Radiocarbon Recalibration

Tree rings are used to calibrate the radiocarbon chronology back about 11,000 years, but earlier dates have lacked a mechanism for calibration. Now ice cores from Greenland, Caribbean corals, and lake-bed sediments in Europe and Canada are revealing some surprising information about the radiocarbon clock and how it applies to the peopling of the Americas. Articles begin on page 1.

The Center for the Study of the First Americans fosters research and public interest in the Peopling of the Americas. The Center, an integral part of Oregon State University, promotes interdisciplinary scholarly dialogue among physical, biological and social scientists. The Mammoth Trumpet, news magazine of the Center, seeks to involve you in the late Pleistocene by reporting on developments in all pertinent sciences.
CORRECTED RADIOCARBON CALENDAR CAN CLARIFY POPELING OF AMERICAS

Radiocarbon dating may have revolutionized archaeology more than four decades ago, but it can be difficult, even for professionals, to keep track of the implications of recent and continuing corrections to the radiocarbon calendar. Stuart J. Fiedel, archaeologist and author of Prehistory of the American, has been reminding his colleagues that newly calibrated dates can bring a wholly new understanding in events that occurred near the close of the Pleistocene.

People truly have been in the Americas longer than most people thought. Clovis, for instance, a tradition long believed to have spanned the period between 11,200 and 10,000 years ago, actually dates back to at least 13,600 years. Dr. Fiedel pointed out the revised chronology in the second edition of his book, which was published by Cambridge University Press in 1992. Earlier this year, he detailed the impact of the changes in a presentation to the Society for American Archaeology titled "Oldest Than We Thought: Implications of Corrected Dates for Paleo." Research on Greenland ice cores and uranium-thorium dating of late-Pleistocene corals off Barbados is helping scientists reset the radiocarbon calendar. Further, scientists continue to examine links between climatic periods in Europe and those in the Americas. Evidence may not yet all be in, but a new calendar is emerging.

Timing the Younger Dryas

Ideas about Clovis and Folsom traditions must be reconsidered in respect to the new calendar and to timing of the Younger Dryas, the profoundly cold period 11,600 to 13,000 years in duration that interrupted the warming trend at the end of the Pleistocene, and that can be recognized in sites on several continents. Folsom, Folsom, Fiedel believes, belongs to the first half of the Younger Dryas, and Clovis belongs to an earlier period. Drought conditions seen at Clovis time can't be attributed to the Younger Dryas, he reasons, but must have some other climatic explanation. "It is either a strictly local phenomenon in the western United States, or more probably, is an expression of one of the global climate oscillations that preceded the Younger Dryas."

Fiedel notes that the Younger Dryas brought the return of nonglacial climate. To the American Southwest, the full glacial climate from 35,000 to 13,000 radiocarbon years ago was wet, cool, and marked by the development of lakes in the Great Basin and elsewhere. "Climate modeling suggests that wetter late-Pleistocene continues on page 4"
Brazilian Rockshelter Reveals Details Dating to Pleistocene

A large rockshelter in the interior of southeastern Brazil has yielded a variety of clues to human activities in the late Pleistocene and early Holocene. A French-Brasilian scientific team led by Andre Proux has been examining the Lapa do Boqueiet since 1981, recovering a rich assemblage of tools, floral and plant materials, and several burials.

Rock art in the form of pictographs and engraved petroglyphs decorates the walls of the shelter and the cliffs on both sides of it.

Lapa do Boqueiet (pronounced BO-keet) is in the valley of Rio Peruaçu, a tributary of the great Sao Francisco River in the north part of Minas Gerais state. The nearest town is Januaria; the area is approximately 600 kilometers north of Belo Horizonte and 900 km north of Rio de Janeiro. The uplands of central Brazil are an extensive massif of dissected limestone that features a number of caves and rockshelters, many of which contain rock art. The region lies within the cerrado vegetation zone, a semi-arid savanna-pantanal. There are gallery forests along the streams.

Canadian scientists Alan Bryan and Ruth Gruhn noted the site during a brief archaeological survey of the area in 1978. Dr. Proux and his colleagues from the Universidade Federal de Minas Gerais in Belo Horizonte later undertook an extensive survey that included test excavations in rockshelters of the region. They tested Lapa do Boqueiet in 1981, and followed up with an extensive excavation begun in 1988. "We have excavated now some 50 square meters in the shelter and more than 10 square meters outside in front of the cave," says Proux.

Lapa do Boqueiet is a level and well-litgted shelter at the mouth of a cavern that slopes sharply downward at the rear. The shelter, which has a roof about 3 meters above the present sediment level, is approximately 25 meters long and 30 meters wide. From the shelter, a incline slope drops into a thickly forested flint extending approximately 300 meters to the Rio Peruaçu.

The floor of the rockshelter consists of approximately a meter of silt overlying a calcite-cemented layer. Excavations revealed complex stratigraphy because people had used the shelter over a long period.

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period of time. During the historic period, domestic animals caused disturbance extending about 15 centimeters below the surface. Prehistoric people partially disturbed the upper half of the sediments, Proux said.

He and his team found that agricultural peoples of the late prehistoric time had dug a number of large storage pits extending as much as 50 centimeters into the rockshelter’s compacted silty floor. Deeper sediments remained undisturbed, however. These contain records of Lapita’s earliest human occupation in a matrix of a 10-cm-thick deposit of white, yellow and dark red silts. The team described stratigraphy in Camadas and geomorphological units. In the deeper sediments, Camadas VII and VIII, Proux and his team found high levels of organic matter including much ash and charcoal. They discovered a number of hearths.

