggests human-megafauna interaction, Gilmour maintains that the evidence is inconclusive because in order to "know for sure that it is a bone point embedded in the mammal's rib cage, you would have to remove the bone point, and that would probably destroy the sample, and that's why no one ever will."

Butler cites the conclusions of researchers Don Grayson and David Meltzer, who note that of 12–15 definitive sites bearing megafaunal remains, all are associated with mammoth and mastodon, and none with horse or ground sloth or any of the

continued on page 11

Artifacts and Geofacts at Wenas Creek

Lubinski (*center*) demonstrating digging methods to two students, 2005.

RICH VILLACRES/CENTRAL WASHINGTON UNIVERSITY

A CONSTRUCTION WORKER building a road in February 2005 near Selah, Washington, had completed grading and was smoothing the embankment when his backhoe hit a large bone. After landowners Doug and Bronwyn Mayo contacted Morris Uebelacker, Professor of Geography at Central Washington University, more bone fragments were collected and transferred to anthropologist Patrick Lubinski's zooarchaeological lab at CWU. The bone was identified as the left humerus of a Columbian mammoth, *Mammuthus columbi*.

From 2005 to 2010 Dr. Lubinski conducted summer field schools on the Mayos' 600-acre property, at a location now called the Wenas Creek Mammoth site. In the 2006 season an attentive undergraduate discovered an object that raised questions about the site—the association between megafaunal remains and possible artifacts, and what the association if true may reveal about the early peopling of the Americas.

Digging for bones

"We tell people we didn't find the bone; the bone found us. There wasn't even a sparkle of imagination that anything like that was there," Doug Mayo says. In fact, if the Mayos had built the road just 6 inches to the right, they might have missed it.

Lubinski's annual field schools for CWU undergraduates were made possible by the Mayos' invitation to turn this unexpected discovery into an opportunity for education. During the first field school, Lubinski and his students concentrated on digging up bones and bone fragments; their focus was paleontology. Lubinski used the site as an interactive learning tool for teaching students how to survey, dig, and study what they find. During that summer and the five that followed, the field school exposed nearly half of the mammoth skeleton and a quarter of a bison skeleton from a single colluvial stratum.

The Mayos encouraged the community to come out and join Lubinski's students in witnessing local history in the making. "A lot of the interest has to do with the geology of eastern Washington shaped by the Missoula Floods," says Mayo, a retired civil engineer, "and we're 300 feet above that, so our critters actually lived and died right where we're finding them. They didn't wash in, and they weren't covered by any flood sediment like most other mammoth finds from central or eastern Washington."

After the megafaunal remains were radiocarbon dated to roughly 17,000 years old, Lubinski knew he was treading on pre-Clovis territory.

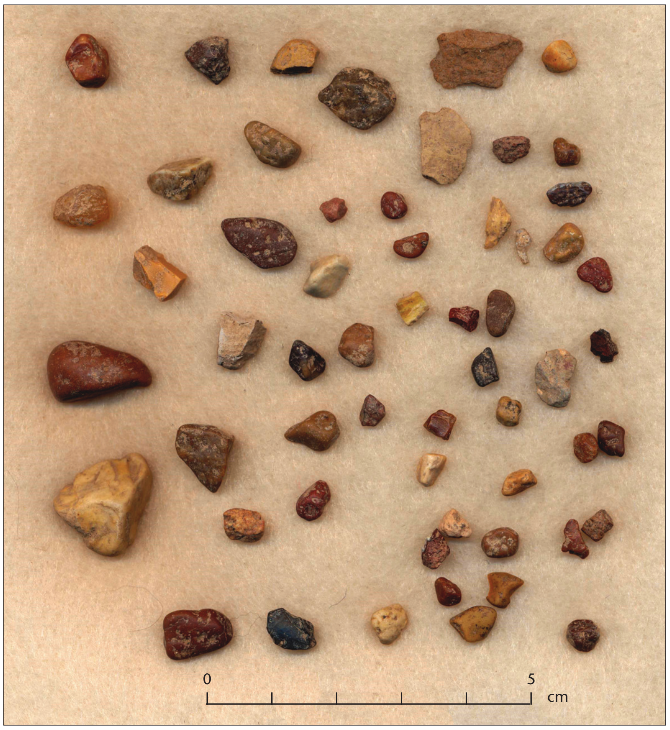
Possible artifacts among megafaunal remains

In the second summer field school, undergraduate student Stacie Cearley uncovered a chipped-stone flake. Instantly Lubinski's project was transformed from a paleontological study into an archaeological adventure because the flake, found in the soil about 15 cm above a mammoth bone, had the appearance of debitage created when a toolmaker knaps stone. "Cearley exposed the top of a flake and then came and got me before moving it," Lubinski recalls. "It was good on her part."

Another flake was discovered in 2007, and Lubinski wondered whether the specimens—labeled catalog 176 and 327 in his study—were human modified, and whether they were associated with the mammoth bones, which were found in the same gravelly layer 20–50 cm thick (labeled Stratum II in Lubinski's study). If the flakes were related to the bones, they were evidence of pre-Clovis hunters. Only a dozen or so sites in the Americas yield strong evidence of mammoths as human prey. Any site earlier than 13,000–14,000 CALYBP is extremely controversial.

Dating possible artifacts to establish megafaunal association

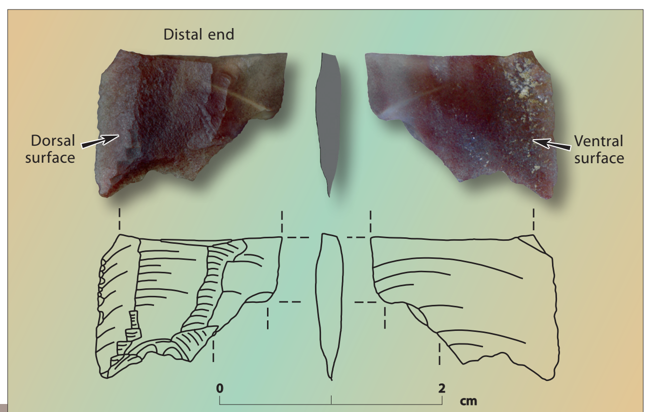
"I didn't expect to find the things that looked like artifacts at all. We were trying to do a paleontology project," Lubinski says, "but I wanted to run this like an archaeological site with fine screening, so that if we did find anything we'd have it in a good location." Certainly Lubinski didn't expect to find what looked like a chipped-stone flake just 15 cm above one of the 17,000-year-old mammoth bones. Given the pre-Clovis age of the underlying bones, Lubinski knew he had to date the possible artifacts if he hoped to confirm megafaunal association.



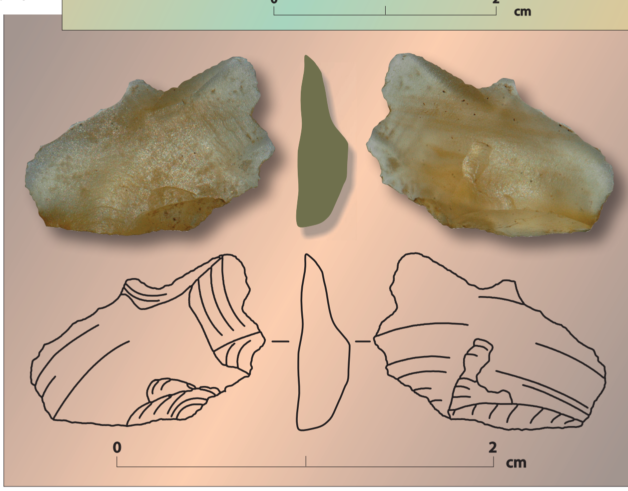
AFTER PATRICK LUBINSKI

Catalog no. 713, matrix toolstone samples used in the test for artifact vs. geofact. These 57 pieces of stone were retrieved from chert excavated from a 5-cm-thick level in a 1.5-by-1.5-m unit and sifted through ⅛-in screen. "These are all the pieces of stone that could conceivably be used to make tools from that level," says Lubinski. "You can see that they are too small and mostly pretty rounded. I doubt that anyone would think these are artifacts."

