MAMMOTH TRUMPET

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Center for the Study of the First Americans
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Nature flaunts her glory

Near Vik, Iceland, a geologic formation known as a columnar basalt rose spectacularly showcases University of Oregon anthropologist Jon Erlandson, who takes time off from his research on the California Channel Islands to explore Viking-age sites (and engage his Nordic roots). His principal goal is to marshal convincing evidence for the coastal-entry route, one of several competing hypotheses that explain how the First Americans entered North America. See part 1 of our series on how the First Americans got here on **page 13.** To learn more about Erlandson's work and career, see his profile on **page 17.**

Photo by Erik Erlandson

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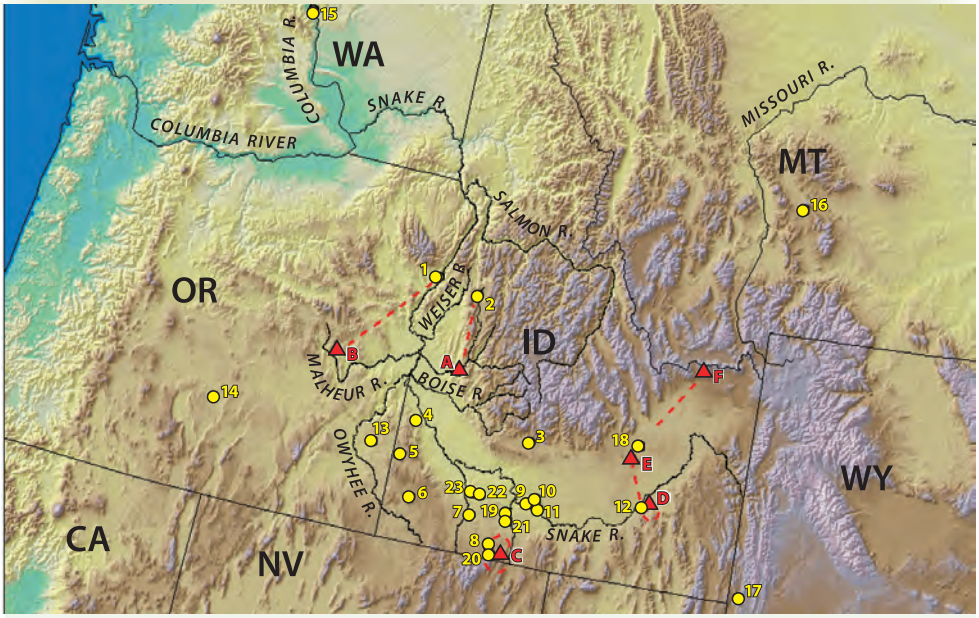
Archaeology of the Gem State



FROM IDAHO STATE HISTORICAL SOCIETY

Clovis sites
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Clovis sites, features, and isolates recorded in Idaho and neighboring States.

INSIDE

IT'S NO SURPRISE that the Clovis culture can be traced to the Snake River plain in Idaho, given its history of faunal exchanges and human migrations. Clovis points lie scattered across the plain between the Teton Valley and the Portneuf River on the east, Hells Canyon on the west, and in the bordering uplands as far south as the Bruneau and Salmon Falls Creek headwaters.

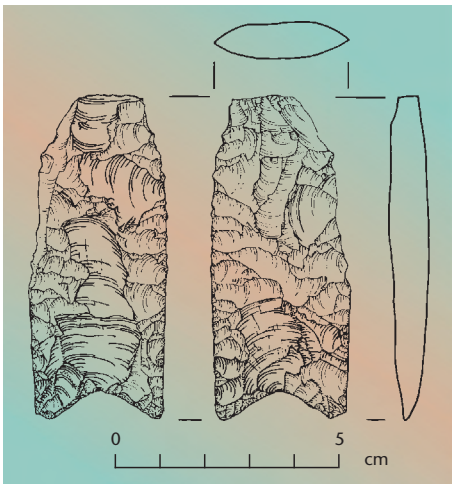
This plain ecoregion follows the Snake River as it winds 400 miles across Idaho from Wyoming to eastern Washington and Oregon. Clovis points can be found virtually in the furrows of the Oregon Trail in the

American Falls locality, a reminder that the Snake River plain has served as a migration corridor since the initial human settlement of the Intermountain West.

Ecological backdrop of late-Pleistocene Idaho

Beginning about 14,000 years ago, the Earth experienced a global warming trend that melted glaciers, disrupted key vegetative zones, and initiated the disappearance of hundreds of animal species. Radiocarbon dates and plant and animal remains from Wilson Butte Cave and the Wasden site—two important archaeological sites on the Snake River plain—as well as the fossil pollen record from Swan Lake, are clear evidence of this ecological shift.

By the time humans arrived in southern Idaho 13,000 years ago and possibly much earlier, the lower elevations that



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Copper Creek Clovis point from Hells Canyon.

today are covered with sagebrush and grasses were dominated by coniferous forests. The first human occupants of the Snake River plain found abundant Pleistocene fauna. It was a time when the human record overlapped with these late-Pleistocene mammals.

Megamammals there were, aplenty. At Kelvin's Cave, investigators identified the remains of horse, muskox, Yesterday's Camel, and *Bison antiquus*, all dating between 14,110 and 19,700 CALYBP. Because no evidence of human occupation was found, the site was interpreted as a carnivore den.

Carnivores weren't the only predators. Hunter-gatherers also preyed on late-Pleistocene megamammals. At the lower depths of Owl Cave, one of three collapsed lava tubes of the Wasden site, fragments of Folsom points were found associated with bones of mammoth and *B. antiquus,* camel, pronghorn antelope, dire wolf, badger, fox, and many microfaunal species. Mammoth long bones had been heavily fractured by butchers extracting marrow. Also at work on mammoth bones were toolmakers seeking bonestock, confirmed by the presence of two bone cores and a bone flaker. Mammoth bone collagen from the Folsom deposits was radiocarbon dated at 10,920 ± 150 RCYBP, about 12,750 CALYBP.

The Snake River plain harbors even more tantalizing evidence of early human presence. When still a graduate student, Ruth Gruhn, professor emeritus of Alberta University, first assayed Wilson

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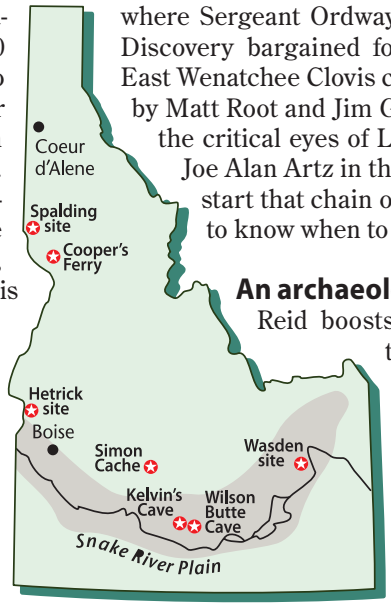
–Michael R. Waters, Director

Butte Cave (**MT 22-4,** "An enduring investigation: Wilson Butte Cave"). Associated with bones of horse and camelid in the lowest stratum of the cave deposits, she found a bone with a cutmark and stone flakes, which may be evidence of occasional occupation by hunter-gatherers as early as 19,000 years ago. Subsequent obsidian-hydration dating of two Great Basin Stemmed point bases from another, higher stratum of Wilson Butte Cave returned dates earlier than 13,000 CALYBP, squarely within the Clovis timeframe. According to Ken Reid, the newly retired State Archaeologist and Director of the State Historic Preservation Office for Idaho, however, among all the artifacts found to date, "there is no convincing evidence for a Clovis or pre-Clovis presence at Wilson Butte Cave."



Idaho State Archaeologist . . . after a long preamble

Ken Reid knows plenty about the environmental, archaeological, and anthropological history of the Gem State, having extensively studied these sites and others for the past few decades.

"I was born in upstate New York and raised on a dozen or so Army posts," he tells us. "I suppose those moves gave me an early exposure to a lot of history along the Rhine, the Austrian Alps, the Aegean coast, as well as the Ozarks, Flint Hills, Monterrey coast, and Jersey pine barrens. But the downside of short stays in many places is that your own past becomes so irretrievable you end up focusing on someone else's." Reid, after starting out as a Plains archaeologist, has since dedicated his career to focusing on the ancient past rather than his own.

A career for any archaeologist of his generation usually covers a lot of geography and includes a lot of mentors. For himself, he can tick off late-Archaic hunter-gatherer camps at Nebo Hill and the Coffey site in graduate school, piece-plotting a Revolutionary War battlefield at Guilford Courthouse in North Carolina with H. Trawick Ward, sorting out the meander history at the Bear River Massacre NHL in Idaho with Ken Cannon, Molly Cannon and Joel Pederson, sampling early-Holocene shell heaps in the Alexander Archipelago with Bob Ackerman, data recovery excavations at middle Holocene bivouacs and the FERC relicensing survey in Hells Canyon, surviving the torments of poison ivy–infested Fort Ancient burials on Blennerhasset Island in the Ohio River, working with Ken Kvamme's geophysics team at the longhouse where Sergeant Ordway from Lewis and Clark's Corps of Discovery bargained for salmon in 1806, witnessing the East Wenatchee Clovis cache so carefully excavated in 1988 by Matt Root and Jim Gallison, learning to read dirt under the critical eyes of Larry Schmits in the Flint Hills and Joe Alan Artz in the Little Caney basin. . . . "Once you start that chain of associations," says Reid, "it's hard to know when to stop."

An archaeology supermarket

Reid boosts Idaho as a great place to study the prehistory of hunter-gatherers. "There isn't much evidence for pastoral or agricultural or even horticultural developments here," he explains, "and the arguments for cultural complexity have always seemed a little strained to me." It's a settled place where people have always tracked changes in their physical circumstances pretty directly. Drolly he quips, "I think your average Idaho hunter-gatherer had a firmer grasp of environmental-reality principles than your average legislator does today."

IDAHO STATE HISTORICAL SOCIETY

Newly retired Idaho State Archaeologist Ken Reid (*far right*) recruits Weiser Valley ranchers in a Certified Local Government program that establishes archaeological sites on private lands, 2016.