Radiocarbon analysis of charcoal Camadas VII and VIII yielded four dates ranging between 12,000 and 11,000 years before present.

The archaeologists found that flaked stone tools, cores, and flakes were plentiful in the site’s lowest level. Chert was the most plentiful material, but the earliest inhabitants of Lapita’s Boquete also used limestone and quartzite. About 30 percent of the chert specimens display evidence of thermal spalling, probably accidentally in the many hearths.

The toolmakers did almost all their flaking by direct percussion. Proux and his team recovered only a few small bifacial trimming flakes and only one bifacially worked artifact, the end tip of a projectile point. The team found that edge retouching of artifacts was done by direct percussion and that inverse flaking was rare.

The flaked stone-tool assemblage from layer (level) eight features thick, large-to-medium flakes with steep edge retouch for use as scraping tools. “Micro-use wear or polish has been seen on several tools,” says Proux.

A number of osteas or unifaces—thick, elongate plano-convex tools with steep edge retouch—were found. Such tools are characteristic of late-Pleniglacial and early-Holocene assemblages in other parts of Brazil. They have been found in the Parana phase of Gonia, dating to between 11,000 and 9,000 years B.P. according to investigations by P. H. Schmitz, and in assemblages dating to around 11,000 B.P. from Pedro Finta in the lower Amazon basin by A. C. Roosevelt and his colleagues. Lapita’s Boquete also produced a large number of small, retouched or utilized chert flakes in the assemblage from the lowest level.

A notable part of Lapita’s Boquete’s artifact assemblage are the quadruplocos, tabular pieces of limestones pecked with one or more shallow depressions. These pieces served as nutcrackers, holding palm nuts or seeds so they could be cracked open with a hammerstone. The researchers found many charred palm nuts in the same stratum.

Proux and his colleagues found evidence of a broad-spectrum foraging economy in the site’s lower levels. Faunal remains found in Camadas VII included fish, lizards, and small mammals. Proux believes that many of the small animals probably were dwellers of the cave. A few bones of larger animals including deer were found as were lacustrine (lake-dwelling) bivalve mollusks. In addition to the abundant remains of palm nuts, the team found evidence of a variety of other fruits.

“I believe that the main part of the subsistence refuse has not been found,” says Proux. “It is clear that the several parts of the retouched tools of different types than those that we found inside, in the western excavation,” Proux told the Mammoth Trumpet.

Workers found one piece of limestone stained with red pigment. Quite possibly it served as a paint palette for one of the artisans whose work graces the walls of the shelter. In part of the site they encountered a lower zone of cemented red silt containing calcite concretions. There were a few chert flakes and some bone fragments within this material.

“In the central part of the site we found a big buried block that fell between 10,000 and 9,000 years ago,” says Proux. It was covered with petroglyphs made before 7,000 years ago. “Some of the lowest ones are surely as old as 9,000 years old.”
Recalibrating Radiocarbon

conditions in the Southwest, correlate with more arid conditions in the Northwest, were created by a change in polar-front jet-stream flow patterns, he says. He infers that the succession evident in the Greenland ice record—Older Dryas, cold; Bolling, warm; Older Dryas, cold; Allerød, warm; Intra-Allerød Cold Period, cold; End of Allerød, warm; and Younger Dryas, cold—should be echoed by climate indicators in the Southwest.

The Clovis-Blackwater Context

In the Llano Estacado region where Blackwater Draw is located, the period from about 22,900 to 14,000 radiocarbon years ago has been termed the Talohka Pluvial, and Fiedel notes that this period was followed in relatively rapid succession by several contrasting periods. There was the Crane Lake Interval, which was dry with lower water levels and increase in windblown deposits—possibly the Bolling-Older Dryas-Allerød period; the Blackwater Subpluvial—perhaps the Intra-Allerød Cold Period; the White Lake Interval marked by dwindling water sources; the Lubbock Subpluvial, a time of increased surface water, but not as wet as the Blackwater Subpluvial; and the Yellowhouse Interval, a dry period after 10,000 radiocarbon years ago when park land was replaced by herb communities.

Fiedel says the Clovis occupation at Blackwater Draw has been assigned to the Blackwater Subpluvial, the megafauna extinctions to the White Lake Interval, and the Folsom component to the Lubbock Subpluvial. If these correlations are valid, he says, the Lubbock Subpluvial should be coeval with the Younger Dryas, from about 12,900 or 12,600 to 11,400 calendar years ago, and the Blackwater Subpluvial should date from around 13,200 to 13,000 years ago.

The Folsom Components

Fiedel notes that if Folsom is stratigraphically and temporally associated with the Younger Dryas, there is the problem of why uncalibrated radiocarbon dates for the Folsom horizon often overlap with Clovis dates around 10,900. He says that at the original Folsom site six dates on charcoal average 10,890 ± 50, although a bone collagen sample yielded a date of 10,390 ± 110 radiocarbon years ago. Dates for Folsom components at Lindsemeyer, Hansen, Agate Basin, and Indian Creek fall in the broad range of 10,900 to 11,100 radiocarbon years, but the most precise dates seem to fall around 10,700.

In 1984 Edwin Wilkens suggested that Clovis and Folsom might represent regional rather than temporal variation.

Recalibrating the Radiocarbon Calendar

Recalibrated radiocarbon chronologies are not simple changes of scale, but rather complex recalibrations made possible by recent research on ice cores and uranium-thorium dating of late-Pleistocene corals.

