Not a cakewalk for an archaeologist

Hakai Institute archaeologist Daryl Fedje examines a karst cave in north Vancouver Island for animal remains dating to the late Pleistocene. Underground, underwater, or on shore, coastal British Columbia challenges archaeologists. See our story on page 10.

Photo by Joanne McSporran

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They’re tiny, but they helped Paleoamericans survive. Stitched clothing was essential for withstanding the bitter cold of the Younger Dryas. Enter the bone needle.

Making sense of a landscape wrinkled by glaciers and beset by madly fluctuating sea levels. “No free rides” could be the motto of hardy archaeologists of the Hakai Institute and University of Victoria who plumb coastal sites in British Columbia.

To find ancient terrestrial landscapes, look for DORA Oregon State University archaeologist Loren Davis certainly found “Dirt of the Right Age” at the Cooper’s Ferry site in Idaho, and in it he found stemmed points . . . underlying Clovis-age materials.

**Part I**

The Inimitable Lewis Binford in 1981 concluded in his book *Bones: Ancient Men and Modern Myths* that most, if not all, so-called bone tools reported at Stone Age sites were really bones broken only to extract their marrow. But even as he publicized his thesis, a Vietnam-veteran-turned-archaeologist was working a site in the South Dakota Badlands that challenged Binford’s theory.

The location under excavation by L. Adrien Hannus, named Lange/Ferguson after the landowners and site discoverer, contained smoking-gun evidence that not one but two mammoths had been butchered there, in part using expedient bone tools—made from their bones and bones from other animals. The site was also indisputably Clovis in age; a first in the SoDak Badlands, insofar as the professional community knew. Two complete Clovis points and one basal fragment were recovered from the butte just a few meters away from the bone bed: beautiful tools from the same level as the mammoth bones, in identical sediments that were all that remained of a spring-fed pond. In the intervening 13,000-plus years, deep fluvial erosion had split the original ancient landform in two.

The deliberate flaking and use wear on the edges of dozens of the recovered bones is proof enough that the mammoths’ own bones were used to dismember them, though some observers have disputed that. It’s harder to contend that the bone flake jammed between two of the larger mammoth’s
vertebrae was the result of some natural process, as it derived from an entirely different specimen: a juvenile that was butchered beside the adult mammoth. By 1980 the juvenile’s remains had been mostly removed by erosion or perhaps by the butchers themselves. The adult mammoth, however, provided a treasure trove of information about Clovis mammoth butchery.

A story long in the telling

In 1960 local collector Les Ferguson found a mammoth femur protruding from a butte on land owned by ranchers named Lange. Knowing the bone would likely be lost to erosion, he got their permission to remove it and took it home with him.

He was impressed and surprised by Ferguson’s many Clovis and Folsom pieces. “I thought they were from the Southwest, but Les said they were all from right there in South Dakota. Professional archaeologists had no inkling of this.” Until then, the oldest formally documented site in South Dakota was the type site for Angostura, a late-Paleoindian culture.

When asked if he’d found any mammoth bones, Ferguson allowed that he had done—on the White River, inside the borders of the Oglala Sioux Pine Ridge Reservation. After Hannus examined the femur, Ferguson took him out to where he’d recovered it. “Ferguson had a map of the Badlands in his head that exceeded any map you could have assembled,” Hannus says. “The Badlands is so chopped up it’s difficult to find your way through it. But we went...

See outside rear cover to order the book on the Lange/Ferguson site by principal investigator Hannus.

Adrien Hannus learned of the find 20 years later. “When I was working in the Cheyenne River basin in 1980,” he recalls, “I checked with local collectors to learn about their finds in the area, and kept hearing the name ‘Les Ferguson.’” By then, Ferguson was serving as President of the Board of Directors of the nearby Hot Springs Mammoth Site. When the two men connected in August 1980, Hannus had an opportunity to review Ferguson’s extensive archaeological and paleontological collection.

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—Michael R. Waters, Director
right back to where he’d collected the femur in 1960—and right away we could see a mammoth pelvis bone eroding out of a black mat on the south side of the butte. On the north face, we found a piece of spirally fractured tibia right on the edge of the butte face. We turned it over, wiped the dirt off, and found that a long channel flake had been knocked off, as if it had been deliberately flaked when it was fresh and green.”

Intrigued, Hannus collected sediment from above the bone, and sent it off to get a radiocarbon age ASAP. By late August he had a date of 11,300 ± 600 RCYBP, firmly within the Clovis age range. The flaked tibia, an obvious bone core, convinced him the site was archaeological. Furthermore, what remained of it was in danger. Although the site sediments had the consistency of concrete when dry, when they got wet enough they became pliable and erodible. Hannus worried that the site might become further eroded in the next flood episode of the White River. After all, severe flooding had carved most of South Dakota’s Badlands millennia before; 9–10 m of the site was already gone on the north side of the butte, which they later realized was where most of the juvenile had been located. Even more of the site was lost when the landform was split into the two adjacent buttes labeled Locality A, where the bones were located, and Locality B, where the Clovis points were found.

As Hannus puts it at the very beginning of his groundbreaking book, Clovis Mammoth Butchery, “The Lange/Ferguson site (39SH33) represents one of the few North American archaeological sites that provide evidence of a Clovis-era mammoth butchery event.” Even rarer was the use of bone tools. Immediately realizing its significance, he called the State Historic Preservation Office, which had funded his work that summer, and secured extra funds to excavate the new site. He then arranged to have a colleague teach a class for him at South Dakota State University that fall and went to work on a series of excavations, whose results he pursued for over 35 years.

Excavating concrete

Lange/Ferguson is located in an extensively eroded area between two draws studded north-to-south with small buttes, east of a much larger upland feature called the Cuny Table. Most of the site excavation took place in the 1980 and 1981 field seasons, with additional work in 1982 and 1984.

The working conditions were often hellish. “Each morning we’d hang a thermometer in the shade of the butte, reading it at morning, noon, evening. The readings for July and August 1981 exceeded 125°F in the bright white unshaded areas,” Hannus recalls. Besides the heat, their first challenge was the 8¼ m of overburden lying atop the bone bed. As is standard in such cases, Hannus hired a local contractor to remove the overburden with a backhoe; but they were careful about it, not wanting critics to argue later that the weight of the machine had damaged the bones beneath the overburden. The contractor built a ramp up the back of the butte to work from, so the backhoe was never actually on the landform. The team examined the overburden for cultural material, but found none.

After a week and a half, they reached a depth of a meter above the black mat. After that, all excavation was by hand. The overburden was mostly montmorillonite, a heavy ash-derived clay often used industrially as drilling mud. “It was like concrete when dry, congealed grease when wet,” Hannus recalls. “So I bought pickaxes to gradually shave it off—but the blades started to turn against the handles because the material was so hard! I then got adzes with harder blades, and we gradually skimmed down through it.” Excavating what amounted to solid rock in 125-degree weather and screening all that material was no picnic, but they did it. They took even more care with the black mat, which provided a rich variety of data of all kinds, not just archaeological and paleontological but also palaeoenvironmental, ex-
Reconstructing the site history

Analyses of the microfossils—including pollen, opal phytoliths, and diatoms—indicated that Lange/Ferguson 13,000 years ago was a marshy, stagnant-water pond or slough located in a mixed forest with shrubby understory, lined by sedges and wetland grasses. The forest was spruce-dominated, with secondary components consisting mostly of black ash, alder, and shrubs like hop-hornbeam and hazel. The plentiful fossil mollusks (both land and water species) suggest a pool likely to dry up in summer located in an open gallery forest with plenty of grassy slopes nearby. All these fossils also point to an environment significantly cooler and wetter than today’s Badlands.