The possible artifacts were discovered during excavation. Catalog 176 was found in situ; 327 was found in the screen. Although 176 wasn't found in direct association with the mammoth bones, it was dug from the same colluvial stratum with no apparent bedding and is therefore possibly contemporaneous with the mammoth. Stratum II of the site and its constituent bones and artifacts were likely redeposited from a location uphill.



◀ Possible artifact, catalog no. 176. Fractured margins are indicated between pairs of parallel dashed lines.



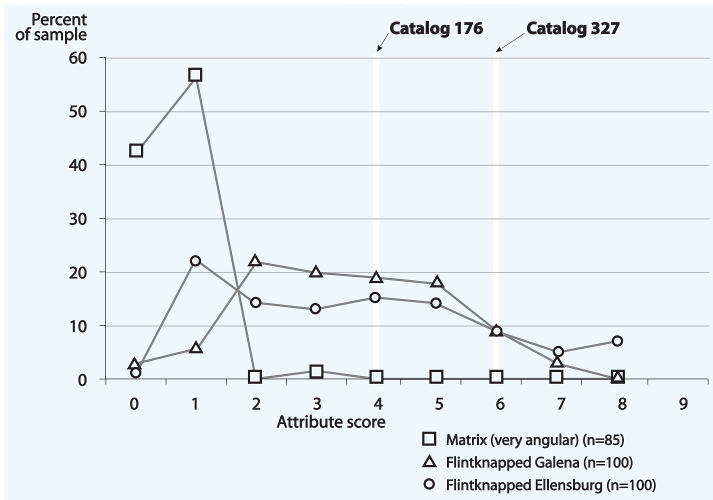
BOTH: AFTER KARISA TERRY

◀ Possible artifact, catalog no. 327.

"We knew we couldn't date the flake directly," says Lubinski, "but we knew we could date the dirt surrounding it." Samples of sediment surrounding catalog 176, found in situ, were subjected to infrared-stimulated luminescence (IRSL) analysis by James Feathers, director of the Luminescence Dating Laboratory at the University of Washington. The objective was to date grains of dirt around the possible artifact to see if their age was consistent with the radiocarbon dates of about 17,000 CALYBP. "The process looks at how long it's been since that grain of dirt has seen the sunshine," Lubinski explains. If you can take a sediment sample that has been long buried, keep it in the dark, and bring it to a lab to shine a laser on it, you can measure how much energy it releases and calculate how long it's been since the dirt saw sunshine.

When 94 sediment grains from the four IRSL samples around the artifact were collected, 80% of them resolved to the age of 16.8 ± 0.9 ka. This age range nicely overlaps the average age of all 8 radiocarbon dates (16.8–17.2 ka) obtained from bones in colluvial Stratum II layer at the Wenas site. These results confirm that most of Stratum II remained undisturbed from bioturbation, which means that the artifact was deposited at about the same time as the bones at the site. The burial events therefore predate Clovis. A more conservative interpretation of these results, however, notes that 20% of grains resolved to an age of 5.1 ± 0.5 ka, which means that the artifact may be a later intrusion, possibly a result of bioturbation. In other words, the artifact could be a Holocene intrusion into the Pleistocene layer containing the bone specimen.

The age of the artifact is ultimately a matter of probability. A pre-Clovis age for the artifact is probable, but researchers can't discount the possibility that localized mixing occurred at the flake location. To establish a pre-Clovis presence at the Wenas site requires proof beyond reasonable doubt, which lies beyond the reach of Lubinski's study. Nevertheless, Lubinski's team has shown the value of single-grain luminescence dating in investigating early sites.



FROM JOURNAL OF ARCHAEOLOGICAL SCIENCE 52 (2014)

How possible artiifacts catalog 176 and 327 scored on the Lubinski team's test for artifact vs. geofact, compared with toolstone rubble from the site matrix and specimens flintknapped by Terry from Galena and Ellensburg chert.

Artifacts or geofacts?

With the age of the possible artifacts reduced to the narrowest window possible by current state-of-the-art technology, the next task at hand was to confirm their legitimacy, to ascertain that they were products of toolmakers and not the result of random acts of nature.

In 2009 Lubinski invited Karisa Terry, Senior Lecturer in anthropology at CWU, to examine the possible artifacts from the Wenas site. Terry has analyzed lithic tools from Upper Paleolithic sites in Japan and Siberia. Upon initial observation, she concluded that their features indeed looked "artifact-ey." But how could she verify that they were lithic objects modified by humans and not shaped by natural agents?

Lubinski added Patrick McCutcheon, CWU anthropology professor and lithics expert, to the team as a consultant on developing a system for distinguishing artifacts from geofacts.

	Typical of geofacts	Typical of artifacts	References■
Characteristics supported by tests			
Identifiable dorsal & ventral surface	Absent	Present	Yes: 2
Platform cortex	Present	Absent	Yes: 5 No: 6
Differential weathering of flake scars	Present	Absent	Yes: 3,5,6
Bulb of percussion	Absent	Present	Yes: 5,6 No: 3,4
Bulb of percussion shape	Diffuse	Pronounced	Yes: 3,5,6 No: 1,4
Eraillure scars (bulbar scars)	Absent	Present	Yes: 4,5,6 No: 3
Fissures	Absent	Present	Yes: 6
Dorsal flake scar count	None or few	Multiple	Yes: 3,4,5,6
Dorsal flake scar orientation	Not parallel	Parallel to medial axis	Yes: 1,3,4,5,6
Dorsal cortex	Present	Absent	Yes: 3,4,5
Characteristics not supported by tests			
Exterior platform angle	>90 degrees	<90 degrees	Yes: 1 No: 3,4,5
Platform faceting	Absent	Present	No: 6
Ripple lines	Absent	Present	No: 3,4,6

■ 1 Barnes (1939) 2 Bradbury (2001) 3 Luedtke (1986) 4 Nash (1993) 5 Patterson (1983) 6 Peacock (1991)

Table of attributes associated with geofacts and artifacts considered by Lubinski's team in scoring possible artifacts. Note that authorities cited by Lubinski's team ("References") aren't unanimously agreed upon which characteristics distinguish geofacts from artifacts. This table is a valuable tool for determining whether a lithic object is an artifact. Ultimately, however, the lithics analyst must make a judgmental decision based on the observed characteristics and the stratigraphic context of the specimen being examined.

At the outset of the investigation McCutcheon defined the task ahead of them: "How do you deal with a situation like this when you have minimal artifact presence and maximal broken chert (geofacts)?" As a start, Lubinski, Terry, and McCutcheon tested the two possible artifacts against the following criteria:

- Attributes expected of artifact debitage and geofact waste based on published experimental data (see table below);
- Stone fragments present in the site matrix (dug material);
- Two flintknapped samples.

After comparing catalog 176 and 327 with objective criteria in published scientific data, Terry says, "We took the toolstone matrix that was collected by Pat Lubinski and his students over the years, and we looked at the attributes." The team recorded the attributes of cryptocrystalline silicate (CCS) specimens (geofacts) recovered from the site matrix. Imagine spending several field seasons gathering natural rock from a particular hillside, documenting its features, then comparing possible artifacts with the rock sample.

Comparing the flakes with natural rock fragments yielded few similarities. The next step was to compare the possible artifacts with objects known to be human-made. Terry created flintknapped pieces for this phase of their investigation. "Hypothetically, if they're really human-made artifacts they should be more similar to the material somebody sits down and chips than to the natural rock found on the hillside," says Lubinski, "so now we're going to look at the material we just chipped to record those features in much the same way we recorded for the natural rock. Then we'll make a graph and show that the things we say are artifacts are more similar to the human-chipped stuff than to the natural stuff."

Scoring system

The possible artifacts, catalog 176 and 327, were then scored for the 10 attributes used in comparing them with stone fragments and with the flintknapped debitage representative of cultural material (see table). The scoring system, extremely conservative by design, intentionally weighs against a geofact's falsely passing for an artifact. Points are scored for the presence of attributes of experimentally human-made artifacts, and no attribute is weighted more than the others. In Terry's words, "The higher the score, the greater the number of artifact attributes. If an object scores 1, it has one of those attributes. When we get to 9, it's solidly an artifact."