Radiocarbon dating is based on the premise that the ratio of carbon-12 to carbon-13 in a living organism is the same as observed in recent (but pre-industrial age) samples. Unfortunately, this ratio has fluctuated even in the pre-industrial past. Archaeologist and author Stuart J. Fiedel explains that there are two principal reasons for the fluctuations: the amount of carbon-14 in the atmosphere has varied due to changes in the intensities of cosmic radiation, solar radiation, and the Earth's magnetic field; and, secondly, the amount of atmospheric carbon dioxide has varied, which in turn affects the production of carbon-14. The amount of carbon-14 has varied, and carbon dioxide was either absorbed from or released into the air at the ocean surface (near of Earth's carbon is stored in the ocean). The concentration of carbon dioxide rose rapidly at the end of the Ice Age, he explains, from the late-Pleistocene level of approximately 180 parts per million to about 250 parts per million. Because of industrial activities since 1850, the concentration of carbon dioxide in our modern atmosphere has increased even further, he says, to about 360 parts per million.

Accurate calibration of the radiocarbon calendar for the Holocene, back to about 11,000 calendar years ago (10,000 radiocarbon years) has been accomplished by comparing radiocarbon dates for small pieces of ancient pine and oak trees against dates obtained from accelerator mass spectrometry rings visible in the wood samples. However, in the absence of trees of the necessary antiquity, this dendrochronological calibration has not yet been extended beyond the Holocene/Pleistocene boundary. Nevertheless, says Dr. Fiedel, an approximate calibration of earlier dates is now possible on the basis of two parallel dating methods applicable to the late-Pleistocene: counting of annual accumulation layers in cores drawn into the Greenland Ice sheet, and uranium-thorium dating of coral deposits in the ocean off Barbados in the West Indies. The same coral samples can also be dated by the carbon-14 method. Comparison of the uranium-thorium and carbon-14 ages

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show that carbon-14 underestimates the age of the late Pleistocene corals by about 2,000 years. No organic materials suitable for radiocarbon dating are present in the Greenland Ice. However, Fiedel describes an intermediate step that allows the ice cores to be used in carbon-14 calibration. A sharp change in oxygen-isotope ratios in the ice at about 12,940 ± 260 years—indicating a sudden, steep drop in temperature—signifies the onset of the Younger Dryas episode. For the next 1,100 years, a nearly glacial climate prevailed in the Northern Hemisphere. "The vegetation in northern and central Europe and North America responded rapidly to this change, and this response is clearly visible in the form of altered percentages of pollen, seen in lake-bed cores," he says. Those lake beds also contain a variety of well-stratified organic materials that can be carbon-14 dated, and the dates obtained for the Younger Dryas onset fall in the range of 10,600 to 10,900 B.P.—again, some 2,000 years later than the date based on the ice cores.

Another point of correlation of these records, says Fiedel, is the onset of the sharp initial postglacial warming episode called the Bolling period. Ice cores date this event at about 14,700 B.P., but...
He cited the statistically indistinguishable dates from Lisdemmeter and Clovis sites as evidence that Folsom and Clovis were at least partly contemporaneous. Fiedel notes that Clovis and Folsom points were originally believed to have been contemporaneous functional variants—Clovis for mammoth hunting and Folsom for bison hunting.

"However, the stratigraphic evidence from Blackwater Draw compels us to recognize a temporal succession," says Fiedel, noting that an erosional incontinuity separates the Clovis assemblage from the Folsom component. He points out that three dates for the Clows occupation, derived from carbonized plants, average 11,300 ± 240 radiocarbon years, while four dates from carbonized plants from the Folsom occupation range from 10,200 to 10,700 radiocarbon years ago, with an average age of 10,380 ± 140 years. A bone collagen sample yielded a date of 10,260 ± 110 years.

"Now it appears that a cultural horizon characterized by unfiltered Plainview or Goshen points may have to be squeezed in between Clows and Folsoms," says Fiedel, citing the research of George Frison and Bruce Bradley. He says Goshen points were stratified below Folsom assemblages at Hell Gap and the Carter-Kerr-McGee site. Five dates at the Mill Iron site in Montana put the Goshen complex at roughly 11,600 years (uncalibrated), but four other dates average about 10,850.

More Clovis Questions

"Since Clows is demonstrably earlier than Folsom and probably older than or contemporaneous with Goshen, it is disturbing that a number of western Clows dates have come in around Vance Haynes, he adds, suspects that dates on collagen or collagen-derived amino acids may be less reliable than charcoal or wood dates, although Fiedel notes that Haynes urges toward accepting a collagen date for the Folsom type site instead of six charcoal dates which are some 600 years older.

Fiedel argues that these Clows dates that seem late cannot be attributed only to sample materials. Calibrated dates of 10,770 ± 140, 10,620 ± 300, 10,700 ± 150, and 10,710 ± 90 years B.P. were obtained on charcoal from the Lehner site, where eight earlier dates (one as early as 11,470 ± 110) were also charcoal-derived. Murray Springs, he adds, yielded a date of 10,710 ± 160 on charcoal (seven others ranged from 10,840 ± 140 to 11,190 ± 180). So why, Fiedel asks, are dates of 11,100–11,400 and 10,700 turning up for some of the same short-duration Clovis occupations?

Clues from Lake Beds

Studies of layered deposits laid down by lakes provide confirmation of irregularities in the chronological record. Fiedel cites studies of a Scandinavian lake-bed sequence, where a date reversal occurs in the deposits lying just beneath deposits indicating the onset of Younger Dryas. A radiocarbon date of 10,750 ± 100 years B.P. occurs 16 centimeters below a date of 10,995 ± 75. That 16 cm is possibly equivalent to about 500 years of deposition according to the lake-bed research. Fiedel says the 10,750 date is sandwiched between dates of 11,065 ± 150 and 11,630 ± 190 radiocarbon years.