Its geographical location, midway between the Pacific coast and the southern end of the Ice-Free Corridor, makes Idaho ripe pickings for Paleoamerican studies. A colonizing population moving inland from the coast could walk along the bank of the same channel of running water from the Pacific Ocean to the Yellowstone Plateau. The Snake River plain is also a natural travel route for colonizers coming from the east. Thus, Idaho might have accepted pioneering populations from either or both directions. "I believe the weight of evidence suggests that the Clovis horizon in Idaho is the same age as elsewhere," Reid says. He cites the Simon Clovis Cache as representative of the largest and best sample of Clovis technology in all of Idaho (**MT 17-1,** "Lithic caches: The puzzling legacy from early knappers").

Although the various unfluted or stemmed points of the Western Stemmed Tradition generally postdate Clovis, arguments for the priority or contemporaneity of stemmed points

with fluted ones continue. Addressing the origins of fluted points, Reid allows that if fluting originated south of the ice sheets, "someone we haven't found or haven't recognized yet must have been here to do it."

Clovis, Folsom, and Western Stemmed in Idaho

Initial cataloguing of projectile points suggested a mysterious east-west partition of the Snake River plain, with Clovis points common to the western region and Folsom points to the east. That apparent pattern, however, was in large part an anomaly introduced by artifact-sampling methods. Reid says we now recognize that Clovis points are distributed across the entire width of the Snake River plain, from Teton to Owyhee counties, and extend northward to at least 45° N latitude. Folsom points, on the other hand, are pretty tightly clustered in the grasslands to the east. If this pattern holds up, Reid believes the random distribution of Clovis points suggests sporadic exploration and colonization, fraught with uncertainties and false starts. The concentrated Folsom points, on the other hand, may reflect greater depth in planning and a studied focus on bison habitat.

Reid freely confesses our paucity of knowledge about the tempo and pace and speeds and spasms involved in colonizing a mostly temperate continent. The Clovis record in Idaho involves one undated biface cache, one not-very-well-dated hearth and associated lithic scatter, a lithic scatter that yielded two Clovis points, and isolated Clovis points, some of which seem geographically clustered. By comparison, stemmed and unfluted lanceolate points grouped under the rubric *Western Stemmed* are distributed widely and nearly continuously. Unlike Clovis points, they often appear in multi-component cultural deposits, sometimes in stratigraphic order and sometimes in mixed assemblages. They give Reid the impression of being early arrivals in places that were repeatedly occupied over time by later groups.

IDAHO STATE HISTORICAL SOCIETY

Reid (*left*) and Utah State University archaeologist Ken Cannon plot a feature at the Bear River Massacre National Historic Landmark, 2016.

Idaho offers the opportunity for truly interdisciplinary research on post-glacial colonizing histories of humans (and other vertebrates), fire histories, forest-grassland fluctuations, faunal extinctions and replacements, and cultural responses to volcanic eruptions. The borders of Idaho intercept 10 different Level 3 ecoregions as mapped by the US Geological Survey. Reid looks forward to witnessing research "that cleaves nature at the joints and ignores political and culture-historical boundaries such as the old Plateau/Great Basin dichotomy."

A textbook example of a well-managed dig

One of Idaho's most prominent archaeological sites, Cooper's Ferry, figures prominently in the coastal-entry theory because it lies on the Salmon River, an important tributary to the Snake, which then joins the lower Columbia. Recent research conducted by the University of Alberta and the University of Idaho reveals a circular pit feature containing numerous artifacts and cut bone, including a cache containing a large scraper and four stemmed points (**MT 31-3,** "The dirt on Cooper's Ferry"). Dating of bone from the pit feature yielded radiocarbon dates of 11,370–12,020, about 13,230–13,800 CALYBP, making Cooper's Ferry the earliest indisputable archaeological site in northern Idaho.

Reid credits Oregon State University archaeologist Loren Davis with recognizing the importance of going back to sites first excavated in the 1960s. Davis's work at Cooper's Ferry builds on B. Robert Butler's research from the '60s. Says Reid, "I'd like to see similar efforts made at other sites with early components in the deeper alluvial sediments of western Idaho. The work at Cooper's Ferry has been remarkably innovative and will set the standard for future studies in the area."

Reid is outspokenly skeptical about inferring Old World origins for Paleoamerican artifacts, for example, attempting to connect stemmed points in Idaho with stemmed points in, say, Kamchatka, or the north Pacific rim in general. After all, he reasons, "There are only a few ways to attach a bifacial point to a shaft, and stemming and notching and—less certainly—fluting must have been independently invented several times." In Reid's book, New World toolmakers were as resourceful and innovative as those anywhere in the prehistoric world.

Opportunities galore

Some important sites like Wilson Butte Cave, Reid concedes, have been poorly protected and probably don't have much left to tell us. Archaeologists seeking an opportunity to practice their métier might consider the Hetrick site in the lower Weiser basin, which contains the most complete Paleoindian assemblage of any archaeological site in western Idaho, or

the Spaulding site in the Nez Perce National Historic Park. As further examples of sites begging for attention, Reid mentions the Wasden site, where two of the three lava tubes have seen only cursory investigation. "More work should be done at Diversion Dam Cave in the lower Boise River Canyon to sort out feature chronology," he continues, "and several early sites in the headwaters of Salmon Falls Creek recorded back in the 1970s warrant more attention."

At the other end of the temporal record, Reid calls attention to increasing public interest in historic battlefield archaeology. He became aware of this when he was working on the Bear River Massacre project, which reconstructs the setting of a shameful incident in 1863, when the U.S. Army killed hundreds of Shoshone men, women, and children. Reid advises that "the public appetite for those kinds of heritage projects might prompt more attention to sites associated with the 1877 Nez Perce and 1878 Bannock campaigns. Taxpayers and historical society advocates relate to drama and tragedy more than careful sequence-building or dietary reconstructions."

The value of legacy data

Historic archaeology in Idaho is flourishing. The University of Idaho has been active at historic Fort Boise and with Basque and African American architectural sites in the state capital. Reid admits being "less confident about our 130 centuries or so of prehistory. Two thirds of the state's land area is managed by federal agencies, and they struggle constantly for staff and budgets." One bright spot has been the long-term Lower Salmon Canyon project, which teams up a research university, federally managed districts, and affected tribes.

Reid finds Idaho archaeology in a period of consolidation. Consequently he believes it's important that scientists collaborate with the five Idaho tribes to dispose of culturally unaffiliated collections and to define appropriate levels of analysis for fieldwork and laboratory collections. "There are many opportunities for research with legacy data," he explains. "The large-scale block excavations that ran through the early 1990s have received only cursory analytical attention. While it's getting harder to give students and younger professionals the fieldwork experience that my generation took for granted, there are plenty of opportunities to work indoors with large faunal, lithic, and household and community datasets."

Without the contributions of key figures in archaeological studies, Reid emphasizes, there would be no datasets to analyze. Reviewing the Paleoindian record that has emerged in Idaho, Reid notes the number of prominent women scientists in a field that used to be called "early man" studies: Susann Miller at Wasden and Suzann Henrikson at Owl Cave and Kelvin's Cave; Theresa Rudolph and Cassandra Manning at Hetrick; Kathryn Harrison at Redfish Overhang; Sarah Shuknecht-McDaniel at Wewukiyehpuh; Laura Longstaff at Kelly Forks, and of course Ruth Gruhn at Wilson Butte Cave, Hind Sadek-Kooros at Jaguar Cave, and of course the late Ruthann Knudson, maintaining an appropriately gendered gaze over them all.

The future of archaeology is technology

Looking forward, Reid believes that ancient DNA studies hold the key to furthering our understanding of the earliest Americans. He cites as an example the Buhl Woman, the 11,000-year-old skeleton of a woman found in a quarry in 1989 near Buhl, Idaho, which has yielded important information about Paleoindian skeletal morphology and diet. DNA studies of ancient humans can only go so far, however, and he frankly admits that tribal opposition to such studies today makes them pretty hopeless. DNA applications focused on the arrival and migration histories of mammals and fish, on the other hand, "have great promise and would probably be enthusiastically supported by the same tribes."

As remote-sensing technologies keep improving, Reid foresees that landscape-scaled survey projects will become more common. As for tidying up existing collections, the radiocarbon record for Idaho prehistory could use a thorough review to cull out bad dates and identify chronological gaps. Mass analyses and minimum nodule analyses of lithic assemblages have made great strides elsewhere in the West, says Reid, although he regrets the scarcity of archaeologists who combine knapping and replicative skill with statistical know-how. Another area he points out that demands attention is the role of ceramics and

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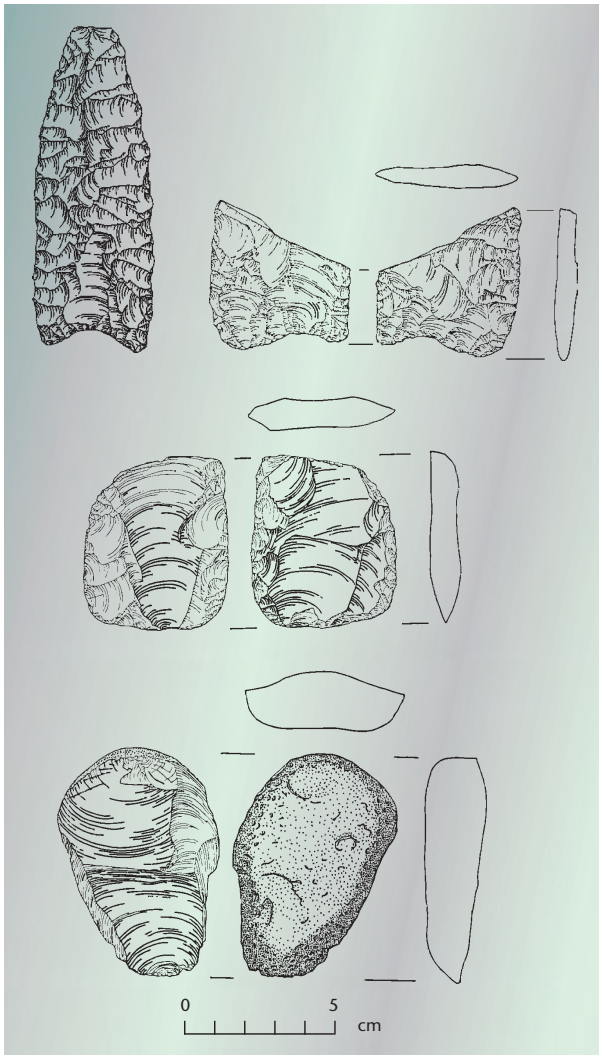