The pelvic bone in the south face of Locality A proved to be from an adult mammoth; the flaked long-bone, however, was from a juvenile. Since little remains of the latter, its cause of death remains uncertain; but it’s clear from the upright, vertical posture of the adult’s front legs (which were inaccessible to the butchers) that it got bogged down in the pond’s bottom sediments, possibly while drinking, having stepped into the springhead that intermittently fed the pond. The juvenile may also have been caught in the bog; or, assuming it was the child of the adult, may have stayed with its parent until both animals died or were killed.

“Our’re missing most of the juvenile elements, swept away millennia ago during downcutting in the area,” Hannus reports. “Vance Haynes thought this occurred about 5000–6000 yr B.P., when circumstances arose that caused these buttes to be formed. It would have been interesting to have more of the juvenile bones, but we just didn’t have that.”

Deconstructing the mammoths

While the loss of the juvenile specimen made determining the butchering process at Lange/Ferguson more difficult, Hannus and his team used the materials they recovered to produce a convincing scenario. That the animals were in fact butchered is obvious; if nothing else, use wear and cutmarks on some of the bones tell the story plainly. The adult’s head was deliberately severed; its scapulae were removed, and parts of one were used as a chopper; breaking and other butchering evidence is visible on the thoracic vertebrae; its entire pelvis was removed and butchered separately; the spinal column, ribs, and brisket were treated as a distinct unit for butchering purposes; and the rear legs were removed and butchered off to the side of the main skeleton. The few remains recovered from the juvenile mammoth suggest it was butchered similarly.

The butchers had to work on the adult from the top down. They skinned it from above, used some of the larger bones from both animals as bone cores and expedient tools, removed the head and pushed it aside, then took apart the most conveniently accessible sections of the animal. Attempting to recover the lower elements, which were still stuck in the mud, probably would have taken more effort than it was worth with so much food already available, so they didn’t bother.

We may never know for sure whether the animals were killed in place or found dead, but it’s clear that soon after the butchering event their remains were buried in sediments deposited by a low-energy flood that didn’t noticeably disturb the bones. Lack of evidence for animal trampling, bone scattering, carnivore predation, and similar taphonomic factors suggest that the burial may have occurred within days. It was only thousands of years later that a powerful flood cut deep into the local sediments, creating the butte system that currently exists and, in the process, taking with it most of the remains of the juvenile.

Marshaling the evidence

Lange/Ferguson is too complicated and well documented a site to introduce in a single article. In part 2 we’ll take a closer look at the tools the Clovis butchers used on their massive prey—and how careful research proved Adrien Hannus’s hypothesis that they were processed, at least in part, using their own bones.

–Floyd Largent

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The world’s oldest bone needle, discovered in 2016 in the Bashelaksky Range of the Altai Mountains of Siberia, is at least 50,000 years old and still functional. But it wasn’t made by Homo sapiens. The 7-cm-long needle was made of bird bone and used by our long-extinct Denisovan ancestors.

It was here at Denisova cave that Russian scientists found the sewing implement—complete with an eye for thread. It’s assumed that the needle was made by Denisovans because it was found in the same layer where Denisovan remains were previously found. The cave is the one place in the world where we know Neanderthals, Denisovans, and Homo sapiens have all once lived. You might say, in fact, it was the cultural birthplace of modern man. In a bracelet made of chloritolite (chlorastrolite), a translucent greenish blue stone, by the Denisovans 40,000 years ago, scientists found a hole drilled with the degree of precision we would expect only from a modern machine tool. The bracelet, which predates the needle by 10,000 years, indicates the Denisovans may have been more technologically advanced than Homo sapiens or Neanderthals in the same period.

Response to cold stress in the New World
Bone-needle technology entered the Americas tens of thousands of years after Denisovans first drilled eyes into their needles. Whether the First Americans carried knowledge of their manufacture with them from the Old World or developed the technology once settled in the New World, it’s certain that bone needles served an essential purpose, especially during the Younger Dryas Cold Event (YDCE). The Younger Dryas (12,940–11,640 yr B.P.) interrupted the global warming trend that eventually melted late-Pleistocene ice sheets. Plant and pollen records show that tundra vegetation supplanted forests during this world-wide cold spell.

The YDCE not only defined the climate for 13 centuries, it shaped human lives and behavior. Survival of course was foremost, and fitted clothing was essential for early immigrants to survive low temperatures. This same adaptive response appears during the Late Glacial Maximum and the YDCE throughout Europe and Asia by Gravettian, Solutrean, and Magdalenian populations. Humans are homeothermic (we maintain constant body temperature independent of the environment) and endothermic (we’re warm-blooded by autonomously generated heat). To survive extremely cold YDCE winters, however, Paleoindians required the additional protection of effective winter “survival suits” to reduce heat loss. To make tailored clothing required needles for stitching.

The manufacture of eyed needles required a special toolkit including gravers (MT 31-1, “The essential tool for making needles”), burins, abraders, and perhaps bow drills. For thread, Paleoindians used sagebrush, hair, and even intestine sliced thin and cured (catgut).

Bone needles pervade Paleoindian sites
“Bone needles have been found across the U.S.,” says Richard Rosencrance, an archaeologist with the University of Oregon Museum of Natural and Cultural History, “but mainly in the western two-thirds of North America.” Eyed bone needles recovered from Paleoindian sites in Alaska, Washington, Idaho, Nevada, Wyoming, Colorado, Texas, Nebraska, and Missouri date to 12,660–10,310 yr B.P. Few eyed bone needles have been recovered from archaeological contexts outside of the Arctic region after the Paleoindian and early-Archaic periods. The reason, according to Rosencrance, is simply that “things probably got a lot warmer after the YDCE.”

Bone needles aren’t completely limited to the terminal Pleistocene in North America. Katelyn McDonough, a doctoral student in anthropology at Texas A&M University, notes that they have been

Eyed bone needles (<3 mm) and awls (>3 mm) from the Connelly Caves. All date to the Younger Dryas.
recovered, for example, from Holocene contexts in Texas. But these are the exception. Bone needles gradually disappear after the YDCE, a fact made evident in the Great Basin region. Rosencrance and McDonough are excavating Connley Caves in the Fort Rock Basin, Oregon, where, at last count, 14 eyed bone needles have been recovered. “The first one we found was in 2014,” McDonough tells us. “I discovered one just a couple of months ago while looking under a microscope at seeds. They’re so tiny they frequently aren’t recovered.” Some fragments are less than 2 mm in diameter. If not for use-wear polish, she adds, you wouldn’t recognize the bit of bone as a needle.