The result of the tests? The two possible artifacts, catalogs 176 and 327, matched more closely flintknapped debitage than geofact waste. Catalog 176 exhibits 4 attributes consistent with artifacts and 3 attributes consistent with geofacts; catalog 327 exhibits 6 artifact attributes and 3 geofact attributes. Thus catalogs 176 and 327 have scores of 4 and 6, respectively. McCutcheon was surprised by "how distinct the two possible artifacts were from the other pieces of chert fragments using our coding system." Even though the two possible artifacts possess both artifact and geofact attributes, the expressed artifact attributes are more numerous and compelling. Both possible artifacts fall well within flintknapped sample distributions and are distinct from the sample distribution of stone fragments.


RICH VILLACRES/CENTRAL WASHINGTON UNIVERSITY

Three students and the first vertebra of the Wenas mammoth.

Viewing the study in perspective

The results of this study aren't definitive, but only a probable conclusion based on statistical analysis.

Terry was surprised that about 20% of the samples of knapped specimens scored equally as low as the geofacts. That bothered Terry until she realized that it was probably a consequence of the Ellensburg chert she knapped for samples, which is of low quality. She recalls that when she knapped Ellensburg chert, "a lot of it fell apart on me, so I think that's part of the reason why there was a high percentage of the knapped samples with a low attribute score. It shattered as I knapped it." The Galena sample, on the other hand, was of higher quality.

The helter-skelter confusion of the megafauna skeletal remains complicated the study of the Wenas Mammoth Creek site. "Just looking at the map of the bones," Lubinski tells us, "they're all mixed up. A mud slide probably brought them down that hillside. It's not likely to give us definitive answers because it's already complicated, but that doesn't mean we should just give up. We should learn all we can from it."

The researchers are optimistic that their methodology may be adapted and prove useful in other studies. "One thing we need to do is take these data and our scoring system and try them out on other sites," Terry says. "There are early sites in Japan and in Siberia that are disputed, so maybe something like this could be used over there as well." Although their scoring system failed to prove that catalogs 176 and 327 are definitely artifacts, the methodology they employed at Wenas Creek may produce more conclusive results at other early sites.

Supporting STEM education

All this research at the Wenas site wouldn't have been possible without the continued interest and support of landowners Doug and Bronwyn Mayo. The first mammoth bone was discovered on their property, and they have since welcomed researchers, undergraduates, and public school children to the site to explore the world of archaeology and paleontology. Doug, a retired civil engineer, and Bronwyn, a retired community-college instructor, now work full-time creating educational opportunities related to the site. "It was part of the deal from the get-go that this would be available for the public," Doug says.


RICH VILLACRES/CENTRAL WASHINGTON UNIVERSITY

Student Stacy Stanley using a gentle air hose to blow dirt off bones, 2006.

The dig was open for 2 to 3 weeks during each of the 6 field seasons. "We estimated about 120 people a day coming to see the work being done," Bronwyn recalls. "It was pretty popular. We had people from all over the world that came here to see this dig." The Mayos kept a guest book, which verifies that more than 2,000 people visited the dig site each season.

Pat Lubinski suffered from a glut of riches. "Over the course of the project, we had over 9,000 people visit the site," he says.

The spectacular success compelled him to hire two teaching assistants, one to help him teach students archaeological and paleontological methods in the field school, the other to guide daily tours to the public every half hour. A number of retired people in the area graciously volunteered their time. The site boasts an impressive website (http://www.cwu.edu/mammoth/), the brainstorm of the parent of one of Lubinski's undergraduates who was skilled in creating a virtual tour of houses for sale. He said to Lubinski, "Why don't I make a virtual tour of the mammoth dig?" Today Lubinski can boast that "if you go on our website there's a way to look around in 3 dimensions to see what we were doing."

Success breeds success. Bronwyn Mayo is proud of their efforts to achieve official recognition of the site: "One of the first things we accomplished was getting the mountain officially named 'Wenas Mammoth Mountain.' It went through the State and U.S. naming committee, and now it's called that on the map." Last year the Yakima Skill Center, a trade school for high school–age students, sent a class of construction students to build the foundation on which the life-size mammoth silhouette now stands to mark the entrance to the Wenas site.

Doug and Bronwyn Mayo at the entrance to the Wenas Creek Mammoth site.

DOUG AND BRONWYN MAYO

The gift of learning

In 2012 the Mayos formed the Wenas Mammoth Foundation, a nonprofit 501(c)3 organization (wenasmammoth.com) whose mission is to preserve the site and utilize it for K–12 education with an emphasis on STEM. More than simply create public access, they wanted the Wenas Mammoth site to have educational value by reaching students struggling to engage in the classroom. The Foundation's board comprises science educators and coordinators. Bronwyn, herself an educator, created a K–12 curriculum centered on the dig that also embraces the history, geography, and geology of the area. She received help from Lubinski and other professors at CWU because she wanted to get the information "fresh from those that know." Some of the topics covered include "Identifying Mammoth Skeletons and other Ice Age Specimens," "Habitat and Biological Evolution of the Proboscidean Family," "The Teeth and Tusks Can Tell a Story," and "Analyzing the Soil for Clues." Each lesson includes plans for the instructor and worksheets that can be tailored for individual classrooms or students.

The dedication of the Mayos appears to be limitless. They purchased a 20-ft-long trailer and converted it into the "Wenas Mammoth Mobile Educational Exhibit." Part traveling museum, part nontraditional classroom, the mobile exhibit is chockfull of prehistoric information, graphs, timelines, and casts of bones found at the Wenas site. It reaches students by literally bringing the gift of learning to them, and it also travels to schools, community centers and events, and retirement homes. Bronwyn says, "We received a grant from Legends Casino, which is owned by the Yakama Nation, for supplies, and the West Valley woodshop students built the display cabinets inside the trailer. In everything we do, we try to make sure students are included." This year the casino gave the foundation another grant, which the Mayos used to buy two 40-ft cargo units; one will be used for storage, the other will function as a lab or classroom at the site. "We want to open up part of the hillside for K–12 science classrooms for field trips," Bronwyn tells us. "We're hoping that in the summer, kids can spend a week here learning unique skills."

The Wenas Creek Mammoth site is a gift that keeps on giving, thanks to the remarkable efforts of all those involved. Not only has it inspired Lubinski's research and informed his undergraduates, it has given the Mayos an opportunity to influence public education for good. Stacie Cearley, Lubinski's student who first discovered the most promising possible artifact in 2006, went on to earn an M.S. in Quaternary Science at the University of London and now works as an archaeologist in Washington State. Her success story showcases one example of how the site has lighted

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Featured websites http://www.cwu.edu/mammoth/
http://wenasmammothfoundation.com

the path for advancement for an eager student. If the Mayos have it their way, more students will be similarly rewarded.

How successful was the Wenas Mammoth dig?

The ingenious scoring system created by Lubinski's team can't prove conclusively that the possible artifacts are indeed the product of human toolmakers. As for their age, they probably date to before the Clovis culture, but researchers can't discount the possibility that localized mixing occurred at their location in the stratum. To establish a pre-Clovis presence at the Wenas site requires proof beyond reasonable doubt, which lies beyond the reach of Lubinski's study. Lubinski poses the rhetorical question, Is it frustrating not to have definitive answers? "Maybe," he answers, "but that's the reality at most archaeological sites anyway."

Nevertheless, the gains are enormously rewarding. Lubinski's team has demonstrated the merit of scoring systems in distinguishing artifacts from geofacts, and has proved the value of single-grain luminescence dating in investigating early sites. Finally, McCutcheon leaves us with a tantalizing morsel: "Lithics aren't the only clues here, either. There are other studies that Dr. Lubinski is doing that will help us understand the association better in the future, so stay tuned!"

–Katy Dycus

How to contact the principals of this article:

Patrick Lubinski
Professor of Anthropology
Central Washington University
Department of Anthropology and Museum Studies
400 E. University Way
Ellensburg, WA 98926-7544
e-mail: lubinski@cwu.edu

Karisa Terry
Senior Lecturer of Anthropology
Central Washington University
Department of Anthropology and Museum Studies
400 E. University Way
Ellensburg, WA 98926-7544
e-mail: terryk@cwu.edu

Patrick McCutcheon
Professor of Anthropology
Central Washington University
Department of Anthropology and Museum Studies
400 E. University Way
Ellensburg, WA 98926-7544
e-mail: mccutchp@cwu.edu

Bronwyn and Doug Mayo
Wenas Mammoth Foundation
2741 S. Wenas Road
Selah, WA 98942
e-mail: wenasmammothfoundation@gmail.com
Facebook.com/WenasMammoth

Megafaunal Remains in the Willamette Valley

continued from page 5

other dozens of megafauna that went extinct. Whether you debate the evidence at the local level, as Butler and Gilmour did, or adopt a more continental view, in Butler's view "the human overkill model [advocated by Paul Martin] seems a bit off; it's hard to find support for it." Simply put, only 12–15 sites bear evidence of human association with megafaunal remains, and only mammoth, mastodon, or bison is present at any site. She allows, however, that since there aren't many sites that date to that time period, the lack of evidence for this killing could reflect the small sample size.