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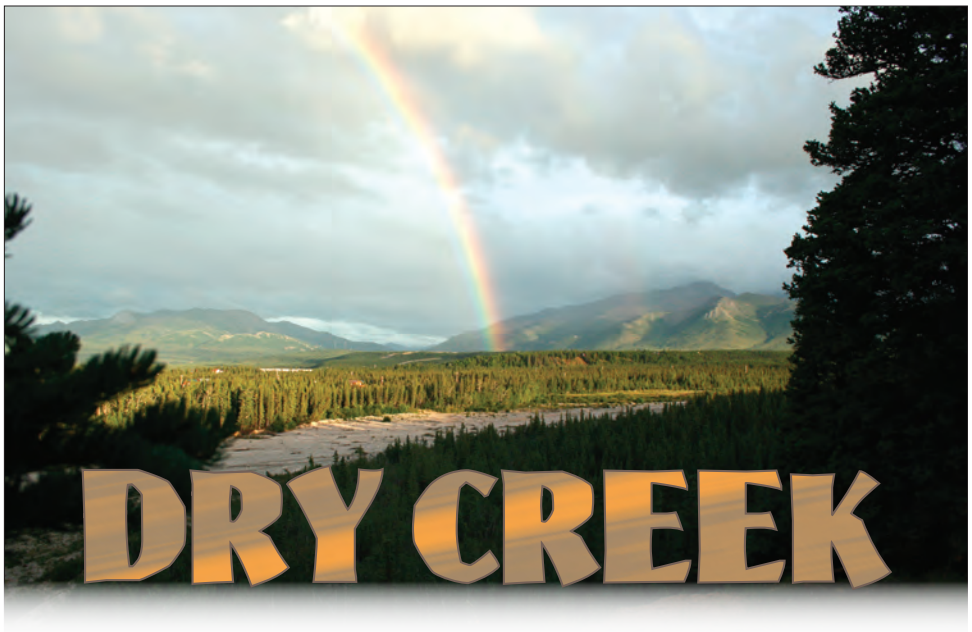
Artifacts from the Heil Pond site on Devils Creek, near the Idaho–Nevada border.



Part 2: Return to Dry Creek

ROGER POWERS, former Professor of Anthropology at the University of Alaska, Fairbanks, never published a final report detailing his work at Dry Creek in the 1970s. Nearly 40 years after his initial excavations, Kelly Graf, Associate Professor in the Department of Anthropology and Center for the Study of the First Americans at Texas A&M University, aimed to fit the missing puzzle pieces back together into a solid framework that made archaeological sense.

Challenges facing the 2011 team

Graf's project had its challenges. There were many moments when researchers sat scratching their heads, trying to understand exactly what Powers was doing when he worked at the site tucked away in Alaska's Nenana Valley. Graf recalls that "when we removed the backdirt from his excavations around the area where he left an unexcavated berm (the area of the site we targeted for our work), we realized quickly that the top portion, 50 cm to even 80 cm in some cases, of intact deposits in this berm was missing."

The mystery was solved by John Hoffecker, Paleolithic and Arctic archaeologist and one-time graduate student of Powers during the Dry Creek project, who related that the bulldozer operator who'd been hired to backfill Powers's excavation inadvertently scraped away the top portion of the site deposits in this area to level out the backfill job. Graf explains that "apparently Roger had turned his back for just a few minutes to do something else, and when he returned to monitor what was going on, he found that that area of the site had been leveled out. Although this meant that we were unable to excavate the Holocene sediments in this portion of our excavations (Blocks A and B), the area of Block C remained unscathed by the bulldozer, so we were able to excavate all site sediments (the entire profile) in this portion of the site."

Area E during the 1977 excavation. Most of the area is on Component II (Loess 3, Paleosol 1).

Hearth features discovered at Dry Creek

Much of the site (250 m^2) was excavated by Powers, but he found no hearths. "Powers had a lot of field school students working on that project. When he was excavating in the '70s, he had crews of like 25. I had 7 undergrads and 3 graduate students," Graf says, "so my crew was small compared to what he was doing. Plus, they were excavating a lot really quickly. You can't do that today with the methods we use. Roger's crew mapped several charcoal concentrations, but never recognized any hearth features. We found three, making this our most surprising discovery!"

Six new AMS dates from Graf's 2011 dig were on charcoal from these features interpreted as hearths, and their presence in Component I (C I) and Component II (C II) shows that Dry Creek served as a camp for at least long enough to leave these types of features behind. Graf suggests they were used on a short-term basis because these are ephemeral, unprepared hearths, which agrees with the conclusion that Dry Creek served as a temporary "spike" camp radiating from a central, permanent campsite.

Postdepositional cryoturbation affects these features, so "you have to be really attuned," Graf explains. Thanks to work she and Ted Goebel did in Ushki, where they found several hearth features, Graf was able to recognize features when she encountered them at Dry Creek. "Cryoturbation, freezing and thawing, has moved them. They're still isolated features. You just have to know what you're looking for," she says.

The hearth features include burnt sediments, charcoal, and fragmented burnt faunal remains. Faunal materials

found in C I identify prey animals as sheep and elk; remains from C II are sheep and bison. Bones found in the hearths, however, were so burnt and weathered the genus couldn't be confidently determined.

Dry Creek cultural layers

While locating hearth features was a surprising discovery in Graf's 2011 reexcavation of Dry Creek, identifying the cultural layers wasn't. From the outset, one of Graf's main objectives was to confirm that the cultural components, C I and C II, were indeed geoarchaeologically and geochronologically distinct.

According to Graf, "Powers was using very modern methods for the time and clearly documented the geological context of excavated materials." In contrast, some archaeologists at the time were excavating at sites like Healy Lake Village in arbitrary levels, which may have resulted in the mixing together of assemblages from different terminal-Pleistocene components.

An issue that further muddies the timeline of early sites in Alaska is that in the neighboring Tanana Valley, archaeologists are finding artifacts of the Nenana Complex, the bifacial industry found in C I at Dry Creek, but here in sediment that dates not just to the time of Dry Creek C I, but also to the Younger Dryas, the time of the Denali Complex and the microblade industry found in C II at Dry Creek. Says Graf, "Colleagues working in the Tanana find it difficult to accept vertical, stratigraphic, and chronological separation of the Nenana and Denali Complexes, but it is there at Dry Creek. And this pattern is repeated at sites throughout the Nenana Valley where the depositional setting isn't compressed, such as Moose Creek, Walker Road, Owl Ridge, Panguingue Creek, and Little Panguingue Creek. The pattern is even repeated across the Bering Land Bridge on the Russian side at sites like Berelekh, Nikita Lake, and Ushki Lake."

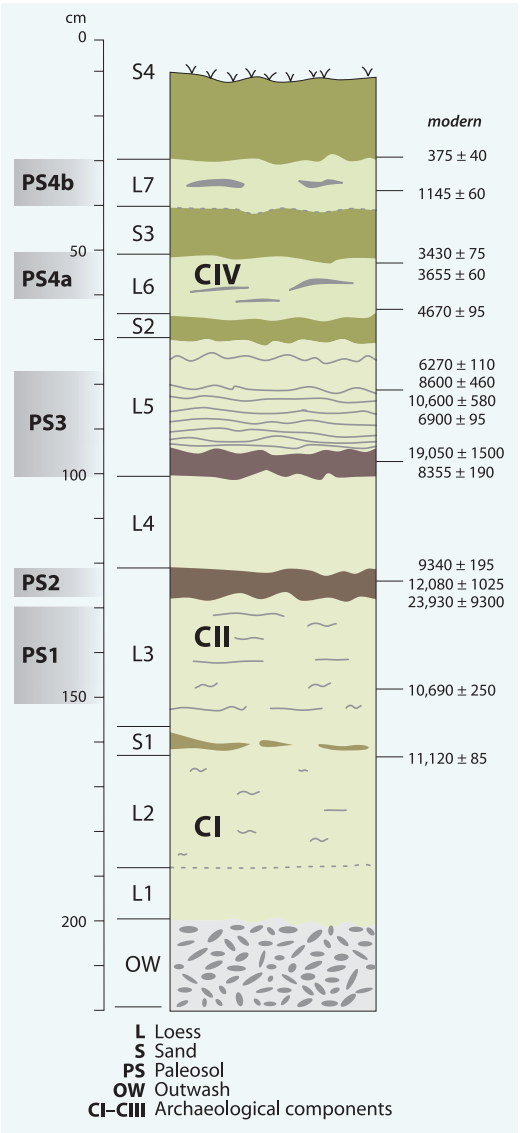
Graf's results show that stratigraphic integrity is maintained at the Dry Creek site. C I and C II are separated vertically by at least 15–20 cm, and artifacts are located in well-defined components. "For me," Graf says, "the distinct layers represent an adaptive change, a response to climate."

An evolving ecosystem

C I, which dates to 13,600–13,300 CALYBP, represents the earliest known human occupation of the Nenana Valley. The occupation coincides with warming of the Allerød interstadial, characterized by spread of birch shrubs and replacement of open tundra-steppe of the full glacial with a new biome, shrub tundra. The absence of mammoth and horse remains at Dry Creek, principal species of the Beringian tundra-steppe ecosystem, may be a result of these species becoming extinct by the time of the C I occupation, which aligns with the taxa record at this time in central Alaska.

The Younger Dryas period (12,900–11,700 years CALYBP), which followed C I, experienced greater wind intensity and a return to the tundra-steppe of glacial times. This included an expansion of *Artemisia* (sagebrush species) and withdrawal of shrub birch, thus creating a good environment for bison.