**Making bone needles**
The most common method for making bone needles probably employed a technique known as “groove and snap,” done by scoring parallel grooves on a bone core, then prying or snapping out the linear blank. We see evidence for this, for instance, in spurred flake gravers and eyed bone needles found in close proximity at the Folsom-age Lindenmeier site in northern Colorado. Archaeological and ethnographic records reveal that alternative methods were used, either by drilling with a bow drill or gouging with gravers.

Scientists who replicate eyed bone needles to understand how form meets function typically utilize bones of birds or small mammals such as jackrabbits. This saves time when producing a preform or blank. The ethnographic record shows a preference for strong, dense bones taken from medium-size or large mammals because, as Rosencrance points out, “for the groove-and-snap technique to work, you need large bone.”

Blanks are shaped by carving, scraping, and polishing. Final shaping takes about 20 minutes. Some replicators form the eye after final shaping and sharpening. Others fear that attempting to form an eye in a narrow shaft after final shaping may fracture the needle. To form an eye by gouging or drilling takes 10 to 15 minutes. The total time needed to replicate a bone needle about 2 mm in diameter is 60–90 minutes.

Making needles was an essential activity during the YDCE. At Connley Caves McDonough and her team found evidence for intensive processing—200 scraper tools associated with bone needles and gravers used to drill eyes or punch holes in hide. The presence of bone needles in conjunction with other tools suggests to her that “the Connley Caves have been used differently through time and by different groups of people.” Rosencrance believes that although people occupied the caves off and on for over 12,000 years, “the most intense period of occupation was when bone needles were being used.” Some caves were set up as work stations for sewing and related activities.

McDonough and Rosencrance wonder how many bone needles archaeologists have failed to identify. “They’re so tiny,” McDonough remarks, “and go through screens so easily I’m sure there are some we haven’t been able to recover. Recently I looked at bulk samples for botanical remains and have already found two fragments of bone needles that were probably too small to be caught in a regular screen. We have already found 14 bone needles, which is a lot.”

**Old World vs. New World needles**
Compared with the wide, flat, bulky bone needles made by Old World toolmakers, bone needles made by North American Paleoindians are quite small and delicate. Their miniature...
size betokens mastery of working with bone. These exquisite devices were doubtless invaluable in creating clothing that helped keep individuals alive in fiercely cold conditions. Their appearance at some of the oldest sites in the New World, like Broken Mammoth in Alaska, supports this idea.

“Bone needles are common throughout Eurasia starting about 45,000 years ago,” says Jordan Pratt, a doctoral student in Anthropology at Texas A&M University. “If you look at Paleoindian needles in North America compared with those found in Eurasia, they tend to be smaller and thinner, and there seems to be a trajectory toward making more specialized needles that aren’t as durable as those found in China and Siberia.” And because they’re smaller, she reasons, they don’t preserve.

It isn’t clear whether narrow needles were already part of the cultural repertoire of human groups that colonized North America or were developed after they arrived. Perhaps a cultural drift occurred in Northeast Asia and we’re missing an intermediate stage. Whatever their genesis, these new narrow needles are associated with a demand for robust thermal insulation among fully modern humans in extreme climatic conditions and became an essential tool for stitching the inner layers of multilayered garments, particularly thin skins of small animals. Multiple layers (up to four or more layers in modern-day garments) can dramatically reduce heat loss. Such complex garment assemblages afford mobility and comfort only if the innermost layers are reasonably thin, soft, and pliable. Sewing such materials requires delicate craftsmanship and the correct tools.

The product of bone needles is, after all, clothing
A huge gap in the archaeological record of sewing technology, McDonough reminds us, is direct material remains that can help us understand the demography. “You have this material object, the bone needle, but we’re not just interested in the object. Why was it interesting to humans? What was the culture? We barely have any physical remains of what people were making.” Sewn leather dating to the Paleoindian period has been found in only one place in North America, Cougar Mountain Cave.

Located in Fort Rock Basin of Oregon, Cougar Mountain Cave was excavated in 1958 by avocationalist John Cowles, who excavated much of its deposits and recovered abundant fiber, lithic, wood, and osseous artifacts. A crew from the University of California, Davis, which visited the site in 1966 to evaluate the potential for further research, collected additional lithic and fiber artifacts from disturbed deposits and in situ charcoal from apparently undisturbed deposits. Because Cowles took few notes or photographs, the Cougar Mountain Cave collection—most of which is housed at the Favell Museum in Klamath Falls, Oregon—has largely gone unstudied even though it contains diagnostic artifacts spanning the Holocene and, potentially, the terminal Pleistocene.

Rosencrance and his colleagues recently submitted charcoal and basketry from the site for radiocarbon dating to determine when Cougar Mountain Cave was first occupied.

“Our results indicate at least a Younger Dryas age for initial occupation,” he says. “The directly dated basketry has provided new information about the age ranges and spatial distributions of diagnostic textile types in the northwestern Great Basin.”

The arid interior of Cougar Mountain Cave preserved leather, fur, hair, grass, string, rope, and wood artifacts from the lowest cultural deposits to the top of the stratigraphic profile. Cowles’s observations that skin, hide, and leather were found in the oldest deposits of the cave in association with Western Stemmed Tradition points, eyed bone needles, and braided cordage have been verified by identical remains found at the Paisley Caves (MT...
25-4, 26-1, “Paisley Caves) and, to a lesser degree, Conney Caves.

“We obtained results on a specimen of sewn leather a few weeks ago,” Rosencrance reports. The item is the subject of a developing paper coauthored by Rosencrance, which explores bone sewing needles and their material products.

**Bone needles can also embroider**

During the YDCE, bone needles were needed to stitch hide, as seen in the garment found at Cougar Mountain Cave. At that time and later they were also used to attach articles to garments.

Why Paleoindians decorated their clothing is unclear. It’s significant, though, that needles haven’t been recovered from Paleoindian contexts before 13,100 yr B.P. The age of known Paleoindian needles (13,100–10,000 yr B.P.) coincides with the time when a newly settled population was becoming denser, thereby increasing the likelihood of encountering hostile strangers or unknown kin. Pratt observes that these smaller bone needles “may have been used not just to make clothing but to sew things onto clothing, which may be indicative of different groups to show group identity.”

Ornaments may also have been stitched onto seams to strengthen them. Inspecting Paleoindian beads and ornaments for use wear may reveal whether they were once attached to clothing.

**Seen one bone needle, you’ve seen ’em all**

Although bone needles were employed by people of different groups across the continent, all adhere remarkably consistently to a common morphology. After comparing the morphology of the needles across space, Rosencrance admits his surprise at their strikingly similarity in manufacture and size. “What that means, I don’t know,” he confesses.

McDonough concurs that bone needles vary only slightly in size. “At Conley Caves they’re delicate and tiny, but needles found elsewhere are sometimes thicker. Overall, they are similar in style and vary little in size. Most of the ones we’ve found are less than 3 mm in diameter.” Large needles (more than 3-mm diameter) were probably used to stitch thick hides; small needles (less than 3-mm diameter) were used to stitch thin hides and for appliqué work.