This research by Svante Bjoernck of the University of Copenhagen and colleagues on lake-bed deposits in Scandinavia revealed large jumps in radiocarbon age from around 11,400 to 10,900 years ago. Swedish lake-bed sediments dated by accelerator mass spectrometer and coeval German tree ring data revealed that after 11,000 to 10,000 radiocarbon years ago, radiocarbon dates suddenly leaped to 10,600 (Folsom-age). Further, Bjoernck and colleagues reported that before a radiocarbon dip at around 12,600 years ago, there appears to have been an increased ratio of carbon-14, itself preceded by another dip that began about 12,300 years ago.

Carbon-14 dates for pollen-bearing strata at Rotsee, Switzerland, show a comparable pattern. Fiedel reports that the stratigraphic sequence from the Swiss core reveals the following reversal in the column: at 795 cm, approximately 11,600 and 11,200 radiocarbon years; at 790 cm, 11,350 years; at 780 cm, 10,600 years; at 770 cm, 11,000 years; and at 760 cm (just after onset of the Younger Dryas), 10,400 years. He notes that similar reversals of AMS radiocarbon dates between 10,660 and 10,900 years ago have been reported in Atlantic Canada lake-bed cores, for example at Splay Pond, where a radiocarbon date of 30,970 ± 90 overlies a date of 10,690 ± 80.

Did Climate Force Migrations?

Ice-core data place the onset of the Younger Dryas at 12,940 ± 260 years ago, or just about the end of the Clovis era in Western North America. Fiedel says the abrupt jump in radiocarbon chronology from 11,400 to 10,900 uncalibrated years probably was related
to this cooling episode. "The Clovis drought in the Southwest may be tentatively identified as a regional manifestation of the 200-year warm interval between the Intra-Allored Cold Period and the Younger Dryas," he says, adding that the interval is marked by a "spike" in ice-core records that indicates increased temperatures and possibly also changes in the global hydrologic cycle.

"Perhaps, we might attribute Clovis emigration from Berinina to climatic stress during the Intra-Allored Cold Period. However, in view of new dates from North and South American sites, it now appears that the initial southward move-
HUMANS BONES excavated in a remote southeastern Alaska cave in 1996 date to around 9,800 radiocarbon years ago, making them the oldest reliably dated human remains found thus far in Alaska or Canada. The antiquity of these bones of a young man, and their location on Prince of Wales Island, lend support to the theory that early people migrated to North America along the Pacific Coast. In addition, a series of accelerator mass spectrometry (AMS) radiocarbon dates from Paleontological specimens from the cave span the past 40,000 years, indicating the presence of ice-free refugia during the late Pleistocene.

The Tongass Cave Project, a joint effort of the United States Forest Service and the National Speleological Society, began in 1990 a systematic survey and mapping of the caves of the Tongass National Forest on the islands of coastal Alaska.

E. James Dixon, Curator of Archaeology at the Denver Museum of Natural History, says these caves are ideally suited for evaluating the coastal-migration theory. Not only was the area free of ice during the late Pleistocene, the caves were a center of human activity, and they contain organic remains that can be dated.

Archaeologists postulate that people could have entered North America by way of the Bering Land Bridge either by an inland or a coastal route. Scientists favoring the inland route hypothesis believe that human hunters followed large animals such as mammoths southward when there was an ice-free corridor between the great Laurentian ice sheet on the east and the Cordilleran glaciers that flowed from the mountains. Others propose an alternative hypothesis suggesting that people, occasionally using watercraft, moved southward along the northwest coast of North America. This scenario explains how humans could have reached South America before the melting of the continental glaciers. Proponents note that several early archeological sites in North and South America lend support to the coastal theory.

The interior-migration model suggests a lifestyle based upon the hunting of land mammals and freshwater fishing. The coastal-migration model suggests a livelihood based upon the hunting of marine mammals, saltwater fishing, and shellfish gathering facilitated by the use of various types of watercraft.

Dr. Dixon, who received his undergraduate and part of his graduate education in Alaska and his Ph.D. at Brown University, is the principal archaeologist in a project that pulls together scientists whose expertise includes glaciology, geology, archeology, palontology, and climate history. In a telephone interview with the Mammoth Trumpet he noted that the origins and development of Northwest coastal culture are not well known because the trearly forested environment makes excavation difficult and the acidic soils result in poor organic preservation.

By focusing on the region's caves, however, typical research problems—such as excavating through massive root systems, sites overlain by uprooted trees and branches, disturbance of the soil layers caused by fallen trees, and the acidity of forest soils—are eliminated. So the Tongass project focused on the region's karst topography, which forms in areas underlain by limestone and is exemplified by underground drainage and caves.
The karst region of southern south-east Alaska contains numerous coastal caves that were carved out by the sea. Though sea level increased after the melting of Ice Age glaciers, many of these caves have undergone geologic uplift so they are above modern sea level. The caves preserve beach deposits that contain shells, driftwood and other organic materials that can be radiocarbon dated.

This karst region is part of the temperate coastal rain forest that extends along the west coast of North America from northern California through coastal Oregon, Washington and British Columbia northward to Alaska's Kodiak Island. The Alaska portion of this region is characterized by hundreds of islands, heavy rainfall, and steep, thickly forested terrain that makes field research difficult.