The C II occupation is harder to date because several radiocarbon dates from the component report an age range of 12,700–10,200 years CALYBP, but Graf says that if we rely on hearth charcoal, the two components are separated by 2,000–2,800 years, a gap that overlaps the Younger Dryas interval, which witnessed a brief reversal to more glacial conditions.



Stratigraphic profile of the Dry Creek site. Dates are RCYBP.

The deepest layer of history at Dry Creek

Humans at Dry Creek during the C I period—a population of Beringians who may have persisted in the Bering Land Bridge region through the LGM—were utilizing triangular biface points, a tool industry that Powers and colleagues called the "Nenana Complex." Similar patterns exist in Ushki Lake sites in Kamchatka, Russia, where assemblages containing small bifacial projectile points date to this time. According to Graf, during the time of the Nenana Complex "folks were behaving more logistically. They were more settled into the landscape, and their strategies were ultimately related to climate and resource availability."

Interestingly, this strong biface tradition could have given rise to Clovis points at the time of a southward colonization of North America prior to 11,500 years CALYBP. The non-projectile-point toolkit of the Nenana Complex resembles those found in Paleoindian sites of the Great Plains.

Graf's 2011 excavation does not, however, establish a conclusive archaeological link between the Beringian industries and

the Clovis Complex, despite the general similarities between the Nenana and Clovis assemblages. Clovis points aren't present in the northern portion of the Ice-Free Corridor, and ones found in the southern part of the corridor are younger than points found south of the ice sheets, so at this point it seems unlikely that Clovis originated in Alaska and directly from the Nenana Complex.

Climate change reflected in adaptive technology at C II

During the Younger Dryas (12,900–11,700 years CALYBP), characterized by the more recent layer C II, faunal composition changed and hunters sought more mobile animals. Microblade weapons work well for hunting this kind of game, Graf says. Microblades are small, lightweight, and provide the maximum amount of sharp linear edge per unit of stone. This technology derives from the northeast Siberian Diuktai tradition, now known to be the earliest culture expressed in central Alaska at the Swan Point site, about 14,000 CALYBP (**MT 20-1,** "Pre-Clovis traces at Swan Point, Alaska"). Dry Creek lies at the nexus between Siberian and North American lithics industries.

Lower tooth row (enamel only) of steppe bison (*B. priscus*), the best-preserved megamammal specimen from Dry Creek. Only the lower jaw was brought from the kill site, perhaps with the tongue and meat from the cheek and neck attached.

The assemblage from C II is more variable than that of Swan Point. Besides microblades, the Dry Creek C II assemblage includes large bifaces, heavy percussion tools, and spokeshaves. The broad range of artifact types may reflect diverse activities underway during the later period of occupation, or they may be the product of newly arrived toolmakers of a different cultural group. The C II assemblage suggests local adaptation of Denali Complex technology, which traces its origins to the Diuktai tradition of central Siberia. Also found in addition to the predominant microblades are lanceolate points; they might belong to these microblade-wielding people, or they might have been introduced by hunters using the Mesa Complex, which suggests the spike camp at Dry Creek was temporarily occupied by different groups on hunting forays.

KELLY GRAF

Heather Smith (*left,* former CSFA doctoral student, currently assistant professor in Anthropology at Eastern New Mexico University) and Graf excavating bones from C I.

How does Graf account for the widely varying tool types? The first humans to migrate from Asia, she explains, were "adjusting through time. During the Allerød, there was a warmer climate. The animal resources were changing, and perhaps people began pursuing different taxa in response to this environmental change, ultimately altering their land-use strategies and developing the Nenana Complex lithic industry. Then, perhaps in response to the Younger Dryas reversal, they reverted to a microblade industry, this time including large bifaces. These different toolkits, however, could have resulted from different populations of people."

Needed: human remains

With only lithic artifacts and faunal remains for evidence, Graf says that "we can't say if the people using these different technologies were members of the same population or different populations. To know that, we would need to find skeletons that preserve DNA." Although none of the sites where she has worked has yielded human remains, archaeologist Ben Potter of University of Alaska, Fairbanks, who also works with Chuck Holmes in the Tenana, uncovered a boy and two infants while investigating the Upward Sun River site (**MT 31-1,** "Digging deeper into Upward Sun"). Researchers at Upward Sun identified mtDNA (mitochondrial DNA) haplogroups for the partial skeletons and recovered genome data from one individual. What we do know, says Graf, is that "they have Native American mtDNA clades, and their nuclear-genome data indicate they were descendants of an ancient Beringian population that also gave rise to Native Americans, but the population represented by these children didn't contribute directly to the First Americans because they postdate the peopling event(s) by several thousand years." The skeletons, two cremations and a burial, are contemporaneous with the C II layer at Dry Creek, about 11,300 RCYBP. Graf hopes that eventually human remains, dating to the time of C I at Dry Creek and with preserved ancient DNA, will be found so we can better understand this ancient Beringian population.

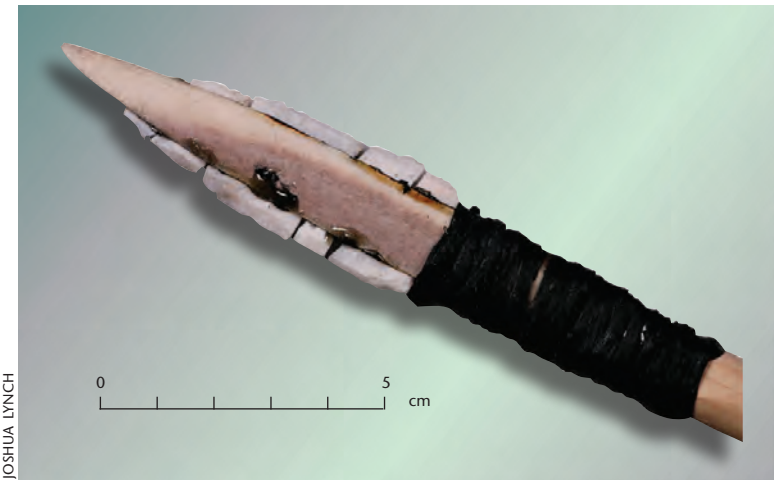
Alaska, the heartland of Beringia

Graf believes that Alaska is the jumping-off point for the First Americans. "We probably haven't found the earliest site in Alaska yet," she tells us. Swan Point, excavated by Chuck Holmes, is the earliest known site, but it shares its pre-Clovis distinction with Dry Creek, Mead, Broken Mammoth, and McDonald Creek, a new site that Graf is currently excavat-

ing. Alaska boasts more well-dated pre-Clovis sites than any other region in the Americas. "If there are that many in this Fairbanks area, there have to be more in the rest of the state," Graf reasons, "and there's a lot of territory we don't have easy access to. It's so expensive to do that kind of research, and it isn't happening as fast as it should. When you think about the sample size and how small the area is, relatively speaking, it's pretty amazing. Alaska and Beringia are really where it's at, but we have a lot of work ahead of us."

Two possible migration routes

When Graf was an undergraduate student in the early 1990s, textbooks cited the Bering Land Bridge as the only possible migration route for the First Americans. "It was overwhelmingly the Bering Land Bridge and the Ice-Free Corridor," she remembers, "and I thought, My God, I need to get to Alaska! So that's what got me started focusing on the North."



JOSHUA LYNCH

A replica of a composite projectile point produced on caribou antler and inset with heat-treated chert microblades. Says Joshua Lynch, Ph.D. candidate at CSFA, "The points are morphologically styled on examples of beveled, bilaterally grooved osseous projectile points from late Pleistocene/early Holocene assemblages in Siberia (western Beringia) and Alaska (eastern Beringia)." The microblades were modeled on the Denali (Component II) microblade assemblage at Dry Creek, largely representative of the Denali microblade tradition. Microblades are cemented in place with mastic made from spruce pitch.

That classic model is today being challenged by the double-barreled hypothesis of the Beringian Standstill and coastal entry. The Beringian Standstill posits that before the Last Glacial Maximum (LGM), Northern Asians settled the easternmost reaches of Beringia. Eastern Beringia became a glacial refuge for the period known as the Beringian Standstill, between 24,000 and 14,000 years ago, during which time the First Americans accumulated enough genetic diversity to become distinct from their Asian forefathers (**MT 33-2,** "The Bluefish Caves"). Once the glaciers gave way, their descendants expanded southward, traveling overland by the Ice-Free Corridor or, by an alternative route increasingly favored by scientists, along the coast.

Graf examining a stratigraphic profile at the Dry Creek site.

Analysis of Native American genetics shows a rapid dispersal out of Beringia following the LGM, and the Beringian source population for the movement contains significant diversity—as many as 16 maternal lineages. Although we find evidence of movement in the Ice-Free Corridor, much of this initial population may have been concentrated along the Pacific coast and adjoining regions of western North America. Ancient DNA from the Anzick burial in Montana, for example (**MT 29-2,** "Clovis child answers fundamental questions about the First Americans"), confirms that people who made Clovis artifacts were derived from one of the groups that spread south along the Pacific Coast.

Coastal movement also points towards a relationship between early Beringian industries and the Stemmed Point tradition of the western U.S. New dates from Paisley Caves in Oregon suggest that stemmed points in the intermontane West are as old as the oldest Clovis artifacts (**MT 25-4, 26-1,** "Paisley Caves"). Moreover, stemmed points have been found at sites on the Channel Islands off the California coast in younger occupations that reflect a maritime economy. The age and context of these artifacts suggest a relationship with southwest Beringia—for example, with Ushki on Kamchatka and its stemmed-point assemblages—and argue loudly for population migration along the northwest coast of North America.

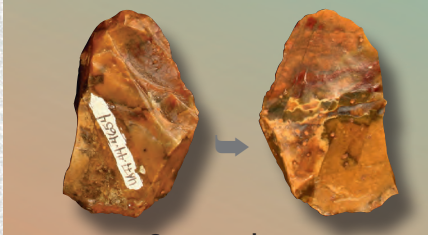
Graf believes that future studies will weigh even more heavily toward the coastal route. "The more folks like Daryl Fedje and Quentin Mackie [University of Victoria archaeologists] we have searching the coast, the more likely we'll find evidence of a coastal migration following the LGM" (**MT 30-4,** "Looking for sites at the water's edge"). She has no doubt that sites along the coast date to the same time as early sites in Alaska. "They just need to find them, but it's a hard terrain to deal with. Part of the coast is under the water, part of the coast is pushed up. So there's a lot of variability and lots of places to look."