Most of the needles found by Rosencrance, McDonough, and Pratt are less than 3 mm in diameter. Because of their small size, the needles are easily broken. “It’s a lot of effort to put into producing something if it’s going to break immediately,” Pratt reflects. “Most of the ones we find are broken, which makes sense—once something is broken, you discard it.” She recalls when excavating at the Weed Lake Ditch site in Oregon her team found needles only because they were wet screening through 1/8-inch mesh. She wonders, “How many of these are potentially being missed, especially with the earlier excavations? Sometimes when you do archaeology for a while, you forget how destructive it can be. Finding a bone needle, you realize how you could have easily missed it. Finding it completely changes your interpretation of the site.”

Given the uniformity of needle morphology and diameter across the western United States, differences in how eyes were made—bifacially drilled, or gouged with a graver—might warrant study to illuminate the spatio-temporal distribution of bone needles.

**Ethnographic data suggest gender roles**

The distribution of Paleoindian bone needles and the types of artifacts they’re associated with suggest that at domestic sites specific areas were allocated for sewing and related activities, probably the duty of women.

As a model for surmising how Paleoindians may have divided labor by gender, Rosencrance looks to the Copper Inuit, who inhabit Canada north of the tree line. For two to four weeks in late autumn (November) Inuit form aggregations of 45–50 people in “finishing camps,” where they devote their full attention to making new winter outfits from caribou hides. They rely upon cached food and observe taboos to
ensure that other activities don’t interfere with the critical “sewing period.” Paleoindians may have instituted a similar rigid schedule, for any individual not equipped with a winter “survival suit” faced certain death.

Women were seamstresses in residential loci, but men on hunting forays might carry needles and sinew thread as part of a repair kit. The highly specialized skills required to produce tailored skin clothing were acquired over a long period starting in early childhood. University of Nebraska anthropologist Alan Osborn notes that among the Nunamiut of the Brooks Range in Alaska, women aren’t considered accomplished seamstresses until they’re 35 years old. Fabricating clothing is temporally and spatially compatible with a range of domestic duties including child care, meal preparation, fire tending, and social activities. Rosencrance believes we can probably assume that these generalizations applied to women during the YDCE.

The Buhl burial in southern Idaho presents an interesting case. The female was 17–21 years of age at the time of her death, dated to 10,700–12,000 yr B.P. She was found buried alongside a large stemmed point and a broken bone needle. Analysis of the needle revealed that it had been snapped but not intentionally used. This is perhaps our best indication that bone needles were the province of women during that period.

Pratt offers a broad interpretation of the Buhl woman’s burial goods: “She is buried with osseous technology, but she also has a stone tool. Clearly, they buried her with a bone needle on purpose, but they buried her with a large projectile point on purpose too. Maybe gender identity isn’t what we think. She may have needed both objects during her lifetime or after it, or both.”

Looking at hunter-gatherer life—and a bit more
Pratt’s work is concentrated on the Weed Lake Ditch site and other open-air Great Basin sites east of Connelly Caves. “At Weed Lake Ditch we’ve found bone needles in one part of the site and not others,” she explains. “It could mean different areas were for different behavioral activities, or that the site was occupied at different times. What surprises me is just the fact that I found bone needles at all. No one expects anything to be found in an open-air site, so the fact that we found osseous materials in stratified contexts is really incredible.

“Osseous technology itself is exciting because it makes you think about questions in different ways. Even if you can’t answer those questions, it makes you generate hypotheses and questions about behavior you weren’t considering before. That’s a really important thing because I think that I’m biased—looking mainly at hunting technologies all day—but that makes up only a small portion of what Paleoindians were doing. Needles humanize the whole thing; it makes you think about prehistoric lives more holistically.”

– Katy Dycus

Texas A&M University students excavating at Weed Lake Ditch, an open-air stemmed point site in the Harney Basin, Oregon, where bone needles, Haskett points, crescents, and items of personal adornment have been recovered.

Suggested Readings


A barbed query aimed at a coastal archaeologist by a colleague whose arena is mountains and dusty plains asks, “If there are sites on the coast 13,000 and 14,000 years old and even older, why haven’t you found them by now?”

Hakai Institute anthropologists Daryl Fedje, Quentin Mackie, and Duncan McLaren contend that an archaeologist not familiar with coastal sites has no idea just how isolated they can be, and how logistically daunting the task of exploring them. Fedje describes a few of the complications that beset the research team: “There are seldom any roads within tens of kilometers. Boat travel is complicated by wind and tide, and there are no plowed fields or road cuts. All the creeks and rivers are lushly vegetated, so there are no visible sediment exposures, and forest soils are deep—often 60 to 80 cm before encountering mineral soils. All this results in very poor archaeological visibility and great effort for very limited sampling of the landscapes.” Oftentimes their hard work yields little to no results.

Yet the research team—a close-knit cadre of First Nations representatives, consulting and volunteer archaeologists, and University of Victoria graduate students—remain determined. “Many of us have been working together year after year for the past two decades on a variety of projects up and down the coast,” Fedje recounts. “We’re always up to the challenges of working in the ‘Wet Coast’ rainforest. Rain, mud, deep organic soils, traveling in tin boats on the open sea, living in pup tents, working the tidal windows.”

Plotting paleo shorelines
The British Columbia coastline, a magnificent stretch of the North American Pacific coast, is a possible— the research team argues the probable—route by which the earliest inhabitants of the Americas journeyed southward around the western margin of the Cordilleran Ice Sheet just after the last Ice Age.

Nonglaciated conditions on the outer coastal islands, and now drowned but formerly exposed sections of the continental shelf west of the Cordilleran Ice Sheet, support the coastal-entry hypothesis. The ice sheet was at its maximum extent about 19,000 years ago, then began to retreat; by about 16,000 years ago only mainland valleys were ice-bound, and the ice continued to

McLaren and Fedje excavating “footprint” site.

McLaren excavating at K1 Cave.
retreat up the valley to modern limits 14,000–12,000 years ago. Along these early deglaciated paleo shorelines archaeologists expect to find evidence for late-Pleistocene sites created by people practicing maritime subsistence.

Investigating these ancient landscapes, however, isn’t always easy. Today dense temperate rainforest carpets much of the region. To identify possible late-Pleistocene habitation sites and dispersal routes along the Pacific coastline, the research team, following the lead of pioneering coastal archaeologist Knut Fladmark of Simon Fraser University, has developed site-discovery models. Their work spearheads a battery of interdisciplinary projects whose goal is to uncover early post-glacial coastal sites in the Americas.

A lot of kettles to stir
How do you create a site-discovery model? Not easily, Fedje explains. “It involves paleoecology, especially paleolimnology, in the development of paleoshoreline histories and associated terrestrial environments, and it also includes geomorphology—soil development, karst landscapes, marine and terrestrial landscape development—and paleontology, the dynamics of early post-glacial marine and terrestrial fauna and association with, or analogies to, human history.”

Along the coasts of California, Oregon, and Washington, paleo shorelines dating to the time of the Last Glacial Maximum (LGM) lie 100–140 m below present sea level. Consequently, archaeologists looking for late-Pleistocene coastal occupation in these areas must either conduct underwater investigations or examine inland features like caves, springs, toolstone outcrops, and resource-rich areas that would have attracted coastal groups.