The excavation of a cave designated 49-PET-408 located in the northern part of Prince of Wales Island in the Alexander Archipelago yielded human remains. Scientists found the mandible (broken into two parts) of an adult male who was probably in his early 30s. "The mandible contains all the teeth, except the four incisors," said Dixon. "Three human vertebrae and a partial right pelvis were found in the same chamber as the mandible, about 10 meters from the cave entrance. Based on the similar degree of stalacting, size, and estimates of age and gender, all the human bones appear to be from the same individual."

Dixon's team submitted two small samples of the bone to AMS radiometric tests. A sample extracted from the mandible dated 9,300 ± 60 years B.P. (CAMS-205731). Another sample taken from the pelvis dated 9,880 ± 50 years B.P. (CAMS).
TRIBAL GOVERNMENTS MAKE DECISIONS

As soon as human remains were found at the NATPE-488 site in 1996 all excavation ceased and the archaeologists began a process of consultation with the tribal groups involved pursuant to the Native American Graves Protection and Repatriation Act (NAGPRA). Terry Fillied, an archaeologist with the U.S. Forest Service’s Craig and Thorne Bay Ranger Districts in Craig, Alaska, contacted the local tribal governments of Klukwan, Craig, Hydaburg, and Kake.

Fillied said the human remains were discovered on July 4, 1996, and that he was informed July 5. By the following day, Fillied had informed the presidents of all the tribal governments concerned.

“The discovery was sudden and there was no time for the archaeological process to take place,” Fillied said.

The Kake and Hysatubg tribal governments defended their Klawock Cooperative Association and the Craig Community Association. The Klukwan and Craig tribal governments represent related Tlingit tribal lineages; it is in their ancestral territory that the human remains were found.

On the first meeting of the discovery, both Craig and Klukwan Tribal Councils had reservations about further study and excavation.

Rosaann Demmett, president of the Craig Community Association, said that at a subsequent meeting, there was a lengthy discussion among the 18 Craig board members. She says that one of the biggest concerns of tribal members is that they do not want the name or the location of the cave to be made known because they fear grave robbers might desecrate it, as has happened at burial sites in other parts of Alaska.

Fillied said the Mammoth Trumpet that she was able to persuade board members to permit radiocarbon dating of the bones for scientific and archaeological reasons. Also, she says, “It would give us a better idea as to how long people had been in this area. We really believe that the Tlingits were the first people in this area. The Haida and Tsimshian people migrated from Canada and have been in this area a long time, but not as long as the Tlingits have been here,”

Rosaann Demmett, President of the

Sabrina Demmett, daughter of Rosaann Demmett, the president of the Klawock Cooperative Association, was one of four interns who worked on the project in 1997. A recent graduate of Klawock High School, she is entering Fort Lewis College this fall.

Klawock Cooperative Association in Klawock, Alaska, said that both tribal associations agreed to allow the skeleton to be dated with the understanding that the bones would be reburied at the same site later. The tribal councils also have an understanding with the Forest Service that all decisions regarding the skeleton will be discussed with them every step of the way. In addition, she said, the tribal councils are to have prior review of any new information that is to be published regarding the skeleton.

Fillied said he attended six tribal meetings over the course of last winter and also exchanged dozens of phone calls and letters with the tribal governments.

Two years prior to the discovery, Forest Service officials had convened a general meeting in Ketchikan and invited all community and tribal representatives to begin a government-to-government relationship, required under executive order, says Fillied. “There was a lot of interest in what they said,” he added. “We took it to heart, and did it the way we were supposed to do it, and it has worked out real well.”

Fillied believes that the government-to-government approach is encouraged by the island’s small community environment. “My children go to school in the same school that most of the council members’ children in Klawock go,” he said. “We’re active in the same community. I see everybody in the grocery store. They know me. People trust me to some extent, and I’m personally accountable for the things that I say in public. There isn’t the amount of distrust that can develop in a more urban context.”

Regarding the current research season, Fillied says that researchers were able to fund two native student internships with their National Science Foundation grant to the Denver Museum of Natural History. The interest has been shared among four individuals selected by the Klawock and Craig Tribal Councils. Respinna Sabrina Devenent, Aubrey Campbell, Tara Shook, and Yarrow Vara have contributed to every aspect of the project and promote to provide lasting links between the researchers and the tribes.

--Carol Anne Lysock

3239. The human bones are being kept in a climate-controlled environment at the Denron Museum of Natural History. They have been dried so that the moisture content is optimal for preservation, and casts have been made, said Terry Fillied, archaeologist with the Craig and Thorne Bay Ranger Districts. In addition to being studied by Dr.
Fred Grady, above, preparator for the Smithsonian Institution, washes cave sediments. Sediment from paleontological context is bagged by provenience unit, and washed in fine-mesh bags to remove fines. The coarse fraction is then dried, sorted and studied. Eric Parish, above right, technical illustrator with the Denver Museum of Natural History, at work on Prince of Wales Island. Parish documented the setting and developed stratigraphic profiles. Palaeontologist Tim Heaton, right, has been studying the Quaternary mammals of Prince of Wales Island since his work at El Capitan Cave in 1992.

Dixon, the bones have been examined by Robert Pickering, a physical anthropologist at the Denver Museum of Natural History. Physical anthropologist Christy G. Turner of Arizona State University plans to study the individual’s dentition, and Douglas Gwasty, head of physical anthropology at the Smithsonian Institution, will also be examining the bones from 49-PET-408.