One of Graf's graduate students is, in fact, interested in investigating raised coastlines. Eventually, Graf is confident, younger-generation archaeologists will find definitive sites once occupied by coastal migrants.

Future lea(r)nings

Since 2007, there has been a resurgence of archaeological

The Yield from Dry Creek, C I



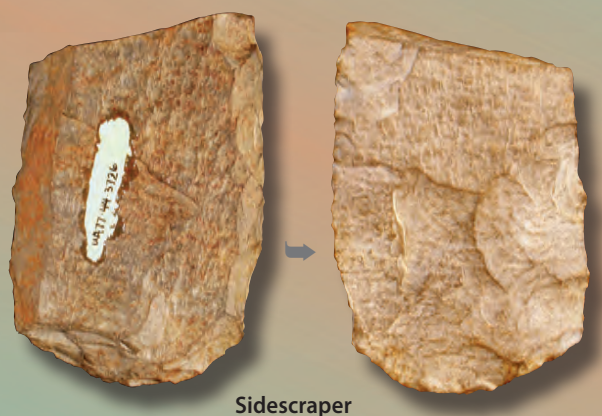
Steep endscraper

Projectile point

Bifacial knife

0 5 cm

A probable hearth feature from Component I.



Sidescraper

0 5 cm

Split cobble tool

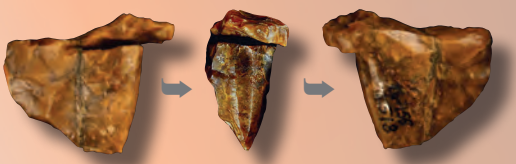
Transverse scraper

. . . and C II

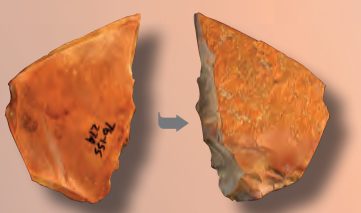
Shown here are representative samples of lithic artifacts from Components C I and C II of Dry Creek. For an extensive illustrated inventory, refer to Dry Creek: Archaeology and Paleocology of a Late Pleistocene Hunting Camp. *See the rear cover for ordering information.*

Wedge-shaped microblade core

Complete microblades

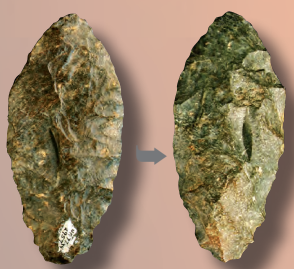


Microblade core with refitted core tablet

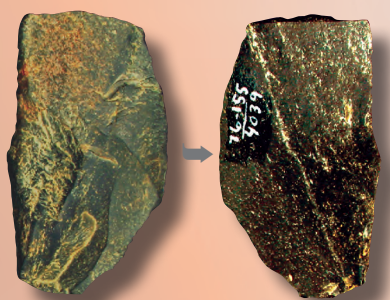


Dihedral burin

Projectile point

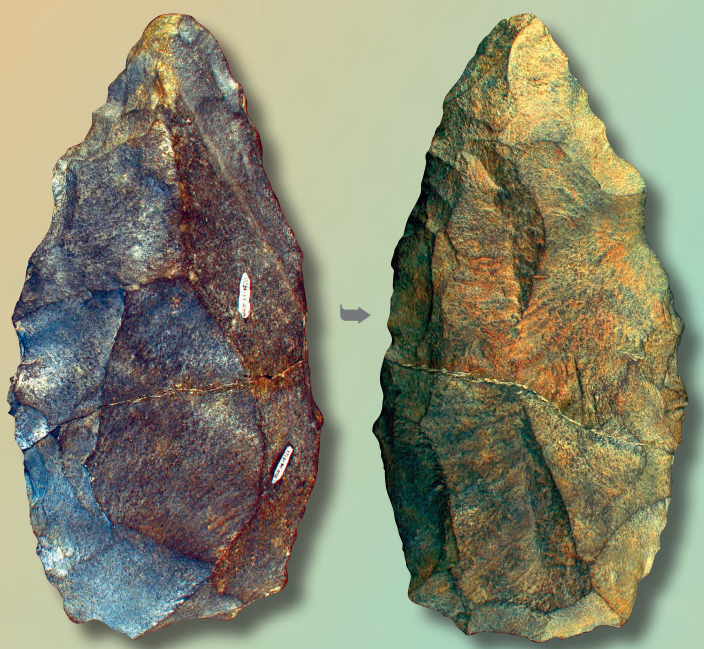


Small spatulate knife



Bladelike flake tool

Oval knife



Lanceolate biface

Cobble tool

research in the Nenana Valley, and future work seems increasingly dependent on genetic studies. The rich archaeological and paleoecological records of the central Alaskan Range aren't finished yet, and the continuing scientific research in the region makes the work of Roger Powers relevant today.

Dry Creek tells some of the ways early humans adapted to a changing ecosystem. Veteran archaeologists Ted Goebel and John Hoffecker suggest, however, that tomorrow's breakthrough discoveries in Beringian archaeology will probably be found far from Dry Creek: "Testing of the current genomics-based peopling models and the search for antecedents of the Nenana Complex require us to turn our attention from upland settings like the Nenana Valley to the lowlands of central Beringia."

As for Kelly Graf, she doesn't plan to return to Dry Creek anytime soon. "I know there's more to excavate," she frankly admits, "but I think it will mostly repeat the patterns that have been recognized. Dry Creek is a national historic landmark and a state landmark. We should preserve this resource before it's completely gone. I have no immediate reason to go back, but in another 40 years someone with more-advanced technologies could go back to address new questions that will have emerged between now and then. There potentially is more to do there. There's always more to do. But we've answered some of those questions that have lingered in the literature."

Quoth the raven . . .

While excavating in 2011, Graf recalls wishing the team could somehow channel Powers and ask him questions. "Of course we had lots of good fun during long excavation days joking about this," she says, "and one day early during the project, when we were trying to figure out why one of Roger's subdatums wasn't matching his excavation corners and walls, a big raven flew down to the site and landed within 20 feet of the subdatum, our total station setup, and us. It began hopping around and looking at us and the datum as if to say, 'Come on, guys, give it up. After 35 years, do you really expect that Roger's subdatum is still going to be in place?' "

That raven, or one just like it, returned to the site on several other occasions and would hop around the edge of the excavation and look over and down the walls as if evaluating the team's work. Graf relates that "we joked quite a bit about whether or not we had indeed channeled Roger! We certainly knew we had an inquisitive raven, or set of ravens, and so the long running joke was whether 'Roger' was going to visit us today." The raven, which in Northwestern Native North American mythology is cast in the role of a trickster, was a welcome source of comic relief for the team.

–Katy Dycus

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Suggested Readings

Powers, W. R., R. D. Guthrie, and J. F. Hoffecker 2017 *Dry Creek: Archaeology and Paleoecology of a Late Pleistocene Alaskan Hunting Camp,* ed. Ted Goebel. Texas A&M University Press, College Station.

Graf, K. E. , L. M. DiPietro, K. E. Krasinski, A. K. Gore, H. L. Smith, B. J. Culleton, D. J. Kennet, and D. Rhode 2015 Dry Creek revisited: New excavations, radiocarbon dates, and site formation inform on the peopling of eastern Beringia. *American Antiquity* 80.4: 671–94.

Archaeology of the Gem State

continued from page 5

the timing of the appearance of pottery in the Snake River plain and northern Rockies.

Advice to archaeologists: Play nice

In his approach to archaeology as a discipline, Reid wishes to echo University of Oklahoma archaeologist Bonnie Pitblado's plea at the close of the 2013 Paleoamerican Odyssey Conference in Santa Fe. "We could use more civility and mutual respect for differing arguments," Reid pleads, "not just in Paleoindian studies, but across the entire span of the archaeological record. There's a difference between trying to find out what happened in the past, and trying to become known as the first person to discover what really happened in the past. That means leaving the emotional security of the old boy and old girl networks and taking some chances with new audiences, both public and professional."

–Katy Dycus

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Suggested Readings

Reid, K. C. 2017 Idaho beginnings: A review of the evidence. *Quaternary International* 444:72–82.

Reid, K. C. (ed.) 2017 Approaching Bear River: Historic, geomorphic, and archaeological investigations at the Bear River Massacre National Historic Landmark. *Archaeological Survey of Idaho Monographs in Archaeology and Ethnography 3.* Idaho State Historical Society, Boise.

Reid, K. C., R. E. Hughes, M. J. Root, and M. F. Rondeau 2014 Clovis in Idaho: An update on its distribution, technology, and chronology. *Clovis: On the Edge of a New Understanding,* 53–76. Texas A&M University Press, College Station.

Woods, J. C., and R. M. Yohe 2002 *The First Idahoans: A Paleoindian Context for Idaho.* Idaho State Historical Society, Boise.

Along the Coast or down the Ice-Free Corridor—How Did the First Americans Get Here?

Part 1

How did the first Americans find their way into the Americas? Archaeologists and geologists have identified two potential routes of entry. People either walked along the Ice-Free Corridor between the receding ice of the Cordilleran glaciers flowing out of Rocky Mountains and the Laurentide Ice Sheet (MT 32- 4, "Was the Ice-Free Corridor the route followed by the First Americans?"), or they followed the Pacific Coastal Corridor, probably in small boats. Or maybe some people followed one route while others followed the other. But in that case, which group got here first?

University of Buffalo geologist Alia Lesnek and her team are investigating the timing of the opening of the Pacific Coastal Corridor at the end of the last Ice Age. They begin their paper, published online May 30 in *Science Advances,* with the rueful acknowledgment that "despite decades of research, the debate surrounding the timing and route of the initial human colonization of the Americas continues."