"When I go back to that 13,000-year record," Butler says, "I'm not overwhelmed with evidence that people were responsible for the disappearance of megafauna, but I'm okay with thinking people contributed. I just think climate probably had more to do with it."

The role of climate and the environment in megafaunal disappearance

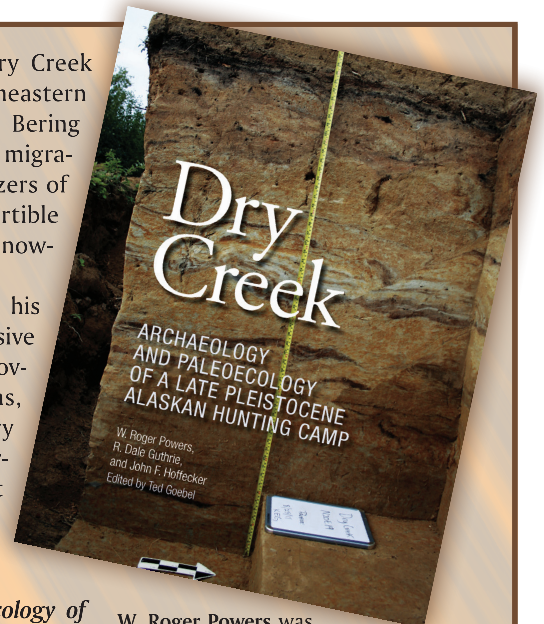
Vegetation reconstructions show that the period of 15,000–12,800 years ago was optimal for supporting megafauna that preferred open grassland and sparse canopy in the Willamette Valley. After the Missoula Floods, immense flood deposits and temporary lakes formed on the surface and eventually became swamps and bogs. "And that," says Gilmour, "is where you get the megafaunal remains." Large mammals thrived in this habitat of open parkland conditions ideal for grassland grazers. Gilmour and Butler's study features 12 such mammals: 5 bison (*B.* sp./*B. antiquus*), 2 mammoth (*Mammuthus* sp./*M. columbi*), 2 horse (*Equus* sp.), 2 sloth (*Paramylodon harlani*), and a single mastodon (*Mammut americanum*). Their C:N isotopic signatures reflect a diet primarily of C_3 plants, chiefly cool-weather grasses growing in open environments, which is consistent with the fact that Pleistocene herbivores at latitudes above 45 degrees consumed almost exclusively C_3 plants. As Butler puts it, "We are what we eat." Food enters our tissues and becomes a record of our lives.

About 13,000 years ago, however, these conditions started to change. The youngest megafaunal sample in Gilmour and Butler's study, Bison 2 (which lived 13,251–13,070 years ago), approximately coincides with the North Atlantic 12,900 CALYBP onset of the Younger Dryas and subsequent regional cooling and transition to more forested conditions.

Our knowledge of the Younger Dryas phenomenon derives from the Greenland Ice Core Project. Ice cores contain information about past temperature and many other aspects of the environment. Ice encapsulates small bubbles of air that contain a sample of the atmosphere, and from these it's possible to measure directly the past concentration of gases (including carbon dioxide and methane) in the atmosphere.

Gilmour argues that referring to the Greenland Ice Core isn't invariably a good measure of environment change. In Texas and the Southwest, researchers find very little evidence for the Younger Dryas. In Oregon, on the other hand, "when we throw up these comparative measures, we're definitely seeing the Younger Dryas in the Valley." Trends in temperature variations seen in Greenland parallel those in Oregon caves.

Around the time of regional cooling brought on by the Younger Dryas, as demonstrated by temperature levels in the Oregon caves, the open grasslands of the Willamette Valley transitioned into forestland. Gilmour names many factors that contributed to the disappearance of megafaunal herbivores from the landscape: the reduction in grazing land; the change in the composition of the flora they fed on; and the expansion of glaciers in the Cascade Range, which produced abundant runoff into the Valley and massive aggradation.



Localized clarity

Butler was shocked that the record was so clear that, as she puts it concisely, "Missoula floods leave: animals. Cold: no more animals." Gilmour was also surprised at the abrupt changes around 13,000 years ago. "Everything stops at the onset of the Younger Dryas," he says, "but we don't know the exact timing and don't have a good understanding of how long it took for certain species to disappear. The goal of this project was to observe a few species of large herbivores and see what the reaction was in one specific small region."

–Katy Dycus

How to contact the principals of this article:

Virginia Butler
Professor of Anthropology
Portland State University
1825 Southwest Broadway
Portland, OR 97201
e-mail: butlerv@pdx.edu

Danny Gilmour
Willamette Cultural Resources Associates
2827 NE M L King Blvd
Portland, OR 97212
e-mail: danny@willamettecra.com

Dave Ellingson
Woodburn High School (Webss program)
1785 N Front St.
Woodburn, OR 97071
e-mail: dellingson9@yahoo.com

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NIKOLAI OVODOV

Canid skull and mandible discovered at Razboinichya Cave, Siberia, dated to 33,000 CALYBP.

From predator to best friend

What we know about the origin of dogs

Part 1 of 2

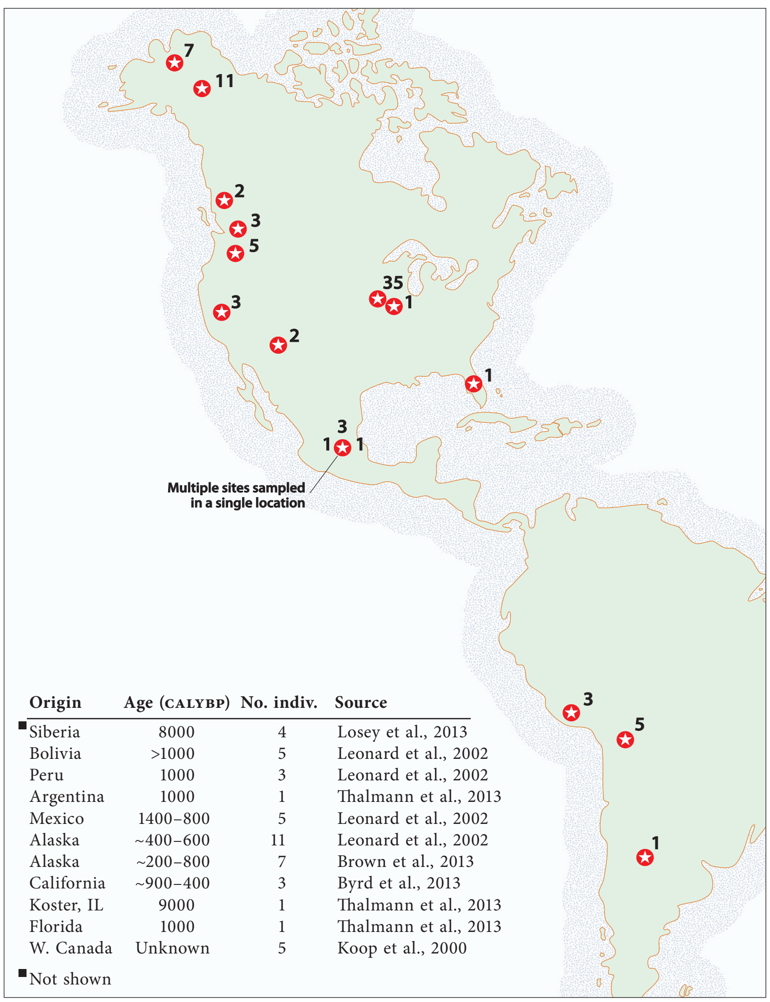
BY NOW you've probably heard that biologists no longer consider the domestic dog a distinct species, but rather a subspecies of gray wolf: *Canis lupus familiaris,* to use the scientific term. If this is news to you, well—surprise! Your 3-pound Yorkie belongs to the same species as White Fang and the Big Bad Wolf. The dog genome is just too similar to the gray wolf's to constitute a separate species. This shouldn't come as too much of a shock; after all, wolves and dogs can interbreed and produce fertile offspring.