The research team agrees that coastal archaeology in both North and South America is still in its infancy. Both areas present similar challenges that researchers must overcome, chief among them changes in sea level that deeply drowned many ancient shorelines. Archaeological visibility is further obscured by shoreline erosion and deposition, soil development, and forest cover. “Dense temperate coastal rainforests that we work in are a huge challenge,” McLaren explains, “because they obscure landforms and have massive organic soils.” This results in very little natural deflation of sediments, a situation in marked contrast with arid regions, where a lack of vegetation increases exposure to erosion and thereby reveals many more archaeological materials on the surface.”

Some benefits, however, accrue to working in the intertidal region, once you learn to “read the wrinkles” in the land. Ice loading during the LGM depressed the inner coast of the mainland, resulting in local sea level about 200 m higher than today (MT 34-4, “Footprints on the sands of time”). Some outer coastal areas, however, reacted with a glacial forebulge, creating a local sea level as much as 150 m below present. Between these extremes of earth movement lay what McLaren calls a “sea-level hinge,” an exposed area with relative sea level close to modern level that for the last 13,000–14,000 years attracted maritime-adapted people. It’s these uplifted areas that the team searches for and explores. They must still nonetheless contend with tides. Nature,
it seems, is reluctant to let archaeologists have everything their own way.

To circumvent the difficulty of working underwater and in ground covered by dense forest, coastal archaeologists can resort to shovel and auger testing, or investigate karst caves and rockshelters, where radiocarbon-dated bone samples can approximate the period when wildlife flourished in the region.

Investigating a karst cave isn’t always a pleasurable experience. McLaren recalls recently excavating a cave site on northern Vancouver Island, “a natural pitfall trap in a karst cave into which a number of animals fell during the late Pleistocene.” At the base of the pit he found a pile of animal bones including remains of black bear, fox, marmot, deer, and wolf, which dated to 14,500–11,800 yr B.P. Natural agents later sealed off the cave, which was recently uncovered during construction of a logging road. He had to use ropes and a harness to lower himself into the pit, where for several days he worked alone while a crew above hauled up buckets of sediment for screening. This, he confesses, “was a much more daunting experience than I ever imagined it would be, made worse by the clear scratch marks on the walls of the cave that had been made by late-Pleistocene bears trapped in the pit. Needless to say, after being alone in this cave day after day, my dreams at night were nightmares full of images of trapped bears. Every morning I would have to mentally prepare myself to go back into the cave.”

Systematically identifying coastal sites

To unearth and analyze these hard-to-access coastal sites, the research team has developed a systematic stepwise process to reveal clues about late-Pleistocene sites hidden along the coast. These steps form an ideal trajectory, building on one another:
Fedje describes this LiDAR map as "Hakai Institute archaeology project proposed survey area. Assu Lake area (Quadra Island) bare earth (LiDAR) model with prospective high archaeology potential locations shown as dashed ellipses (enclosing portions of paleo-tombolo and terraces). Elevations are in meters above higher high tide. Contour intervals are 5 m. The yellow contour line is 200 m above modern high tide."

- creating localized sea-level curves;
- generating detailed bare-earth digital elevation models;
- creating archaeological predictive models;
- testing these models using archaeological excavation;
- verifying the late-Pleistocene age of archaeological materials.

To identify the location of an ancient shoreline, it's necessary first to plot the local sea-level history. The most robust data points that define a sea-level curve are radiocarbon dates from precise elevations, where proxy indicators demonstrate the depositional context: marine, brackish, freshwater, or terrestrial.

Digital elevation models created by remote sensing are also important in the search for late-Pleistocene sites along the Pacific coast. Ancient shorelines and areas of promising archaeological potential can be plotted from precise digital elevation models generated by remote sensing technology such as LiDAR, a stepchild of radar technology, which measures precise distances by timing a reflected laser beam.

Bathymetric models, which plot the contours of ocean floors, also assist in mapping shorelines and paleo landforms now submerged. These digital models may identify geomorphic features associated with past shorelines—deltas, islands, exposed shoreline, protected coves, and bays.

All these data—sea-level curves, digital elevation models, and bathymetric models—are entered into a GIS system, whereupon computer wizardry generates a map-based predictive model that serves as the starting point for an archaeological survey.

With the predictive model in hand, preliminary field work can begin. McLaren explains that “we look for micro-topographic features (such as flat areas, terraces, or berms). We dig holes by shovels or using coring devices and screen the sediments, looking for archaeological indicators: charcoal, bone, shell, stone tools, etc. Where these are found we use radiocarbon dating to find out how old they are. If they’re in the age range we’re looking for, we return and open up excavation units for controlled testing and sampling (excavation by trowel).”

Beach-oriented geomorphic features are the most promising locale for finding archaeological remains in primary context. High-tide beach berms, for example, often flat-topped and well-drained, were attractive to coastal people. Berms accumulate sediment; they may contain stratified living surfaces, each floor capped by sediments dumped by wave action that preserve deeper-lying sediments.

Microfossils of pollen, diatoms, dinoflagellates, and amoebas can also help date sites by serving as environmental proxies that indicate late-Pleistocene conditions. For example, when submerged or intertidal artifacts have been colonized by barnacles, dating the barnacles can establish
how much time has elapsed since those artifacts were in the intertidal zone.

**Scoring successes to date**

McLaren admits that their strategy to date has been more survey-based than excavation-oriented. “For this reason we end up working at many different locales for relatively short periods of time. In some respects we’re searching for the right site or place to set up longer excavation-type projects, but in my opinion we haven’t found it yet.”

Perhaps “only survey-based,” but the research team can boast of headline-worthy successes:

- **Freshwater diatom Stauroneis.**
- **Marine diatom Rhabdonema.**

their strategy has already achieved. Haida Gwaii stands out as a stellar example. This archipelago, formerly known as the Queen Charlotte Islands, lies 130 km offshore of British Columbia. Having investigated the surrounding waters, caves, and submerged beaches for two decades, Fedje, Mackie, and colleagues gained considerable understanding of how people exploited the coastal landscape.

To get the feel of the ancient now-submerged landscape, Mackie and Fedje, with the help of doctoral student Alison Proctor of the University of Victoria Mechanical Engineering Department, “flew” an AUV (automated underwater vehicle) over the ocean bed and were rewarded with a dazzling picture of ancient river channels and estuaries and, most tantalizing, what appears to be a rock wall and possibly the oldest fish weir ever discovered (MT 30-4, “Looking for sites at the water’s edge”). It’s interesting to note that University of Oregon archaeologist Loren Davis scanned the bed of the Sea of Cortez using an AUV in similar fashion in his search for First Americans sites in Baja California (this issue and MT 24-3, “Putting MUSCLE into coastal-entry research”). Many promising sites on the seafloor around Haida Gwaii have been catalogued as candidates for future investigations, perhaps with the aid of an ROV (remote-operated vehicle), an underwater robot with manipulative appendages of the type used by University of Michigan anthropologist John O’Shea to explore ancient caribou drive lanes on the floor of the Great Lakes (MT 32-1, “Archaeology under the Great Lakes”). Increasingly archaeologists are refusing to accept water as a barrier to their research.