Archaeologist Andrea Freeman, University of Calgary, in a 2016 paper focused on the Ice-Free Corridor, explains why this important debate has been so hard to resolve: "It is extraordinarily difficult to demonstrate exactly what type of environmental or geographic features may have existed" that would have enabled people to migrate from Asia to America. This set of questions lies at the heart of the discussion.

In this series of articles, we view the debate through the lens of six papers published between 2013 and 2018. The authors of these papers are trying to find the answers to Freeman's questions and discover the footsteps, figurative or literal, taken by the first Americans.

The Pacific Coast Corridor was the most likely route

E. James Dixon, archaeologist with the Maxwell Museum of Anthropology at the University of New Mexico, in a paper published in 2013 in *Quaternary International*, uses large-scale paleogeographic reconstructions of North America and Beringia to evaluate the viability of an interior mid-continental route of entry to the Americas, versus a maritime route along the Northwest Coast. He integrates data from a variety of sources to provide "a paleogeographic foundation for diachronically interpreting the biological and geological constraints influencing the first human colonization of the Americas."

Dixon concludes that the "opening of the ice-free corridor (or more accurately stated, deglaciation corridor) probably occurred between 15,000 and 14,000 cal BP."

He argues that this deglaciation corridor, having only two relatively narrow openings, greatly limited the opportunities for species colonization. Moreover, citing the research of other scholars, he concludes that the "newly created terrain . . . was geologically unstable and biotically impoverished." He is therefore careful to distinguish between a geographical opening when the Laurentide and Cordilleran ice sheets fully separated, and an ecological opening when the Ice-Free Corridor became suitable for human subsistence.

Dixon overflying the Wrangell Mountains in an archaeological survey of Alaska, 2011.

Unstable substrate, water-logged terrain, and the presence of large glacial lakes initially lacking outlets would have presented formidable impediments to recolonization of the corridor by large mammals. The available paleontological evidence indicates that for many centuries few edible plants grew in the deglaciation corridor, and the cold, silt-laden waters of the glacial lakes supported few, if any, fish, beaver, muskrat, waterfowl, or aquatic plants.

Dixon argues that the appearance of bison in the Ice-Free Corridor establishes a minimum limiting date for the ecological opening of the central areas of this route to—or indeed, from—the New World. Based on radiocarbon dates for bison recovered from Charlie Lake Cave in eastern British Columbia, he suggests that the "deglaciation corridor may have been suitable for human subsistence" by about 13,500–13,000 CALYBP. Since sites like Monte Verde, Cactus Hill, and possibly Meadowcroft Rockshelter predate 13,500 CALYBP, the people that inhabited those sites must have come by another route.

The Pacific Coastal Corridor presented an alternative route of entry into the New World. According to Dixon, "Sizable areas of Southeast Alaska were ice-free along the inner continental shelf during and toward the end of the last glacial maximum."

He notes that the timing of the Last Glacial Maxiumum (LGM) varied between southeastern Alaska and British Columbia, occurring sometime between 29,000 and 18,000 CALYBP depending partly on latitude. Except for "a 400-km coastal area between southwest British Columbia and Washington State, the Northwest Coast of North America was ice free by 16,000 cal BP." And in spite of the fact that many large glaciers along the Gulf of Alaska extended to the edge of the continental shelf, refugia along the Pacific coast served as wildlife reservoirs from which "established populations of fish, marine mammals, and avifauna, as well as terrestrial plants and animals, were immediately able to colonize newly deglaciated habitats."

Dixon acknowledges that although it's theoretically possible that humans adapted to high-latitude maritime conditions might have been able to hopscotch from one refugium bordering the Gulf of Alaska and Northwest Coast to the next, this would have been a difficult and dangerous undertaking. Sometime after about 17,000 CALYBP, however, deglaciation was sufficiently advanced to create a relatively safe and biotically continuous corridor along the coast thousands of years before the midcontinental Ice-Free Corridor was open and ecologically viable. He concludes that, based on the current state of knowledge, human colonization along the North Pacific Rim, either prior to or subsequent to the LGM, "appears to be the most viable hypothesis for an initial migration from northeast Asia."

Most evidence favors the Ice-Free Corridor

Ben Potter, University of Alaska Fairbanks archaeologist, and five colleagues review the geological, archaeological, and paleoecological evidence for the early colonization of Beringia and northern North America. Their goal: "To evaluate the colonization of Eastern Beringia and the route(s) used by Clovis and Fishtail complex progenitors." The potential routes they consider are the Ice-Free Corridor and the Northwest Pacific coast. They present their conclusions in the July 2017 issue of *Quaternary International.*

Although Potter and his colleagues don't exclude the possibility that pre-Clovis populations preceded the Clovis complex in the Americas, they dismiss the importance of any such precocious incursions as failed migrations that "left little or no genetic contributions to recent/modern Native Americans." They focus instead on the Clovis complex and related Paleoindian materials, which they regard as "the first widespread cultural manifestation south of the Ice Sheets."

Potter and his team accept the implications of the Beringian Standstill model, which proposes that the ancestors of American Indians were genetically isolated from their Asian ancestors for an extended period before they entered North America (**MT 33-2,** "Proving the Beringian Standstill Hypothesis: The Bluefish Caves"). They suggest that this period of isolation took place in Asia, since they find no evidence for human occupation in Chukotka, Kamchatka, or Eastern Beringia prior to about 14,000 CALYBP.

Potter (*arrow*) at the Upward Sun River site in Alaska, 2011.

Archaeological evidence for the migration routes

Potter and his colleagues review the archaeological record for Eastern Beringia, the Pacific coastal route (from the Aleutian Islands to the Northwest Coast), and the interior corridor for the period 15,000–10,000 CALYBP, which they break up into thousand-year increments. Here are their conclusions.

- **Before 15,000 CALYBP** No sites known in the region.
- **15,000–14,000 CALYBP** Two sites identified in Eastern Beringia, Swan Point and Little John.
- **14,000–13,000 CALYBP** Clovis and Fishtail complex sites are widespread in central North America and South America. Of the 21 components older than 13,000 CALYBP in their study region, they point out that 16 are located in deep interior Beringia, 2 or 3 are along the coastal route, and one lies within the interior corridor. One or two aren't accounted for in their discussion.
- **13,000–12,000 CALYBP** 20 sites identified, including 7 in Eastern Beringia, 5 along the interior route, and 2, possibly 7, along the coastal route.
- **12,000–11,000 CALYBP** 28 sites identified "in the broader region": 14 in Eastern Beringia, 5 along the interior route, and 3 possible sites along the coastal route, with 6 unaccounted for.
- **11,000–10,000 CALYBP** 29 sites identified in the region: 15 in Beringia, 9 along the coastal route, and 5 along the interior route.

Arguing from the premise that no known sites exist during this entire period from 15,000 to 10,000 CALYBP in broad stretches of southern coastal or near-coastal Eastern Beringia until later in the early and middle Holocene, Potter and his colleagues conclude that the "patterns suggest the initial colonization of Beringia was through interior east-west trending river systems between 14,000 and 13,000 cal yr BP."

Potter and his team acknowledge that limited archaeological visibility and sampling errors make it difficult to identify the earliest human presence in Beringia. They note, however, that in substantial parts of unglaciated Eastern Beringia that are exposed and accessible, they conducted several large-scale surveys that identified 15 Pleistocene-age components. Although the earliest occupations lie in interior river valleys and highlands, they found no evidence for sites older than about 12,000 CALYBP along the salmon-rich Copper River, which would have been accessible to any putative early coastal populations. This absence of evidence, Potter suggests, may reasonably be interpreted as evidence of absence.

Potter and his colleagues argue that the earliest-known Beringian occupation, the Swan Point site, is similar in many respects—a stone-tool technology characterized by microblades and burins and a diet of mammoth, horse, and waterfowl—to the Diuktai culture of Western Beringia and Siberia. They conclude that the "East Beringian tradition, Diuktai phase represents the best evidence we have for human migration into the North American continent via the Bering land bridge" and assert that "evidence for an earlier migration, by either interior or coastal routes, is lacking." Moreover, they find no evidence at any known Beringian site for technology appropriate to coastal subsistence, such as fishhooks, boat parts, or floats for hunting sea mammals on sea ice or open water,

Potter and his coauthors also point to distributional patterns of obsidian in the region that argue for an interior migration route instead of a coastal route of entry for the First Americans. Obsidian is volcanic glass, whose chemical fingerprint identifies the parent volcano. Obsidian tools at archaeological sites can therefore be traced to their point of origin. Potter and

his colleagues found that interior sources of obsidian were exploited 5,000 to 2,000 years earlier than coastal sources. Moreover, obsidian from interior sources "was widely distributed throughout interior Eastern Beringia along east-west trending drainages, and not transported within north-south trending Pacific seaboard drainages." These data support the expectations for "an initial interior occupation and later expansion to the coast."

Geological and paleoecological evidence

In weighing the evidence for the two main hypothetical routes, coastal and interior, Potter and his colleagues consider when glaciers may have blocked human migration, when deglaciated landscapes had sufficient biological productivity to support human populations, and whether the earliest colonizers possessed the technology necessary to extract resources from these areas or to move freely and without substantial risk.

For the interior route, Potter and his team's review of the data indicate the formation of an ice-free corridor 300–150 km wide, which opened no later than 15,600–14,800 CALYBP and by 14,000 CALYBP expanded to at least 300 km wide. They argue that by about 13,555 CALYBP, possibly as early as 14,900 CALYBP, the northern portion of the corridor had sufficient plant and animal resources to support the Siberian Diuktai culture. Indeed, they contend that"Early Beringians would have been uniquely positioned to deal with these rigors, as they were already adapted to periglacial conditions in central Alaska and Yukon Territory."

Munyikwa preparing to extract core sediments in north-central Alberta, 2009.

GARY O'BRIEN

Rittenour near Moab, Utah.

Feathers.