Since dogs are so much a part of the human experience, including that of the First Americans, we at *Mammoth Trumpet* have an abiding interest in their biological origins—especially in terms of when, where, and how this predator joined forces with our ancestors to become the very first species we domesticated. We've previously looked at subjects canine in 2009 (**MT 24-4,** "Big black wolf"), in a three-part series in 2010 (**MT 25-2, 3, 4,** "On the trail of the domestic dog"), and in 2013 (**MT 28-2,** "Ancient Siberian canid skull raises questions"). Now, in 2016, it's time for an update.

Land of confusion

Even a cursory review of the state of research on dog origins reveals one certainty: The matter is, to put it mildly, rather confusing. Some might call it an ungodly mess. You'd think that with improved techniques for extracting and analyzing DNA, not to mention extensive genome mapping and several different types of DNA to study, pinpointing the origin of dogs would be an easy task. But what we see is spatial and temporal anarchy. Theorized locations of the origin are literally all over the map, and postulated origin dates span a range of 20,000 years.

We know for certain that dogs split off from wolves fairly recently and that the populations of both dogs and wolves suffered a severe bottleneck sometime around the end of the Pleistocene. According to studies recently published by Thalmann et al. in *Science* and by Freedman et al. in *PLOS Genetics,* the wolf population that spawned both dogs and modern wolves is now completely extinct.



Origin	Age (CALYBP)	No. indiv.	Source
■Siberia	8000	4	Losey et al., 2013
Bolivia	>1000	5	Leonard et al., 2002
Peru	1000	3	Leonard et al., 2002
Argentina	1000	1	Thalmann et al., 2013
Mexico	1400–800	5	Leonard et al., 2002
Alaska	~400–600	11	Leonard et al., 2002
Alaska	~200–800	7	Brown et al., 2013
California	~900–400	3	Byrd et al., 2013
Koster, IL	9000	1	Thalmann et al., 2013
Florida	1000	1	Thalmann et al., 2013
W. Canada	Unknown	5	Koop et al., 2000

■Not shown

AFTER KELSEY WITT

Locations of archaeological sites in North and South America containing dog remains from which mtDNA sequences were obtained. The number at the site identifies the population size.

Proto-dogs alone suffered at least a 16-fold reduction during domestication, and a similar "sharp bottleneck" occurred among wolves soon after the divergence. Thus wolves alive today aren't as closely related to dogs as initially hoped, which makes it difficult to pinpoint their origin.

Although six years have passed since our three-part series on dog origins, the picture is murkier than ever. Analyzing DNA from different sample populations yields wildly different origins in both time and space, leading to the possibility, as Skoglund et al. note in *Current Biology,* that "the ancestry of present-day dogs is derived from multiple regional wolf populations." Add the complete extirpation of wolves in several parts of the world, including the crucial region of Asia south of the Yangtze River (ASY), and the picture becomes all the more confusing.

The dump that feeds you

How dogs evolved from wolves is much easier to understand. Unlike dogs, wolves are obligate carnivores: They must eat meat because most of them can't digest starches. But as you probably know from your own dog's behavior, dogs can digest just about anything. So imagine what happened when wolves started coming across kitchen middens left behind by omnivorous humans. There may have been some tasty bones or viscera there, but some of the edible garbage would have been plant remains, replete with starches. "The most common theory is that in a first step of domestication, wolves domesticated themselves a little," says Peter Savolainen of the Royal Institute of Technology in Solna, Sweden. According to this theory, individual dogs that could more easily digest starch—from sheer random chance in the genetic lottery—would have survived longer and thereby enjoyed greater reproductive success.

Witt in her office.

THE UNIVERSITY OF ILLINOIS, URBANA-CHAMPAIGN

Swedish molecular biologist Olaf Thalmann, whose research indicates dogs evolved more than 30,000 years ago, doesn't entirely agree with this theory. "This is a bit tricky," he says, "as the necessity to digest starch only became important after the Agricultural Revolution—which happened only some 10,000 to 12,000 years ago, and thus does not really coincide with the suggested onset of dog domestication." First Americans guru Stuart Fiedel agrees. "The importance of starch digestion is ambiguous. If domestication occurred in the north, in an Upper Paleolithic context before 16,000 cal BP, the human diet would have included very little plant food. The emphasis shifts to human selection if the most important factor was genetic determinants of reduced fear and aggression behaviors."

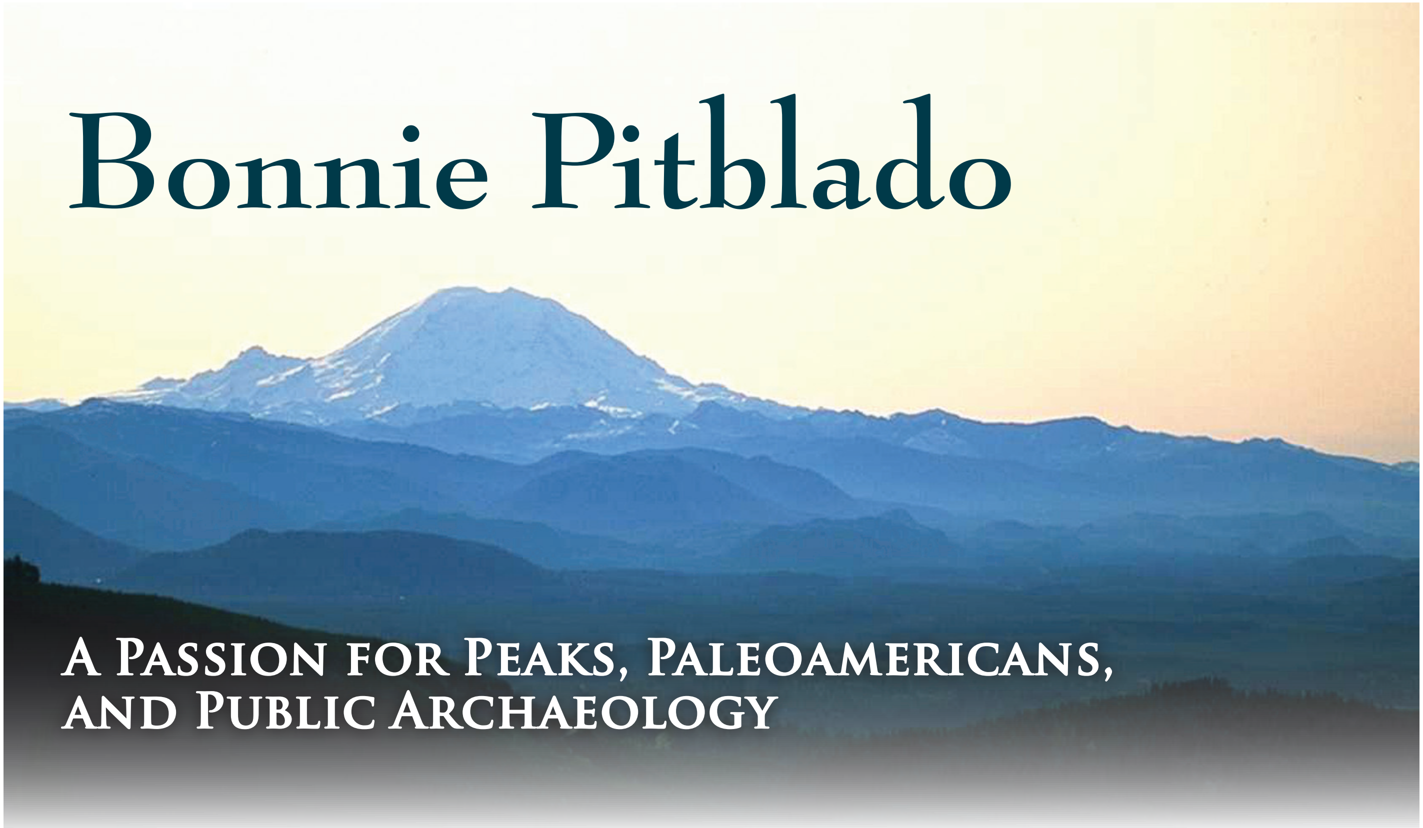
In any case, a canine generation is short, only about two years long; and if the starch theory is correct, selective pressures would have favored wolves capable of digesting starches. Eventually they would have evolved into omnivores, and, in time, "Somehow started living together with humans, forming a population more or less isolated from other wolves," says Dr. Savolainen. "The humans only accepted (consciously or unconsciously) the most docile individuals. Those individuals got more food and thus had more offspring. . . . Hereby, gene variants for docile and non-aggressive behavior were inherited from wolf to dog, while the 'bad' gene variants were not." By then, proto-dogs had become a codependent species, serving as camp guardians, garbage disposals, companions, beasts of burden, ritual animals, and occasionally a source of food.