The paleo-coastal Kilgii Gwaay site on a small island in the south of Haida Gwaii, which dates to about 11,000 yr B.P., surrendered both wooden and stone artifacts and braided twine, together with an extensive faunal assemblage of the bones of maritime animals human hunters preyed on (seal and sea lion, otter, fish, and sea birds). Fedje underscores the importance of their research into the Kilgii Gwaay site because “it shows that people were well adapted to a maritime way of life by ca. 11,000 years ago with the site producing an abundance of maritime fauna and transport of large amounts of toolstone by boat from a source about 10 km away.”

The Haida Gwaii caves K1 and Gaadu Din produced stone tools, including spear points, associated with bear hunting dating as early as 12,600 yr B.P. and remains of brown bear dating to ca. 13,500 yr B.P. as well as other animals like salmon, black bear, and deer (MT 24-3, “Early bear hunting and ceremony on the Northwest Pacific Coast”). “I think the cave-archaeology results from Haida Gwaii provide the most solid evidence for late-Pleistocene human presence on the coast of British Columbia,” McLaren says. “The artifacts are clearly human made, and the sites are well dated.”

To excavate the ancient intertidal site on Calvert Island, the research team had to contend with the incoming tide (MT 34-4, “Footprints on the sands of time”). Their fine sense of timing paid off with the discovery of 29 human footprints impressed into clayey paleosol by boat people emerging from their craft 13,000 years ago. This discovery shows that humans were thriving on the Pacific Coast of Canada at the end of the LGM, says McLaren.

Over the years the research team has revisited the Stave River watershed 75 km east of Vancouver, a site with a troubled past, brutalized first by Nature in the Ice Age, then by humans in the Industrial...
ANTHROPOLOGY PROFESSOR Loren Davis of Oregon State University has discovered new evidence of human activity at the Cooper’s Ferry site in western Idaho that suggests humans arrived in the Americas 16,560–15,280 years ago, before the inland Ice-Free Corridor appeared. Radiocarbon dating verifies the age of the site at the confluence of Rock Creek and the lower Salmon River, where once stood an ancient village known to the Nez Perce tribe as Nipehe. In its deposits Davis unearthed hearths, pits, animal bones, and artifacts, including stemmed projectile points, which predate the appearance of Clovis technology.

“It’s a wonderful feeling to discover archaeological evidence that was created by people who lived during the Pleistocene,” Davis tells us. “I like to think about how the past world of the First Americans was so different from our own and how early people solved the everyday problems of their lives in these different environments. More and more, being able to share the wonder of discovery with other researchers, tribal members, community members, and students drives much of my interest in First Americans studies.”

Born in Portland, Oregon, Davis developed an interest in archaeology as a child. Spending summer hours on the Oregon coast, he explored beaches, rivers and lakes, dug holes in the dunes, and became fascinated with the natural world and stories of native peoples who lived there in the past. Later, as an undergraduate at Oregon State University, he was fortunate to have archaeology professors who instilled in him a deep sense of wonder about the past of the local area, which has continued to grow throughout the different stages of his education and career.

Clovis-First, say goodbye to bragging rights

“Based on what we know from archaeological evidence and from recent paleogenetics studies,” Davis says, “humans initially arrived in North America sometime before about 16,000 calendar years ago. How much earlier than that time is harder to know, but given that humans don’t appear to be living along the parts of northeast Asia closest to the Pacific side of Beringia until after about 40,000 years ago, then I suppose we could put a lower limit there. Although this is a large temporal window of opportunity for humans to begin moving into the Americas, it’s not clear at this point that people made the journey into North America until after the height of the Last Glacial Maximum. So, we could make a reasonable guess that people probably first arrived in the New World sometime between 20,000 and 16,000 years ago.”

Reliably dated archaeological sites in the Americas predate the appearance of the Clovis Paleoindian culture at around 13,050 yr B.P. Data from the Cooper’s Ferry site in western Idaho extend the timing of human populations south of Late Wisconsinan ice sheets to 16,000 yr B.P. As part of his doctoral studies at the University of Alberta, Davis excavated a 2-by-2-m area here in the 1990s and uncovered a cache of Western Stemmed Tradition points. These excavations returned ages in excess of 15,000 yr B.P., confirming that humans were already here at least 2,000 years before Clovis and, most important to Davis, before the appearance of the Ice-Free Corridor.

Cooper’s Ferry isn’t the first site to report cultural findings at least 2,000 years before Clovis and, most important to Davis, before the appearance of the Ice-Free Corridor. The Monte Verde site in southern Chile, the Friedkin and Gault sites in Texas, and Paisley Caves in Oregon all report dates older than Clovis sites in the Americas, and Cooper’s Ferry and the Gault site vie for the distinction of the earliest discovery so far in North America. Although later human migrations may well have used the Ice-Free Corridor, Davis finds inescapable the conclusion that the First Americans...
journeyed by boat transport and foot travel along Pacific shorelines to reach North and South America (MT 34-1, “Along the coast or down the Ice-Free Corridor—how did the First Americans get here?”).

**Cultural affinity with Upper Paleolithic northeast Asia**

Unfluted stemmed projectile points found at these locations bear a strong resemblance to those found in Upper Paleolithic Japan (MT 35-4, “Cooper’s Ferry”). According to the chronology for Cooper’s Ferry, based on C-14 dates from 21 charcoal and bone samples, the lithic artifacts precede and partially overlap the Clovis time period. They are products of a separate flake- and macroblade-based lithic technology that includes stemmed, lanceolate, and foliate projectile points, often discovered in stratified context beneath Clovis. For Davis they are evidence for a cultural connection between the late-Pleistocene peoples of northern Japan and North America, complemented by a genetic heritage shared by the Pleistocene peoples of northeast Asia and the Americas.

“The Japanese stemmed-point tradition predates the peopling of the Americas by thousands of years,” Davis explains. Thus credible timing is in place for a trans-Pacific migration from northeast Asia to the Americas. “Genetic evidence points clearly to northeast Asia as the geographic source for the ancestors of the First Americans, so there’s not much controversy there for me,” says Davis. “Of course, northeast Asia is a big place and archaeologists have traditionally assumed that the First Americans moved into the New World via a high-latitude pedestrian migration that started in western Beringia. Archaeological evidence from multiple sites, however, shows that people were south of the North American continental ice sheets before we see the first clear signs of human habitation in eastern Beringia, so this suggests that we should question the traditional Beringian migration model.”

As an alternative model, Davis proposes that “people probably traveled along the coastline of the northern Pacific rim, skirting the ice sheets, and made their way into the Americas farther south before they settled eastern Beringia. Critics of this idea like to point out that there are no early sites along the Pacific Rim that show a coastal migration ever happened. But the same thing can be said about the traditional model of pedestrian migration across Beringia—we haven’t yet found early sites on the submerged land bridge to support this migration either. So, in the end, I think about this...
problem as an issue of opportunity and constraint: There was ample opportunity for people to make their way along the Pacific coast through a combination of boating and walking to arrive south of the ice about 16,000 years ago; however, a walking path southward through the continental ice sheets didn’t open until after the time when we know people were already in the Americas.”