In addition to the human bones, scientists discovered three artifacts while excavating 49-PET-408. They found a piece of marine mammal bone, possibly a large mammal, that had been modified into what was probably a flint flaker. This artifact and the human remains exhibit similar staining and preservation qualities and it appears that they were associated, says Dixon. Near the rear of the cave the team found the medial fragment of a large barbed bone projectile point. The fragment, which appears to have been manufactured from the rib of a marine mammal, is not stained dark brown like the human remains and the flint flaker.

The only lithic artifact researchers found is a bifacially thinned chert tool encrusted with calcium carbonate. This biface was recovered from a chimney near the cave entrance. Dixon says calcium carbonate encrustations characteristically form on the underside of artifacts in cave deposits, and the fact that these encrustations occur on both facets of
the artifact indicates that it was turned over some time after it was originally deposited in the cave.

Perhaps more exciting than the artifacts, however, are animal bones from the cave dating back more than 40,000 years, establishing for the first time the existence of a glacial refugium.

New Books


Holland, a University of Wisconsin geographer, has extensive experience studying well-known archaeological sites on the southern High Plains including Lubbock Lake, Plainview, Clovis and Midland. This book, covering 20 sites, presents a synthesis of data from decades of earlier research on the region’s geochronology as well as Dr. Holland’s own recent research. He integrates new and old data on geomorphology, stratigraphy, soils, geochronology and paleoenvironments. He also compares the sites with other sites across the Great Plains. This new book is considered a key source on the early geochronology of the region.

COMING CONFERENCES


Nov. 7-9 Eastern States Archaeological Federation Meeting, Travelodge Conference Center, Mt. Laurel, NJ. Contact: Debra Martin, 302-832-0653.

Nov. 13-16 30th Annual Acmochloa Conference, Calgary, ALB. Contact: Nancy Salberg, Conference Committee, Dept. of Archaeology, University of Calgary, 2500 University Dr. NW, Calgary AB T2N 1N4. 403-220-5227. e-mail: 13nno1@ucalgary.ca.

Nov. 19-23 96th Annual Meeting, American Anthropological Association, Washington, D.C. Contact: AAA Meetings Dept. 4510 N. Fairfax Dr. Ste. 640, Arlington VA 22203. 703-528-1902 ext. 2. e-mail: tbla@aaa.mhs.compuserve.com.


March 31-April 3, 1998 Annual Meeting, Human Biology Association, Hilton Hotel, Salt Lake City, UT. Contact: Michael Crawford, Department of Anthropology, University of Kansas, Lawrence KS 66045-2110. e-mail: crawford@kuhub.ukans.edu.

April 1-4, 1998 Annual American Association of Physical Anthropologists, Hilton Hotel, Salt Lake City, UT. Contact: Clark Spencer Larsen, Research Laboratories of Anthropology, Alumni Building, CB# 3120, The University of North Carolina, Chapel Hill, NC 27599-3120.


August 23-29, 1998 Eighth International Congress of the International Council for Archaeology (ICAZ '98), University of Victoria, Victoria, BC. Contact: Conference Management, Division of Continuing Studies, PO Box 3010, Victoria, BC, V8W 3N6. e-mail: moagard@uvic.ca, http://www.vics.uvic.ca/conference/admin.htm.

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Expedition Affirms Significance of Moose Creek Site

Remote Alaskan hilltop yields evidence of Nenana plus two Denali occupations

New Excavations confirm that Alaska's Moose Creek site was first occupied by people of the Nenana tradition. The 1996 field work also revealed two hitherto unknown Denali occupations in higher levels of the remote site. Initially excavated in the 1970s and 1980s, Moose Creek had previously had an ambiguous cultural affiliation and question-able age, but a larger University of Alaska Fairbanks excavation in 1996 headed by Georges A. Pearson of the University of Kansas has affirmed the status and significance of this Alaskan site.

Located in the northern foothills of the Alaska Range about 100 kilometers southwest of Fairbanks, the site is approximately two miles from the confluence of Moose Creek with the Nenana River and four miles from the town of Ferry. It is on the highest terrace of the Nenana Valley on a hilltop carved from glacial outwash by the Nenana River and Moose Creek.

John F. Hoffecker and C. F. Waythomas identified the site in 1978 while assessing the extent of late-Pleistocene human occupation of the Nenana Valley during the North Alaska Range Early Man Project. Archaeologists had previously found that human presence at the nearby Dry Creek site went back more than 11,000 radiocarbon years. At Moose Creek, Hoffecker and Waythomas tentatively assigned cultural material to the Nenana complex, an early tradition characterized by the presence of triangular and teardrop-shaped points and endscrapers, and the absence of microblades and fluted points. However, their excavations did not yield unequivocal Nenana affinities, and antiquity of the cultural material had to be inferred from a 3,200-year range of radiocarbon dates from samples of organic material in buried paleosols. Hoffecker and colleagues found that Moose Creek possessed at least two cultural components, both of them lacking diagnostic tools; thus, the site remained something of an enigma.

Analysis of the 1996 findings is still in progress, but this latest expedition has clarified the significance of the remote site. "The principal aim of last summer's re-excavation," says Pearson, "was to liberate the Moose Creek site from an unfortunate state of
limbs." It succeeded in finding two distinct Denali occupations above unequivocal Nenana material. Denali complex, sometimes referred to as American Paleoarctics or Beringian tradition, is characterized by microblades and wedge-shaped core technology that are regarded as closely related to artifacts found in Siberia.

The 1996 field work so far has produced one radiocarbon date, 11,190 ± 60 years B.P. (Beta-06627), from an accelerator mass spectrometer (AMS) assay of hearth charcoal. Pearson says budget restrictions have delayed further radiocarbon analysis of 1996 Moose Creek discoveries. The radiocarbon dates previously obtained from Moose Creek paleosols ranged from 8,160 to 11,730 years B.P.