This is no "just so" story, created to fit the facts; there's plenty of evidence to support it. Unlike most wolves, all dogs have multiple expressions of the gene for amylase, an enzyme necessary for digesting starch. Olaf Thalmann believes the ability to digest starch allowed dogs to coexist successfully with humans during the Neolithic. "I do not see this as a 'trigger' for domestication, but rather a selective advantage," he cautions. "I think that the domestication process started way earlier, independent of the consumption of starch."

Behaviorally, dogs and wolves are quite different. This may be because dogs retain into adulthood characteristics that, in wolves, are juvenile traits. Some experts claim the mental maturation of dogs ceases at about the age of a 10-week-old wolf puppy. This may explain the relatively non-aggressive temperament of dogs, and what Savolainen calls "their adaptation to follow humans and understand their signs."

Depending on the breed, the physical differences between dog and wolf can be subtle. Dogs tend to have a shorter snout than wolves, which results in tooth crowding, even in breeds with long snouts. The dog skull is also rounder and typically smaller than that of a wolf, which suggests that adult dogs retain some juvenile physical traits as well—a tendency also seen in humans. Wolves almost invariably have yellow eyes. So do some dogs. Other eye colors in dogs include blue, brown, and black. Wolves have narrow chests and hips, long legs, and large paws, which outfit them for running large distances. These physical attributes are also found in some dog breeds, though usually not simultaneously or to the same extent. And except for such breeds as huskies and Shepherds—among the most wolfish of domestic canines—most dogs also have floppy ears. Not all these traits are visible in the fossil record, but many are.

–Floyd Largent



Bonnie Pitblado

A Passion for Peaks, Paleoamericans, and Public Archaeology

At first glance she looks like a fashion model, but Bonnie Pitblado, currently the Robert E. and Virginia Bell Endowed Professor in Anthropological Archaeology at the University of Oklahoma, is serious about digging in the dirt—specifically the sifted sediments of archaeological excavations. She got her feet wet (well . . . not literally) at the University of Arizona Department of Anthropology, where her interests, originally in the archaeology of the Southwest, took an abrupt turn when she enrolled in C. Vance Haynes's Paleoindian course. "I was hooked forever," Pitblado says, "not by the artifacts—-although they are fascinating—but by the myriad questions provoked by each new Paleoamerican discovery." She completed her M.A., then in 1999 her Ph.D. at Arizona, where she received a commendation for her outstanding dissertation and defense.

"Bonnie Pitblado was, without question, one of the finest students I have had the pleasure of knowing," says C. Vance Haynes. "In my teaching, Bonnie was very good about asking me to clarify anything she did not completely understand, particularly in identifying projectile points and chronology. She is a superb field archaeologist in excavating and recording as well as in teaching others. It was a real pleasure to work with her."

Eight years after Pitblado's birth in Forest Grove, Oregon, her family moved to Connecticut, making her a child of both coasts, but it was camping trips to the mountains with their majestic peaks that wormed their way into her heart. "Archaeology became my calling," she

STEPHANIE STUTTS

Pitblado on top of Elk Mountain in the Wichita Range of southwestern Oklahoma, June 2014. She remarks that "it sure was a delightful surprise to discover that within 75 miles or so of home, I can enjoy spectacular mountain vistas here in Oklahoma!"

tells us, "because it combined my love for research and mysteries with the opportunity to be outdoors among the mountains that nourish my soul."

While an associate professor of Anthropology at Utah State University, where she served as director of the Anthropology Program as well as director of the USU Museum of Anthropology, Pitblado continued to concentrate on the southern and central Rocky Mountains with a particular interest in high-altitude sites. While excavating at the Chance Gulch site in the Gunnison Basin, Colorado, she became aware of the urgent need among archaeologists for a technique to source quartzite (**MT 26-2,** "Bonnie Pitblado: In pursuit of Paleoamericans"). Pitblado set her sights on developing such a tool. Working with a diverse interdisciplinary team of scholars and many field-school, work-study, and graduate students, she developed a two-pronged approach to sourcing, geochemical and petrographic. She published the results of the geochemical study in the *Journal of Archaeological Science* (40-2), and the petrography in the January 2016 issue of CSFA journal *PaleoAmerica*. The upshot, Pitblado says, is that, at least at the Gunnison Basin, prospects for matching quartzite artifacts to quarries are quite good. Success, however, will require an assemblage-based approach rather than an individual artifact-to-source approach. "I consider that twist—sourcing assemblages rather than artifacts," Pitblado explains, "to be the most important outcome of the sourcing research program and one that needs now to be tested in various settings."

BETH ANN CAMP

Pitblado excavating at the Black Mountain Folsom site, 1996. Her colleague, friend, and mentor Pegi Jodry led the excavations at this high-elevation site near the town of Creede in southwestern Colorado.

"A Tale of Two Migrations"

As her interest in quartzite at the microscopic and even the atomic level grew, so did her curiosity about the bigger picture of Paleoindian use of the Rockies specifically and the New World in general. That curiosity led her to write "A Tale of Two Migrations," an article that showcases her formidable capability in detailed research.

HOLLY ANDREW

While director of the Utah State University Museum of Anthropology, Pitblado conducted highly successful "Artifact Road Shows." This visitor to a 2010 show brought in a Clovis biface she had found as a teenager in southeastern Idaho while harvesting potatoes.

After digesting 300 manuscripts by geneticists, oceanographers, and other earth, life, and planetary scientists, she was pleasantly surprised to discover that evidence drawn from these disciplines agrees in more areas than she had anticipated. She concludes that peopling of the New World was accomplished in two pulses, both traceable to western Beringia, and, prior to that, to south-central and southeastern Siberia:

- The first wave, boat people, followed the coastline of Alaska and the Pacific Northwest, which was ice free 16,000–15,000 years ago. These immigrants occupied areas near the coast or proximate to rivers and lakes.
- Migrants in the second wave traversed Beringia and made their way south through the Ice-Free Corridor 14,000–13,500 years ago. Their descendants then plunged east, west, and south. Along the way they refined their hunting technology and developed the iconic Clovis toolkit.

Genetic studies point to south-central and southeastern Siberia as the geographic source of the new immigrants. Pitblado notes that some genetic data suggest the possibility of a bottleneck in western Beringia, the "Beringian Standstill" (**MT 32-1,** "Beringian Incubation Model"). Immigrants may have been stalled for thousands of years by ice sheets that blocked access to the Americas.

Pitblado finds the time frame for the arrival of First Americans more difficult to pin down. Recent estimates consistently approximate arrival just after the Last Glacial Maximum. "Few, if any, geneticists," according to Pitblado, "argue that the peopling of the Americas occurred over an extended period of time

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At the 2017 meeting of the Society for American Archaeology in Vancouver, Pitblado and other members of the task force she chaired received SAA Presidential Recognition Awards "for their rigorous, inclusive, development of standards and practices to guide interaction among SAA members, avocationals, and responsible artifact collectors, grounded in their common interest in the American past." (*Left–right*) SAA President Diane Gifford-Gonzales, Pitblado, Angela Neller (Washington), Giovanna Peebles (Vermont), Jim Cox (Oklahoma), Suzie Thomas (Finland), Scott Brosowske (Texas), and Chris Espenshade (Pennsylvania).

and involved the serial migration of many groups from multiple parts of Asia to the New World."