**Cooper’s Ferry scores a bulls-eye**

Many more Western Stemmed Tradition sites are needed to verify the toolmaking chronology of fluteless points with distinctive stemmed bases. Geoarchaeologists like Loren Davis have their work cut out for them. Davis understands that surface finds aren’t likely to lead him to more sites as early as Cooper’s Ferry. “For evidence of human presence 16,000 years ago,” Davis remarks, “you must first find 16,000-year-old sediments.”

Davis can read undisturbed layers of sediments in a prospec- tive site like a history book. He pays careful attention to subtle changes in the layers of sediment, an expertise that paid off at Cooper’s Ferry. He noticed unexpected cobbles and pebbles overlaying a patch of darker jumbled sediments, which made him wonder if the area was a pit and the cobbles on top of it a cairn. As he excavated deeper he found that sediments in the pit contrasted sharply with surrounding sediments. He therefore concluded that the pit had been refilled with the muddled layers of sediments removed when it was originally dug. The pit was in fact a cache, which contained 13 lithic tools, 724 pieces ofdebitage, and numerous bits of faunal remains including freshwater mussel shells and mammal bones. Near the bottom four stemmed points sat atop an artiodactyl bone with cutmarks!

Cooper’s Ferry shows the wealth of ancillary information that can be obtained in a careful archaeological dig. The virgin lithic cache Davis’s team found at Cooper’s Ferry is a rare find, especially in the Far West (MT 31-3, “The dirt on Cooper’s Ferry”). Ordinarily caches of Clovis and WST points are discovered by amateurs, thereby denying archaeologists vital information about ancient toolmakers and their culture that can be gained by investigating surrounding debitage and less significant tools. At Cooper’s Ferry the original 2-by-2-m unit has been enlarged into a 6-by-10-m excavation, and a new area, Area B (12-by-12-m), has been opened. Discoveries include WST tools, cultural features such as hearths and other caches, fire-cracked rocks, and unusually colored sediments; one dark layer may be decayed organic matter.

A habit of Cooper’s Ferry occupants endears them to Davis: They marked their caches carefully, but didn’t return to retrieve them.

Davis’s team also found tooth fragments from an extinct horse known to have lived in North America at the end of the Last Glacial Maximum. Radiocarbon dating of this area in Cooper’s Ferry wins it the distinction of the oldest radiocarbon-dated site in North America that includes artifacts associated with bones of extinct mammals.

David Madsen, a colleague from the University of Texas, has witnessed Davis at work at Cooper’s Ferry and describes him as “one of the most meticulous excavators I’ve ever met. Over the course of a number of field seasons at the Cooper’s Ferry site I watched as he and his student crew uncovered and mapped in place every tiny bone fragment, piece of lithicdebitage, and pebble in the stratified loess of that 16,000-year-old site. Every rodent burrow was identified and avoided; every feature carefully identified, photographed and described. Digital cameras high above the excavation areas took images every few seconds throughout the entire field season so
slow-motion videos of the entire excavation could be produced
to document the context of everything that was recovered.
Watching Loren and his crew convinced me that Cooper’s
Ferry is indeed the oldest well-dated site in North America.”

WST and Clovis points are birds of a different feather
WST points from Cooper’s Ferry are surprisingly thin,
about 4.5–5.3 mm thick, much thinner than most Clovis
points (15.4–20 mm). Stemmed points are made by pres-
sure flaking thin linear flakes; Clovis lithic technology
uses percussion flaking to progressively thin and shape
bulky bifacial blanks.

DORA is the key to future success
“There are many great questions and issues to address
in First Americans studies that vary across regions and
researchers,” Davis says, “so I’ll just speak from my own
perspective. If humans actually traveled into the Americas
along the Pacific coastline, then we should focus a great
deal of effort on finding early sites that hold evidence of
this initial migration. If the Pacific migration theory holds
true, then the earliest archaeological sites in the Americas
should be found along the coastlines of southern Alaska,
British Columbia, and the Pacific Northwest. To do this, we
need to build our knowledge of what the Pacific coastline
environment looked like during the late Pleistocene, learn
where DORA (‘dirt of the right age’) can still be found in
remnants of ancient terrestrial landscapes, and then work
to collect any archaeological evidence that might be pres-
ent in these deposits. I’m also interested to know where
other early sites are held in good, buried contexts above
sea level in other parts of western North America. By
building a geoarchaeological perspective on where buried
deposits that are relevant to First Americans studies can
be found, we can greatly narrow our search for early sites
in areas that have yet to yield such evidence. Building up

A, a linear macroflake found in pit feature PFA2 at Cooper’s
Ferry (Davis believes this is a preform used to make stemmed
points); B, blades found in pit feature PFA2;

our knowledge of where DORA exists in many places is a gift
that will help future generations of archaeologists discover new
First Americans sites.”

The Indian Sands site on the Oregon coast proves the
worth of DORA (MT 22-1, “Late-Pleistocene occupations
on the Oregon coast”). A distinctive paleosol in an area of
Pleistocene-age sediments yielded thousands of pieces of
stone debitage, many stone tools, and a date of 10,430 ± 150
RCYBP (about 12,300 yr B.P.), the oldest site yet recorded on
the Oregon coast. With his research, Davis hopes to provide
clarification for the vigorously debated suggestion that early
Ice Age groups migrated to the Americas at different times
and along different routes.

Research made possible by a generous benefactor
Retired Denver geologist and avocational archaeologist Joseph
Cramer and his wife, Ruth, endowed the Keystone Archaeologi-
cal Research Fund, which has supercharged Davis’s research
into ancient sites in the Pacific Northwest, the Pacific Coast,
and Baja California (MT 24-3, “Putting MUSCLE into coastal-
entry research”). Studies at Cooper’s Ferry are now complete.
Now Davis, named executive director of the Fund in 2008, plans
to refine the chronology of ancient sites on the Oregon Coast,
to cooperate in an expedition to map and excavate the paleo
shoreline in the Sea of Cortez, and to engage in other projects
that have piqued his curiosity. The Keystone Fund insures long-
term stability for Davis’s projects and enables him to purchase
cutting-edge research equipment.

Locating submerged sites is no easy task
Research into Davis’s theorized West Coast route for the
peopling of the Americas has been limited by the difficulty
and expense of finding and investigating underwater sites. Be-
cause the shape of the coastline varies with sea level, a way of
predicting its shape in the past (intricacy, sinuosity, involution,
fractal dimension) is vital when designing a program to locate
Pleistocene sites along the Northwest coast. Davis views the
ancient environment as a series of time slices involving multiple
AMONG THE EARLIEST modern humans in Europe were hunters who settled beside the Danube 30,000 years ago. They chose the site well: It lay at the edge of the enormous ice sheet, which created a tundra-like environment that attracted mammoth and reindeer. With ample food year-round, they had the leisure to learn new skills. Excavations at the site in the modern Czech Republic, ongoing since 1924, reveal some of the earliest examples of textile and ceramic manufacture. They were gifted artisans, capable of creating stunning jewelry and figurines (notably the famous Venus of Dolní Věstonice shown here on the cover, an exotic, highly stylized female fetish). They practiced ritual burial, in one instance three young persons interred in a common grave.