The one new date compares closely with radiocarbon dates from nearby Nenana sites, Walker Road and Dry Creek. Differences are, in fact, statistically insignificant. Three Walker Road AMS

At the Nenana level at Moose Creek the 1996 excavation discovered a diagnostic Chinidadin point (right), pictured in situ above.

dates range from about 11,010 to 11,300; Dry Creek has a date of 11,120 years.
The data indicate that the Nenana Valley was first occupied around 11,200 radiocarbon years ago.

The solid evidence of Nenana occupation at Moose Creek came from the discovery of a Chinidadin point in the site's deepest cultural component. The new radiocarbon date came from a hearth in this same component. The two Denali complex occupations were separated by more than 20 centimeters of sand. "These data demonstrate that previous assemblages were composed of mixed artifacts from the Denali and Nenana complex levels," says Pearson. "The sequence of archaeological components at Moose Creek is similar to those observed at Dry Creek, Walker Road and Panguigue Creek." Those nearby sites are all south of Moose Creek.

Setting out to locate hearths and diagnostic tools, Pearson decided that the 1996 Cuomo Creek expedition should excavate more than twice as much surface as had the previous investigations. The project was part of the University of Alaska Fairbanks Summer Session's archaeological field school, which provided the energy of 15 students who came from all parts of the United States, and Robert A. Beckwith, the crew chief. Their excavation units surrounded those that had been put in by Dr. Hofecker, and followed the same grid system so that all features could be plotted on a single map. Pearson's crew excavated more than 45 square meters, in spite of the difficulties imposed by the remote site.

"It was by far the most extreme kind
of archaeology I've had the pleasure to be involved with," Pearson told the Mammoth Trumpet. The expedition's base camp was set up far below the site on a lower terrace of the Nenana River. The area's abundant bears—black bears and Alaska brown bears—were a constant threat in the thickly wooded area. "We had to cut our own path through the forest to bring our equipment to the site," said Pearson. University of Alaska archaeologist W. Roger Powers provided an all-terrain vehicle to help move equipment to the camp. The crew carried some of their equipment.

The daily climb up to the site took 40 minutes, and always Pearson or Beck with escorted the crew with 12-gauge shotguns for protection against the bears. It took 25 minutes to climb back down to camp.

No refrigeration was available, and food was brought in weekly. Water had to be brought in daily from Ferry. "This research would not have been possible without the help of the people of Ferry," said Pearson, "especially De Vere Pieschl, who let us use his well."

Because earlier archaeological investigations at the Moose Creek site had found only a few flakes in the upper layers, Pearson had his crew excavate them by arbitrary 10-centimeter levels using a "skim shovel" technique. They sifted these upper-level materials through a combination of eighth- and quarter-inch screens and recorded artifacts either by a three-point system to locate each precisely within the site's three-dimensional grid, or simply within quads of 50 square centimeters, 10 cm in depth.

Upon reaching the site's lower levels, the crew employed more precise methodology. Workers excavated in five-centimeter levels with trowels, and sifted all material through eighth-inch screens. They recorded provenience of artifacts by the three-point system and employed three separate depth measurements—
distance below surface, below datum, and below sand layer. Pearson says the below-sand measurement standardized their depth measurements and maximized the resolution of the five-centimeter levels. "This allowed us to compare more readily and accurately the relative depth of objects across the site," he explained.

Though archaeological materials come chiefly from four strata, Moose Creek site has seven distinct strata that become compressed near the edge of the bluff. The lowest, stratum I, consists of archaologically sterile outwash gravels—an unsorted mix of pebbles, cobbles and sand of various kinds of rock. Above this layer is stratum II, approximately 25 centimeters of fine, windblown silt. This layer with discontinuous paleosols yielded both Nenana and the early Denali cultural materials. Its paleosols are more evident away from the bluff than they are near the bluff. Nenana-complex material including the Chindada point was found near the bottom of stratum II, and the oldest Denali-complex material was found near the upper horizon of the stratum, underlying a conspicuous layer of silt—stratum III—approximately five centimeters thick. Previous Moose Creek dates that ranged from 8,160 to 11,730 radiocarbon years came from organic materials in soils in the upper half of stratum II.

Stratum IV is a layer of coarse, weathered sand approximately 25 centimeters in thickness, and above that, stratum V is a complex of buried pedolands, dark brown in color, mixed with lighter layers of sandy loam. On top are strata VI and VII, a modern horizon of poorly weathered sandy loam topped by about seven centimeters of humus and surface litter.

The archaeologically important layers, strata II and V, are the two buried soil complexes. Pearson said permafrost conditions have not caused major alterations to the stratigraphy, though some
evidence of permafrost was found at the site.

Hoffecker had designated two cultural components at the Moose Creek site, but Pearson says the 1996 excavation indicates these each could be subdivided stratigraphically, making four distinct cultural components. The oldest, of course, is the Nenana material low in the second stratigraphic unit. Diagnostically, Nenana material, in addition to the Chinook point, included a sub-triangular point and a large scraper blade. The Chinook point was found 15 centimeters below the lowest part of the site's microblade component, and it was associated with the hearth dated at 11,190 radiocarbon years. Dave McMahon of the Alaska Department of Natural Resources identified charcoal from the hearth as willow.