The lure of the Rockies

In a forthcoming article in the journal *Quaternary International,* Pitblado argues that although the Rocky Mountains might not have been the immediate destination of new immigrants, by Clovis time First Americans knew the mountains intimately. Given the many resources the Rocky Mountains offer—plentiful water, high-quality sources of knappable obsidian, chert, and quartzite, and a vertically oriented landscape replete with floral and faunal diversity—this shouldn't come as a surprise to archaeologists. The first waves of new settlers, after all, had occupied mountainous regions in Asia for about 45,000 years before they migrated.

"The Rocky Mountains played an earlier and more significant role in the peopling of the New World than archaeologists have traditionally recognized," Pitblado explains. In the 1960s, University of Wyoming anthropologist George Frison grasped the importance of montane environments to First Americans when he conducted excavations at sites like Medicine Lodge Creek in the Bighorn Mountains. After finding a marked difference in the archaeological evidence from Plains sites he had excavated, he concluded that by 10,000 years ago the environments had nurtured two distinct Paleoindian subcultures with different subsistence strategies.

Pitblado agrees with Frison, although she argues that First Americans as early as Clovis time incorporated the Rocky Mountain environment into their settlement of the continent in important ways.

Three Clovis caches located within the boundaries of the Rocky Mountain physiographic zone (Mahaffy, Fenn, and Anzick) offer evidence that for Clovis people the mountains were more than a venue for occasional hunting. Chipped-stone artifacts dominate these caches, although differences abound. Anzick, for example, includes ocher-stained human bones and bone fragments, which are confirmed by radiocarbon dating as Clovis age. Every stone tool from these three caches is made from toolstone that has its source in the Rocky Mountains. Pitblado considers the Rockies, once thought to be a barrier to the movement of people throughout prehistory, a place Clovis people knew and a landscape they routinely exploited.

"By preoccupying themselves with a 'Clovis First/Not First' dichotomy," Pitblado laments, "many archaeologists in past decades sacrificed time and energy they could have more productively directed at *how* colonization of the New World occurred, in all its complexity." She longs to see all sorts of questions about the peopling process evaluated from a position of respect instead of being infected with the skepticism and divisiveness that too often plagues archaeology.

"I like and respect Bonnie," says University of Tennessee archaeologist David Anderson. "She is not afraid to tell people

CHRISTOPHER W. MERRIMAN

Pitblado supervising excavations at the Fox site in southeastern Idaho, 2011. Cody Dalpra (*arrow*) was later her graduate student and coauthor of a 2016 paper on quartzite sourcing using petrography.

what she thinks. She trains very fine students, does exceptional research and writing, and is one of a new generation of leaders in Paleoindian archaeology."

A passion for public archaeology

Pitblado wasn't particularly surprised to learn that at the 2013 Paleoamerican Odyssey conference in Santa Fe, professional archaeologists (46% of the attendees) were outnumbered by nonprofessionals (54%). Some professionals nonetheless expressed dismay that the collection room held displays exhibited by nonprofessionals.

The field of archaeology has long wrestled with ethical questions concerning the ownership and commercialization

Pitblado among the famous wildflowers of the American Basin in Colorado, summer 2015. The region, elevation about 11,600 ft, is a strong contender for her next survey project.

of prehistoric cultural material. In many circumstances laws prohibit collecting artifacts, although often they don't apply when collecting occurs on private property.

Pitblado encourages collaboration between professionals and private collectors. The eight Principles of Archaeological Ethics adopted by the Society for American Archaeology in 1996 address issues of stewardship and commercialization that concern those involved in the discipline. They *also,* however, stress the responsibility of archaeologists to recognize the interests of other stakeholders and to interact respectfully with those stakeholders.

If archaeologists, Pitblado believes, focus on using their specialized knowledge to promote public understanding of archaeology and its preservation goals, collectors willing to share their finds will welcome the opportunity to share in these goals. Working alongside a collector to gather as much data as possible about the provenience and context of artifacts benefits the discipline.

Michael Shott of University of Akron shares Pitblado's longtime passion for this issue. Together they organized a session at the 2015 meeting of the SAA. It was packed. The November 2015 issue of the *SAA Archaeological Record,* which they guest edited, received more online clicks than any other e-published issue of the newsletter. The SAA then asked Pitblado and Shott to study the issue. They formed a task force of 13 representatives from around the world, which drew from all branches of archaeology (academic, government, and CRM) and the collecting community. A social-media campaign elicited a valuable sampling of attitudes and opinions, which the task force incorporated into their final report and was evaluated at the spring 2017 SAA board meeting.

Fingerprinting the Fremont Figurines

An excellent example of productive collaboration between professionals and collectors involves the Fremont Figurines, discovered in a sandstone niche in eastern Utah by rancher Clarence Pilling in the 1950s. Pilling packed the six female and five male figurines into saddlebags, brought them home to Price, Utah, and then readily shared his find with professional archaeologists. Sent first to the Smithsonian Institution and then to the Peabody Museum of Harvard, the figures were studied, photographed, and coated with an organic preservative. For more than a decade they were displayed at a motel. From there, with the consent of the Pilling family, they were displayed at the College of Eastern Utah Prehistoric Museum before being returned to the family again. Sometime between

JOE DULIN

September 1973 and January 1974, male specimen number 2 vanished.

Nearly four decades later, a plain cardboard box arrived at the Utah State University Museum. Inside was the missing figurine along with an anonymous note explaining that the sender wished to return it to its proper place. Pitblado, then director of the museum, assembled an interdisciplinary team to evaluate the authenticity of the figurine in light of the many replicas produced over the years.

Using basketry-imprint analysis (detailed basketry impressions covered the reverse side of all the figurines), archaeologist Jim Adovasio found strong evidence that the returned figurine was an original Pilling. Scanning electron microscopy also identified the organic preservative that had been painted on the surface in the 1950s. In a final effort to determine whether the specimen was a member of the original set of Pilling figures, Pitblado's team compared the signature of trace elements in the clay with that of the other figures. The results from the three strategies positively "fingerprinted" the Fremont figurines and confirmed that the box indeed contained the original lost specimen. The Pilling Fremont Figurines are a textbook example of the rewards that are possible when professional archaeologists collaborate with collectors.

◀ This long-missing Pilling Figurine (specimen 2) and anonymous note arrived at the Utah State University Museum of Anthropology in an ordinary cardboard box. Here they are nestled in an archival-quality box made by museum staff.

BOTH: HOLLY ANDREW

◀ The missing figurine reunited with its female "mate" in the Pilling collection. Exhaustive tests described in the story verified that the pair are made of the same clay with unique geochemical characteristics.

A distressing brush with gender bias

Somewhere in the background for most of us lurks an incident we'd rather forget. Pitblado's moment came early in her career. Although distressing, it was also a defining moment in her life. She very nearly lost everything she had worked hard for when a full professor at a small college (now university) on the western slope of Colorado began to make disparaging statements about women at the college and Pitblado in particular. When she applied for and was awarded a tenure-track position for the 2001–02 year, the abuse intensified. The professor created a hostile work environment for Pitblado by harassing her in various ways: denying access to the museum's secure storage for artifacts she uncovered at the Chance Gulch site (although unsupervised access was granted to male undergraduates), demanding that she return keys to display cases and thus denying her the opportunity to showcase her research, and leaving papers with threatening messages lying about for her to find. Pitblado documented each incident.

Such hostility also targeted other women at the college, and Pitblado reported the incidents to her department chair, who referred her to the human-resources department. Following a series of mediated sessions, she learned that her contract wouldn't be renewed and that the college refused to administer a $90,000 grant she had recently been awarded.

Shortly afterward, Pitblado joined the faculty of Utah State University. She was torn between her wish to put the nightmare behind her and a desire to hold the institution and the professor accountable. With the support of the American Association of University Women Advocacy Fund, she filed a lawsuit. The college, evidently recognizing that the testimony would be quite damaging to them, negotiated a settlement. Although 20 years have passed, Pitblado's experience profoundly affected who she is as a person, a scholar, and a mentor.

"Bonnie Pitblado is a remarkably talented colleague with whom I have shared a love of Rocky Mountain Paleoindian studies for more than 20 years," says Pegi Jodry of the Smithsonian Institution. "In addition to her prolific research, she is an effective leader in political forums reflecting on the interactions between archaeologists and collectors and issues of sexual harassment in professional archaeology. She generously shares her knowledge, enthusiasm and warmth with students, colleagues and the public in such a way that she intentionally creates a very positive culture in which the investigation of First Americans archaeology moves forward."