For the North Pacific Coastal Route, Potter and his colleagues conclude that deglaciation began around 19,000–17,000 CALYBP, but they argue that sea ice likely continued to be a factor limiting access to this route until as late as 12,800 CALYBP. They argue that plant and animal resources were limited to isolated refugia until around 14,700 CALYBP, when ice-rafted debris vanishes in marine core samples along the southern Alaska coast. Finally, Potter and his colleagues see little evidence of the technology needed to exploit the resources of the coastal route:

> Hunting and navigating on drift ice requires complex hunting and transportation technologies, including composite toggling harpoon systems, drag-float systems, umiaks, kayaks, and dog sleds. . . . The Late Upper Paleolithic Siberian and earliest Beringian cultural complexes do not contain these technologies.

Potter and his team conclude that "a preponderance of the current evidence suggests that we cannot reject the interior route. More work is needed in both coastal and interior route areas, grounded in secure chronological controls of deglaciation, deposition, revegetation and habitat development."

The Ice-Free Corridor was open at the right time

Kennedy Munyikwa, a geologist with the Centre for Science at Athabasca University in Alberta, Canada, along with Tammy Rittenour, a geologist from Utah State University, and archaeologist James Feathers of the University of Washington, in a paper published in 2017 in *Palaeogeography, Palaeoclimatology, Palaeoecology*, used optically stimulated luminescence (OSL) to improve our understanding of the timing of the Late Wisconsinan deglaciation of the ice-free corridor in western Canada.

Optically stimulated luminescence dating is based on the property of minerals such as quartz to preserve a record of the last time they were exposed to light. Measuring the luminescence signal of a quartz sand grain effectively tells you when that grain was buried. Munyikwa and his colleagues argue that OSL dating yields a more accurate and precise dating of the deglaciation of western Canada because radiocarbon dates reflect when the ice-free landscape was colonized by biological communities, whereas OSL dating reflects more directly when receding ice sheets re-exposed surfaces to sunlight and windblown sand particles, their luminescence clocks reset to zero, began to accumulate.

OSL dates are, however, limited in precision. Munyikwa and his colleagues admit that "luminescence ages from eolian landforms simply denote time that has lapsed since the last depositional event." Deglaciation may have occurred somewhat earlier, but later erosion may have removed those older deposits. The land surface isn't

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Jon Erlandson

MAHAN KHALSA

Archaeologists Erlandson and Kristina Gill searching late-Pleistocene sediments on Santa Cruz Island, 2015.

The Role of the Sea in Human Prehistory

JON ERLANDSON, archaeologist, professor of anthropology at the University of Oregon, grew up in Santa Barbara and regularly visited his grandfather in Oregon, who showed him arrowheads found on his lakefront property. "Something about that tangible experience of holding history in your hand and recognizing that the items were made by ancient peoples stirred me," Erlandson says. A lifelong lover of water sports—swimming, surfing, and sailing—he was also drawn to the field of marine biology and realized while at the University of California, Santa Barbara, where he earned his bachelor's degree in 1980, that it was possible to combine his two interests in one field—coastal archaeology. He went on to complete his M.A. and Ph.D. from the same university.

In 1989, Erlandson worked to protect archaeological sites from damage following the Exxon Valdez oil spill, where his collaboration with biologists inspired him to become involved in policy issues related to the conservation of endangered coastal sites, fisheries, and ecosystems.

"From hiking ten miles a day—with no shoes—to dangling off a 30-foot-high sea cliff, Jon has tirelessly pursued archaeological research on the antiquity of coastal adaptations and the peopling of the Americas," says colleague Torben Rick of the Smithsonian Institution. "Perhaps more than any other single researcher, Jon has advanced science on early coastal archaeology in North America, and it has been a joy to work with him for over 20 years."

Maritime adaptation isn't new to humankind

The prevailing belief when Erlandson was in college was that boat technology only developed in the last 10,000 years, about 1% of human history. While a graduate student, he began synthesizing information about coastal peoples around the world, and in the last couple of decades he and other researchers have collected compelling evidence that coastlines and coastal peoples were important in colonizing the Americas. "Boats and seafaring and maritime adaptations actually played a key role in the spread of humans out of Africa," says Erlandson. "Anatomically modern humans were on the move along coastlines much earlier than previously believed, and must have mastered travel by sea, as illustrated by the peopling of Australia 50,000 years ago." Erlandson also points to island groups that show evidence for occupation 40,000–50,000 years ago. Shell middens, the refuse heaps of coastal peoples, testify to human habitation.

Erlandson concedes that the problem of finding evidence for early coastal peoples is rising ocean levels (**MT 30-4,** "Looking for sites at the water's edge"). The last time sea levels were this high was 120,000–130,000 years ago. In the last 20,000 years, sea levels have risen 120 m. If people lived along coastlines during the Last Glacial Maximum, those occupations have long been submerged.

Early tenants of Channel Island property

On the Channel Islands off the coast of Santa Barbara he has expanded on findings of earlier researcher Phil C. Orr of the Santa Barbara Museum of Natural History (**MT 26-4,** "And ere the boards did shrink: A story of ancient mariners"). By the time Clovis people arrived in North America with their big-game hunting strategies, Erlandson believes people already occupied the Channel Islands, subsisting on shellfish, seabirds, and other animals. Small wonder that he has focused much of his research here over the years. San Miguel Island, for example, has yielded some of the earliest shell middens found in North America. It embraces a number of sites that date to ca. 12,000–9,000 years ago.

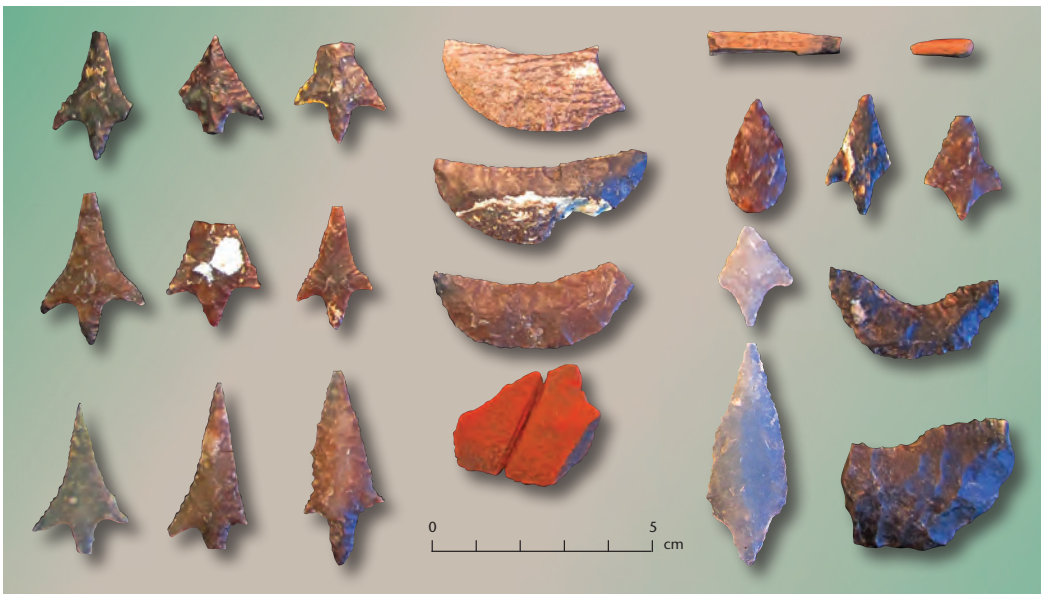
The four Northern Channel Islands were originally a single landmass known as Santarosae until rising sea level separated them about 10,000 years ago. Early arrivals would have needed the skill to build boats and traverse open waters. The islands enjoy a wealth of marine resources including seaweeds, marine mammals, shellfish, finfish, and seabirds. Human bones from the Arlington Springs site on Santa Rosa Island date to about 13,000 years ago (**MT 21-4,** "First Lady of the New World: Arlington Springs Woman") [ed. note: The remains were later ascertained to be those of a male].

Erlandson's recent archaeological studies on the Northern Channel Islands, supported by National Science Foundation funding, have discovered a growing number of early tool types that provide new insight into paleocoastal subsistence and technologies. By examining caves, springs, toolstone outcroppings, and other geographic features that would attract maritime peoples, Erlandson and his colleagues have identified extensive

shell middens, which suggest that a substantial population existed on the islands in the early Holocene.

- Sites at Cardwell Bluffs on San Miguel Island have yielded bifaces, crescents, and stemmed points associated with shell middens that date to the terminal Pleistocene, ca. 12,000–11,500 CALYBP. On the same marine terrace landform, Erlandson discovered another site where chipped-stone artifacts were found scattered over a large eroded area. Since only artifacts exposed by soil erosion were collected, Erlandson believes that the site may be considerably larger. Among the scattered finds were two teardrop bifaces and an unusual bear-shaped crescent. All were made from local chert.
- Santa Rosa Island site CA-SRI-512, dated to ca. 11,750 CALYBP, appears to have been occupied in winter and has produced scores of tiny stemmed points, crescents, and abundant bones of geese, ducks, and seabirds—including an extinct flightless scoter, *Chendytes lawi*.
- CA-SMI-261 on San Miguel Island, also known as Daisy Cave, contains stratified Paleocoastal shell middens dated between at least 11,700 and 8500 CALYBP. These strata produced stemmed and leaf-shaped points, bone gorges, sea-grass cordage, and other artifacts associated with a diverse assemblage of shellfish, thousands of fish bones, as well as bird and marine mammal remains, many of them from kelp-forest habitats.

These and many other smaller sites investigated by Erlandson and his colleagues fuel his belief that our ancient ancestors weren't landlocked as once believed, but instead were savvy, opportunistic hunter-gatherers who took advantage of the vast resources provided by marine environments. He believes that early peoples were probably drawn inland by the need for freshwater, caves for protection from constant island winds, and chert for toolmaking. Many of them were year-round residents on the Channel Islands. Erlandson now believes that the islands supported many more people than he originally thought.



A suite of Paleocoastal artifacts, including Channel Island Barbed points, chipped-stone crescents, and red ocher, ca. 11,750 CALYBP, from a site on Santa Rosa Island.