Associated material included three large "hearth stones," a bifacially flaked tool, a sidescraper, a bipolar flake core, a sub-triangular point, and a scatter of flakes. "The majority of these artifacts were manufactured from a single large basalt cobble taken from the underlying Nenana gravels," says Pearson, who adds that pitting on the large hearth stones suggests that the basalt cobble was reduced using a bipolar technique with the large stones as hammers and anvils.

Pearson's component two consists of the upper portion of the second stratigraphic unit and is associated with a palisade immediately under the silversand layer (stratum III). Diagnostic material includes 27 microblades and a Donnelly burin. The 1996 workers found all of this level's microblades in a tight cluster, suggesting that they are all by-products of microblade production.

This Denali component is likely associated with a hearth Pearson's crew found nine centimeters below the silver sand horizon. Because of budget restrictions, the hearth has not yet been dated, but Pearson has tentatively assigned the Denali component a radiocarbon age 5,640 years ago.

Peopling of the Americas is the subject of a session being planned for the annual meeting of the Society for American Archaeology in Seattle next March. Organizers George A. Pearson of the University of Kansas and David R. Yesner of the University of Alaska-Anchorage have titled the session "Late Pleistocene-Early Holocene Population Movements in the Americas: The Peopling of a Continent."

The session is to address important questions related to the initial dispersal and settling of humans across North, Central and South America, say the organizers. Papers are being sought from researchers in physical anthropology, human genetics and linguistics as well as those in archaeology. Pearson and Yesner say possible topics include technological diffusion versus human migrations, coastal versus interior entry and dispersal routes; late Paleoindian origins and expansions; periglacial refugia and "backwash" movements; migration waves revisited, and others.

Peopling of Americas Subject of SAA Session
Two Netana artifacts discovered at Moose Creek in 1996: right, composite, bipolar flake core; below, three views of a composite biface.

Denali complex II at Moose Creek yielded microblade points—microblades (top) and a microblade core rejuvenation tablet.

Unlike all related Netana Valley sites, the Moose Creek site faces southwest, not south, but that may not always have been so. Pearson's team put in several test pits around the periphery of the site to look for other signs of occupation and to determine the extent of the site. Little cultural material was found, and Pearson speculates that the site may have been more extensive and included a south-facing slope that has been removed by erosion. Evidence of Pleistocene-Holocene occupations that likely occurred on the south side of the Moose Creek hilltop would have been lost to erosion.

Pearson believes the absence in the site's assemblage of processing implements such as endscrapers is significant. "Moose Creek may have been a satellite hunting point to a larger occupation situated on a lower terrace nearby," he says.

-DAH

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Ice Age Beringia the Focus of New Museum in Whitehorse

The Yukon Beringia Interpretive Centre in Whitehorse, featuring more than a dozen exhibits and displays designed to take visitors into Yukon’s Ice Age past, opened to the public this summer.

Major exhibits include a replica of the Bluefish Cave, one of the most significant archaeological sites in North America. Broken mammoth bones and stone tools found there in 1985 indicate humans found shelter in the cave. An adjacent exhibit tells the story of scientific research in the area.

The Exhibit Gallery contains thematic displays and dioramas as well as educational programming. Computer kiosks connect visitors to interactive displays and the center’s web site, Beringia.com. Among the exhibits in the Great Hall is a diorama of a First Nations winter camp and a cast of the largest woolly mammoth ever recovered. The mammoth was the most abundant of all the animals found in Beringia.

Yukon First Nations heritage is highlighted through a variety of displays and commissioned works of art. Traditional First Nation elders, academics, and designers who guided the Centre’s development, Keenan said that First Nations, particularly the Vuntut Gwichíin of Old Crow, have been instrumental in helping scientists locate Beringian evidence in the northern Yukon.

Keenan also praised the cooperation of placer miners. “Donations of ancient animal remains found on placer claims are invaluable for education and research. This support has led us to a much truer picture of the animals who roamed this land during the Beringia period.”

Beringia is the name given to the area between Siberia and the Mackenzie River that remained ice-free during the Ice Age. Low sea levels caused by glaciation created a land connection between the continents by way of the exposed floor of the Bering Sea. A vast grassy tundra, known as the Mammoth Steppe, supported herds of woolly mammoth, caribou, and steppe bison. Also present were the giant ground sloth, the giant beaver, and the North American horse and camel. Predators, including the giant short-faced bear, the scimitar cat, and the American lion, followed the great herds. Evidence shows the First Peoples of North America also hunted these ice age mammals and arrived in Beringia at least 24,000 years ago.
Ancient Alaskan Bones

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on Prince of Wales Island. Bones of a brown bear (Ursus arctos) yielded a radiocarbon date of 35,365 ± 800 years B.P. (A141227). Radioisotope assay of black bear (Ursus americanus) yielded a date of 41,500 ± 1,500 years B.P. (A146831). It had been thought that brown (or grizzly) bears had never inhabited the island, but it now appears they have lived there through the last glacial maximum, probably living on fish. Mammoth and seal bones of Pleistocene times also have been found in caves in the area.

Dixon says PET-408 still contains much undisturbed sediments including some year-by-year records of the cave that appears to be several meters thick and probably spans the past 40,000 years. He thinks it is quite possible that other and possibly earlier archaeological evidence is waiting to be found. The interdisciplinary team plans to continue excavating PET-408, and to survey other caves in the region. Team members are also working to define late-Quaternary sea levels and the timing and extent of late-Pleistocene glaciation.

The project is undertaken through the professional and financial resources of the U.S. Forest Service, Tongass Cave Project, Denver Museum of Natural History, University of South Dakota, and the National Science Foundation.

—Carol Ann Lynck


Ancient Alaskan Bones