What happens when you put a mountain woman in Oklahoma?

Pitblado's current position at OU was created through an endowment by Arnold and Wanda Coldiron, who were interested in Paleoindian archaeology and also wished to improve relationships between professional and avocational archaeologists—relationships that had become quite strained in Oklahoma. Oklahoma hadn't exactly been on Pitblado's radar screen, but under heavy recruiting she visited the campus. They offered her the job during the interview, and later flew her husband out and matched him with a position as well. The whole family moved to Norman.

"I take my mission, to improve those strained relationships I mentioned, quite seriously," Pitblado tells us. She encouraged a graduate student who shares her interest in public archaeology to conduct what amounts to an anthropological study of the Oklahoma Anthropological Society, the home (or former home) of folks who had become disillusioned with professional archaeology. The student's thesis illuminated the issues that had fomented dissatisfaction, and there were many. Some are unique to Oklahoma; most mirror trends seen across the nation.

"In 2016," Pitblado says, "feeling that we had identified the problems and could begin to try to solve them, we founded

OKPAN, the Oklahoma Public Archaeology Network, with a mission to build bridges among all stakeholders who care about Oklahoma's incredibly rich deep and more recent past." Their audience includes archaeologists, avocationals, indigenous peoples (Oklahoma is home to 39 tribes), graduate students, undergraduates, K–12 students and teachers, and members of the general public. OKPAN's major initiatives so far include sponsoring Oklahoma Archaeology Month each October and organizing the Oklahoma Archaeological Conference, a statewide annual meeting to help maintain a sense of community. The organization also sponsors classroom visits with the younger set from professional archaeologists. For more information about OKPAN, log onto website **https://okpublicarchaeology.wordpress.com/**

A look at the future

Pitblado is currently bent over her keyboard working on a book for the SAA Current Perspectives Book Series entitled *Peopling of the Americas: Central Controversies of the 21st Century,* in which she investigates both the content and the tone of "peopling" archaeology today. When completed, the SAA book will be added to her already impressive list of publications.

JAMES MAYER

Pitblado and a few members of the Gunnison Basin quartzite collection crew of her 2009 field school, taking a break from sampling near Crested Butte, Colorado.

"What I love most about the 'peopling' niche," Pitblado confides, "is how many disciplines contribute to its questions and answers. Certainly all archaeology is interdisciplinary, but 'peopling' is informed by planetary science, genetics, oceanography, and other fields that are not among the usual suspects of archaeological collaborations. I've begun to realize that mountainous regions of the New and Old Worlds played a far more fundamental role in the peopling process than I ever dreamed. I therefore expect that my future holds a trip or two or three to Siberia, Mongolia, and other mountainous regions that were home to those who would become the First Americans."

Pitblado certainly hasn't given up her love for the Rockies, although she was thrilled to discover that Oklahoma has SIX mountain ranges. From the gorgeous Wichita Range in the southwest to the Ozark Plateau in the northeast and Black Mesa in the panhandle, she has set some of her students to work in the Oklahoma "high country" in hopes of catching up to where Rocky Mountain archaeology is today. "But nothing," she vows, "will ever come between me and the Rockies."

Says Colorado State University archaeologist Jason LaBelle, "Bonnie has led the way in advancing our understanding of the Late Paleoindian peoples of the Central and Southern Rockies, with important excavations at such notable sites as Caribou Lake and Chance Gulch. She has conducted innovative research into source analysis of the most ubiquitous of Late Paleoindian raw materials—quartzite. But perhaps even more importantly, Bonnie works extensively with the public, bringing academic knowledge to the masses as well as recording scores of private collections to better advance our understanding of the prehistoric past." MT

–Martha Deeringer

How to contact the principal of this article:
Bonnie Pitblado
455 W Lindsey, Room 521
Norman, OK 73019
e-mail: bonnie.pitblado@ou.edu

Suggested Readings

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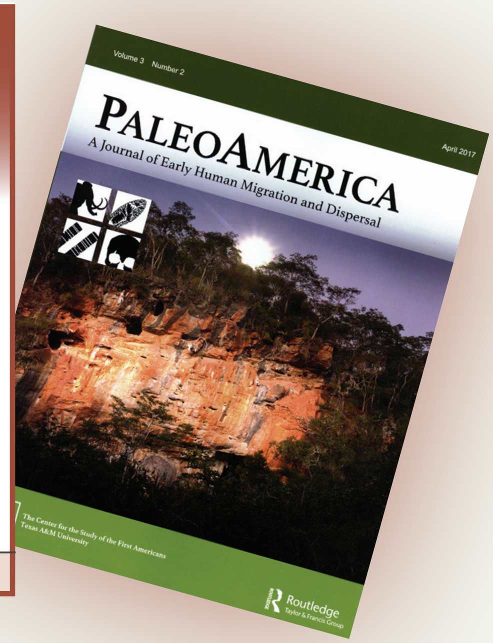

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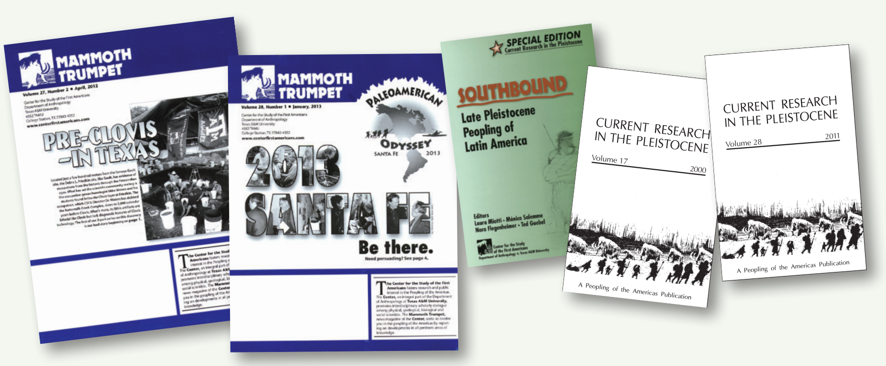

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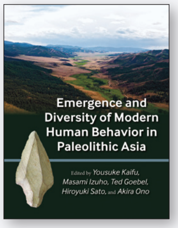

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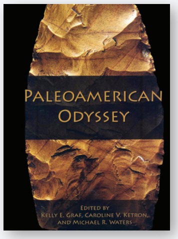

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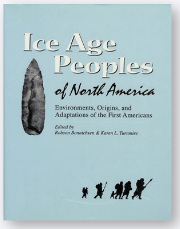

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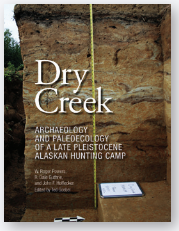

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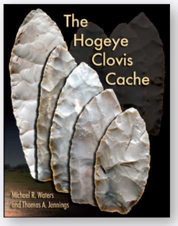

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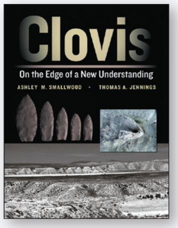

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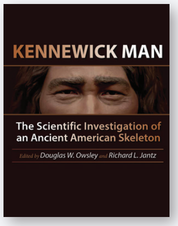

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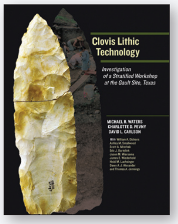

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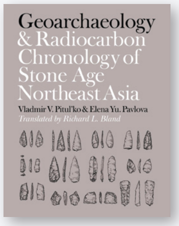

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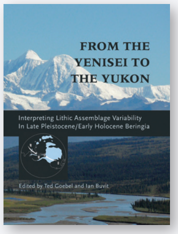

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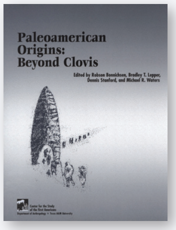

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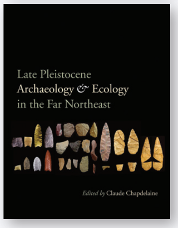

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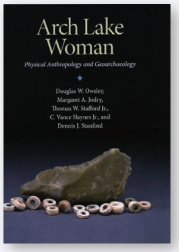

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