Scientists will find the scholarly text of Dolní Věstonice–Pavlov: Explaining Paleolithic Settlements in Central Europe a valuable reference. Casual readers will enjoy the beautifully executed scenes of Paleolithic life inspired by archaeological finds over the past century. Those who enjoy Jean Auel’s Clan of the Cave Bear will find intriguing the fact that the author credits the technical accuracy of Paleolithic life expressed in her novel to research at Dolní Věstonice. See the outside rear cover of this issue for ordering information.

Jiří A. Svoboda served as principal investigator of the Dolní Věstonice site from 1985 until he retired in 2019. He is coeditor of Early Modern Human Evolution in Central Europe: The People of Dolní Věstonice and Pavlov. Translator Suzanne Dibble has served the English-language needs of publishers, universities, and other institutions throughout the Czech Republic.

coastlines. Underwater archaeology therefore pursues a moving target, although it may move in predictable ways.

Davis is confident that his theorized West Coast route will yield benefits as archaeological studies by himself and others of human occupation of ancient coastal zones, now drowned portions of the continental shelf, extend to pre-Clovis times.

The future of Davis’s research
Davis’s Pacific Coast Archaeological Laboratory is part of the Anthropology Department at Oregon State University, where he works with students and other scientists. Current projects include a closer study of the Cooper’s Ferry archaeological collection and a project to develop advanced 3-D scanning and other techniques for analyzing lithic artifacts.

“Although we have completed our recent excavations at the Cooper’s Ferry site, our work continues as we study the artifacts and assemblages we found,” Davis explains. “We have a lot of other stories yet to tell from the evidence we recovered there. I’ll also continue to work with my students and colleagues to identify and explore DORA in many places along the northern Pacific Rim, both above and below sea level, to find new locations that hold Pleistocene-age archaeological sites.”

Loren Davis’s methodical work habits and exquisite attention to detail haven’t escaped notice by colleagues and other scientists. David Sisson of the Idaho Bureau of Land Management declares that “over the years Loren has shown his ability to take a project from its infancy to its final completion. Loren can identify landforms and map these accurately in complex riverine environments. Once excavating a site, his skill is unparalleled in mapping artifact locations in detail and noting potential impacts from past disturbance. Soil strata are mapped in an equally detailed manner and the artifact relationship to strata is emphasized. Additional data are carefully assembled to interpret the results. What is exceptional is that Loren does that by engaging the public and interpreting the results so they can understand it. He involves other professional archeologists, both nationally and internationally, during all phases of his work including the report preparation. Not only do other archeologists benefit from his work, but the public gains insight to our shared past.”

High praise also comes from Matthew Des Lauriers of California State University, San Bernardino. “Loren Davis is one of those exceptional scholars who manage to make everyone around him a better archaeologist. From his students, to his colleagues, he unselfishly gives of his time, insight, and humor. Working with him on our Isla Cedros research project has been not only produc-

Davis standing in Area A of Cooper’s Ferry, pausing a moment from describing site stratigraphy, 2018.
scapes that were relevant to people thousands, and even tens of thousands of years ago can handicap efforts to achieve clarity in our understanding of the past. He is exceptionally skilled at communicating with people both inside and outside the field, and does so with an easy manner that disarms his audiences. I couldn’t ask for a better research partner, and his friendship is one that I value highly.”

More praise for Loren Davis the scientist and person comes from Madsen, who confesses to awe for Davis’s “attention to detail, which extends to his innovative analytic approach to understanding the lithic traditions of the earliest Americans. The GIS-based analyses of stone tools he and his colleagues executed have revealed previously unknown behavioral aspects of tool production and traced the origins of the earliest tool traditions to progenitors in northeast Asia. Fortunately, this focus on the trees hasn’t hampered Loren’s larger goal of understanding the forest. Rather, he uses this attention to detail to explore the larger issues of when, how, and where the earliest people got to the Americas. He is an iconoclast in the best and truest sense. He hasn’t set out in a biased fashion to intentionally destroy a widely held dogma in American archaeology; rather, his meticulous research has helped put the lid on the coffin of the Clovis-First paradigm. If that weren’t enough, Loren is one of the nicest people you’ll ever meet. If you ever have the chance to do fieldwork with him, grab it with both hands.  

—Martha Deeringer

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Archaeology in coastal British Columbia

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Age. Lying at the lower extremity of the Fraser River valley, the site shed its glaciation somewhat early, about 14,500 years ago. Isostatic depression, however, the “memory” of the enormous weight of ice, created a basin that collected water from the Stave River. Then in 1910 Stave Lake and the lower river were transformed into a hydroelectric reservoir. Predictive models highlighted promising submerged terraces and leves for future archaeological surveys. Reservoir action, unfortunately, has eroded the margins of the lake and exposed buried stone artifacts, including flaked spear points of unusual morphology. Found on the surface and therefore lacking provenance was a fragment of a fluted point. If it dates to the Clovis period (13,000–12,700 yr B.P.), the point marks the northernmost limit of the Clovis culture.

Much remains to be discovered

These coastal sites collectively reveal the remarkable extent to which early Americans thrived in the Pacific Coast environment. Paleoenvironmental evidence reveals that in the period 18,000–14,000 yr B.P. the western margin was a more viable habitat for plants and animals than the interior Ice-Free Corridor.

Proponents of the Ice-Free Corridor as the likely migration route of the First Americans say the very paucity of pre-Clovis sites found along the Pacific Coast renders the coastal-entry hypothesis highly doubtful. The research team counters that no pre-Clovis sites have been found at the bottom of the Bering Strait, and that no pre-13,000-year-old sites have been found in the 2000-km length of the Ice-Free Corridor between Little John in the western Yukon and Wally’s Beach in southern Alberta.

The preliminary work that’s been done along the Pacific Coast has already led to significant discoveries of several late-Pleistocene sites, and the evidence finds strength in numbers (most notably in British Columbia and the Northern Channel Islands offshore of California) that suggest well-established populations and the possibility of a deep demographic presence.

Upbeat Daryl Fedje, born and raised on the outer west coast of B.C., tells us, “I’ve always been closely tied to the ocean. This work allows me to continue being on and near the water.” And that’s not all. “There is so much to be learned, and huge challenges involved in overcoming the effects of the amazingly dynamic history of the area, especially regarding the early post-glacial record.”

Asked about his most memorable moments working on the coast, Fedje remembers Haida archaeologist Alan Davidson’s “coffee bar” at Richardson Island: “Stove-top espresso maker in the pouring rain on a one-burner propane stove at the base of a little gully. The crew was excavating a 10,500-year-old living floor on a 15-m-elevation raised beach on a remote island in southern Haida Gwaii. A touch of creature comfort to stave off the worst of the rain, mosquitoes, black flies, and naseeums.”

What more could an archaeologist ask for?  

—Katy Dycus

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