JON ERLANDSON

"I have known Jon since I first began my career in archaeology in 2002, in the beginning only by name," says Amy Gusick, Associate Curator of Anthropology at the Natural History Museum of Los Angeles County. "He was an early proponent of considering the importance of coastal resources and island environments in major human movement around the world, particularly in the peopling of the New World, my research interest. His work was always inspiring to me and really played a role in encouraging me to focus my research interests on understanding development of maritime societies and on the importance of coasts and coastal resources in human dispersals (**MT 24-3,** Putting MUSCLE into coastal-entry research"). As I advanced in my career, I have had the fortune to develop both a professional and personal relationship with Jon. Through this transition, I have found that my early inspiration was well deserved. Not only does he continue to conduct pioneering research, he is an encouraging and kind mentor, and a good friend. He also, importantly, introduced me to the joys of wearing sandals for coastal surveys!"

The flowering of the Coastal Migration model

About two-thirds of North American scientists, according to Erlandson, now believe that the peopling of the Americas began around the Pacific Rim with coastal migration. Genetic information paired with archaeological discoveries has driven this paradigm change. In the last 20 years three important paradigm shifts have occurred:

- Consensus that *Homo sapiens* evolved fairly recently—200,000 years ago in Africa—followed by rapid spread around the world in the last 75,000 years.
- Acknowledgment that coastal occupation, seafaring, and fishing played important roles in human evolution and dispersal.
- Collapse of the Clovis-First model and the escalation of the coastal migration theory from marginal to mainstream.

Erlandson's Kelp Highway Hypothesis, a corollary to the coastal migration theory, argues that coastal refugia, rich in birds, fish, seals, and seaweeds, presented a made-to-order route for hopscotching human migrants. For Erlandson and his colleagues it helps to explain the early peopling of the Americas and the presence of pre-Clovis sites like Monte Verde (**MT 33-3,** "Tom Dillehay: The Clovis-First iconcoclast") and Oregon's Paisley Cave (**MT 28-2,** "Older than Clovis: The Western Stemmed Tradition points from Paisley Caves"). These sites

date to about 14,000 years ago, before the Ice-Free Corridor is believed to have opened.

The Kelp Highway traces a series of productive kelp forests from Northeast Asia to Baja California. Kelp supported a wide variety of resources useful to early humans: fish, shellfish, sea mammals, and nutritious kelp itself. The kelp also benefited early waterborne travelers by damping harsh waves.

"The collapse of Clovis–First opened a Pandora's Box of alternative models," Erlandson tells us. "I currently favor a Pacific Rim coastal dispersal, but it's really important that we acknowledge how much we don't know and continue to explore multiple scenarios for the origins of the First Americans."

Stone crescents, those jack-in-the-box artifacts

If you examine large collections of Paleoamerican artifacts, sooner or later you're sure to come across a crescent-shaped tool among the projectile points, scrapers, and other implements commonly fashioned by early peoples. Although crescents number no more than 5% of artifacts from any site, they were once widespread over much of western North America. It isn't known why they disappeared from the archaeological record about 8,000 years ago, and no one knows with complete certainty what purpose they served.

In studying crescents, Erlandson and colleagues learned that they're typically found associated with ancient wetlands, which suggests a connection between crescents and waterfowl (**MT 29-4,** "Elusive crescentics"). They may have been used as transverse projectile points to bring down geese and swans, which proliferated in the Great Basin and adjacent regions during the late Pleistocene and early Holocene. The nesting behavior of the tundra swan, greater white-fronted goose, snow goose, and Ross's goose involves a flightless period of about one month while the birds are molting, which may have made them easier targets.

Crescents, which are members of the Western Stemmed Tradition, are usually 2½–10 cm long. They appear in the shape of a half moon, crescent moon, and butterfly, and sometimes in a bizarre shape known as an eccentric—occasionally zoomorphic in design, with spurs that suggest stylized arms, legs, and heads. Most crescents are thin and bifacial.

Erlandson's study of crescents has focused on sites in Washington, Oregon, Wyoming, Utah, Idaho, Nevada, New Mexico, and Colorado. Nearly every site that has yielded crescents was once near a wetland environment—lake, marsh, estuary, or island. He and his colleagues theorize that crescents were transverse projectile points that served to stun birds rather than impale them.

In 2003, Erlandson found an eccentric crescent within a stratified shell midden near Daisy Cave, on the northeast coast of San Miguel Island. The eccentric crescent was embedded in the middle of strata exposed in the sea cliff and probably dates to about 9,000 years ago. The first island crescent from a well-dated context, it's made from local marbled black-and-gray chert.

JON ERLANDSON

Channel Island Amol point, ca. 12,000 CALYBP, from Santa Rosa Island.

Twenty years of discoveries

A consequence of Erlandson's extensive work in the field is an enviable list of accomplishments. Alongside his teaching obligations, he serves as Director of the Museum of Natural and Cultural history at the University of Oregon. He has authored numerous books and more than 300 articles.

"Jon has been on the forefront of pushing archaeological inquiry of early maritime migrations, coastal adaptations, and the peopling of the Americas forward for decades," says colleague Todd Braje of San Diego State University. "His work has helped reshape how all archaeologists and other scientists think about these issues. After working with him for over 15 years, I've come to realize that Jon possesses a unique combination of intellect, curiosity, and dogged determinism. He integrates concepts and information from archaeology, geology, ecology, and a variety of disciplines to read the archaeological record in a completely novel way. Combine that with an unquenchable curiosity and thousands upon thousands of hours

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spent in the field and laboratory, and poring over academic literature, and you get some alchemist's eureka moment in creating the quintessential edgewalker archaeologist—someone who is always pushing the boundaries of what we think we know about the human past."

"Just about everyone loves a good origins story," Erlandson says, "but this is an especially exciting time to be involved in First Americans research. With new theories to test and new technologies in our tool chest, discoveries are coming fast and furious, with no end in sight." As for the future, "I'm currently engaged in Pacific Coast field work on land and beneath the sea. I'd love to see much more research on North America's vast submerged coastal landscapes—one of the last frontiers of modern archaeology. Submarines are really cool!"

–Martha Deeringer

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Coastal Entry or Ice-Free Corridor

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fully stabilized until vegetation becomes established. Therefore, OSL "chronologies simply represent minimum possible ages for deglaciation."

Munyikwa and his team obtained OSL dates for dune fields and sand hills in central and northern Alberta "to construct a chronological framework for the recession of the LIS [Laurentide Ice Sheet] from western Canada." They determined that a majority of the dunes in central and northern Alberta developed "time-transgressively in a northeasterly direction following the retreat of the LIS." This means that as the melting ice sheet receded, the land in the southwestern parts of the study area became exposed first. As the ice sheet melted, some of the meltwater accumulated in large glacial lakes, so the underlying land surface wasn't exposed to sunlight until the lakes drained.

Munyikwa and his colleagues conclude that, overall, OSL dates indicate that central Alberta had become free of both ice and dammed water by around 15,000 years ago, which means that the Ice-Free Corridor was open to the First Americans by that time.

–Brad Lepper

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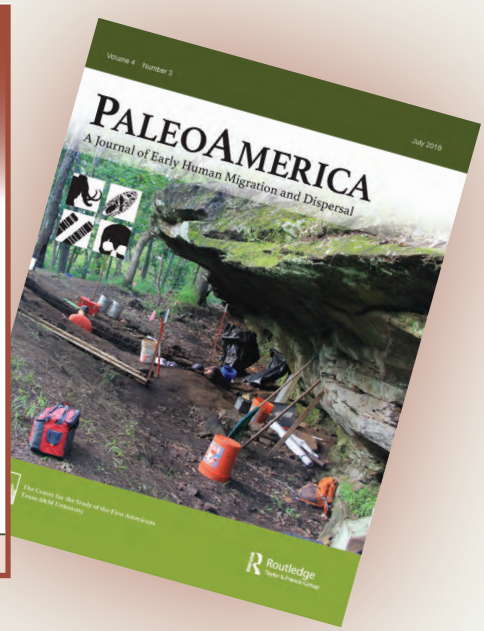

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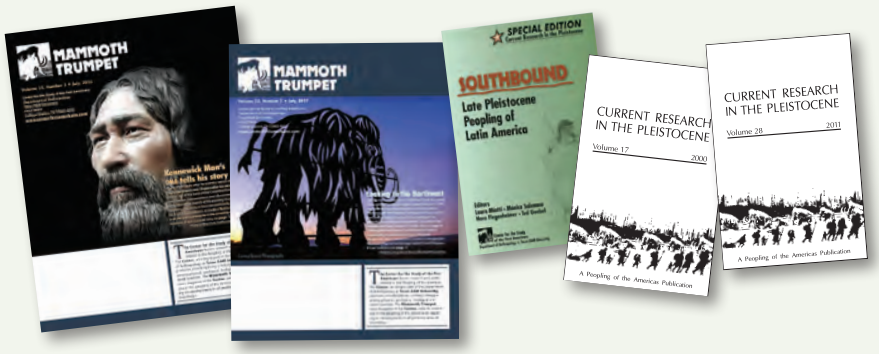

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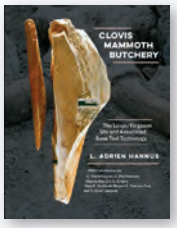

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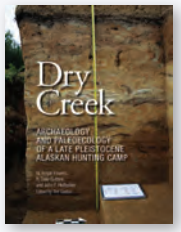

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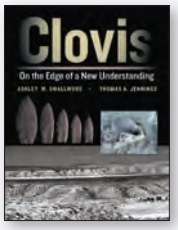

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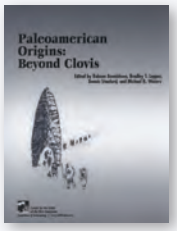

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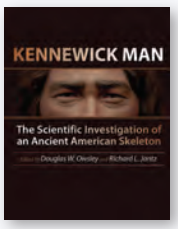

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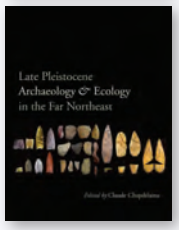

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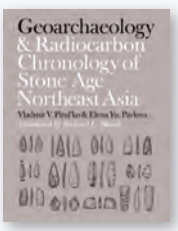

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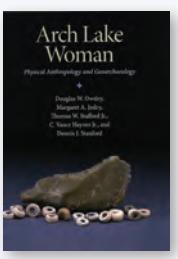

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