ARCHAEOLOGY SOUTHWEST *magazine*

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Rethinking the Peopling of the Americas

Jonathan B. Mabry, Desert Archaeology, Inc.

"CLOVIS" IS THE NAME GIVEN TO THE OLDEST and most widespread culture conspicuous in the archaeological record of the western hemisphere, radiocarbon-dated between about 11,600 and 10,900 years ago. However, long-held theories about the origins of this culture and its role in the peopling of the Americas are changing in the wake of new research, dates, and discoveries.

In the first meeting of its kind since 1941, experts gathered in October 1999 for the "Clovis and Beyond" conference in Santa Fe, advertised as a "free-wheeling, no-holds-barred conversation" about these new developments. Sponsors of the conference included the Smithsonian Institution, the Center for the Study of the First Americans, and the Museum of New Mexico Laboratory of Anthropology.

Among the issues discussed were new views of Clovis and pre-Clovis cultures, the controversial implications of the 8,400-year-old "Kennewick Man" skeleton (see page 8), whether biological connections between early and contemporary Native American groups can be assumed without DNA analyses, and if the scientific value of very ancient skeletons should outweigh the rights of tribes to rebury their claimed ancestors.

With the growing acceptance of the age and implications of the 12,500-year-old Monte Verde II site in Chile, the bottom has dropped out of New World prehistory for many of the attending archaeologists. The "Clovis First" and "Ice-free Corridor" models that have dominated American archaeology since the 1940s are now competing with models of earlier migrations and other routes of colonization.

Because the ice-free corridor between Alaska and the northern Plains did not open until 13,000 years ago, an alternative model of an earlier, coastal route of migration from Asia has been revived. The model is given new plausibility by the discoveries of Monte Verde II and a

In 1926, Byron Cummings and his students from the University of Arizona excavated a mammoth skull at Whitewater Draw in southeastern Arizona. They believed that the grinding stones they found below the skull were the first proof of an Ice Age human presence in the New World (see pages 4 and 5). Photograph courtesy of the Arizona State Museum, negative number 71.

This Issue

For more than sixty years, the prevailing scenario of the peopling of the Americas envisioned Clovis mammoth hunters walking across a temporary land bridge connecting Siberia and Alaska at the waning of the last Ice Age. Now, new data from the Southwest and elsewhere are challenging this model. This issue of *Archaeology Southwest* reexamines the greatest mystery in American archaeology, starting with broad perspectives and then focusing on the evidence from Southwestern sites. The articles explore new information and ideas about the peopling of the Americas; the remarkable tool technologies of the Clovis culture; the dramatic climatic changes that affected big-game hunters and their prey; newly discovered Pleistocene rock art; and recent archaeological fieldwork that may ultimately change our understanding of the first peoples of the Southwest. For expanded coverage, visit our website at <www.cdarc.org>.

—*Jonathan B. Mabry, Issue Editor*

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12,000-year-old settlement on the coast of Peru, and two 11,000-year-old human skeletons from sites on the Pacific Coast of North America.

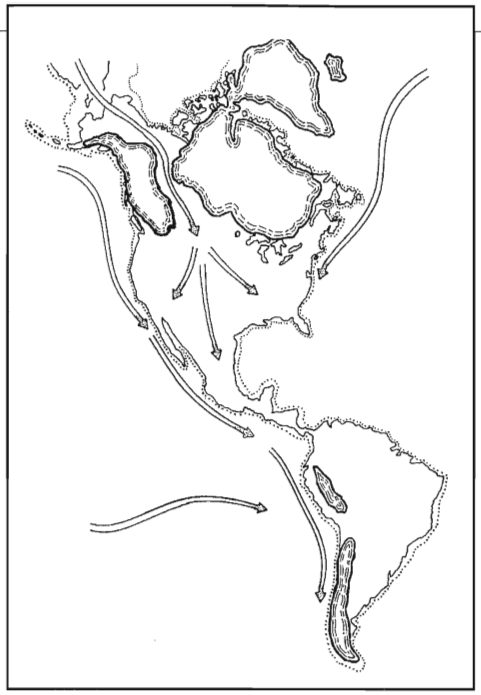
But acceptance of these sites has come slowly. The lead excavator of Monte Verde, Tom Dillehay of the University of Kentucky, has had to address numerous critiques. He suggested that a "Clovis Mafia," comprised of influential American archaeologists, has ignored convincing pre-Clovis evidence from South America because it is not on their own turf and the artifacts are unfamiliar. "There is a North American prejudice; evidence of Paleoindians is not limited to projectile points," Dillehay asserted.

Ruth Gruhn of the University of Alberta argued for the acceptance of still older sites, warning, "The Monte Verde I and Pedra Furada sites in South America, both radiocarbon-dated to more than 30,000 years ago, are a time bomb waiting beneath any models for peopling of the Americas no earlier than 15,000 years ago." Others called for reconsideration of a sea route from the South Pacific islands to South America, a possibility made famous by Thor Heyerdahl's experimental journey on the reed boat "Kon-Tiki" in 1947.

Interest also returned to the striking similarities—widely discussed during the 1930s—between Clovis lithic technology and that of the Upper Paleolithic "Solutrean culture" that flourished in western Europe 20,000 to 16,000 years ago. Dennis Stanford of the Smithsonian Institution and Bruce Bradley, an archaeological consultant from Colorado, see strong similarities between Clovis and Solutrean artifacts. They think that eastern North America was colonized by Solutrean groups using skin-covered boats to skirt the margin of the Atlantic sea ice. Stanford observed that the colonization of Australia demonstrates that, by Clovis time, humans had at least 40,000 years of experience in maritime travel.

Also discussed was possible evidence of pre-Clovis occupations at the Meadowcroft, Topper, and Cactus Hill sites in the eastern United States, and Pendejo Cave in New Mexico. James Adovasio of Mercyhurst Archaeological Institute, the excavator of Meadowcroft, described fragments of basketry, matting, and cordage from pre-Clovis age contexts (including an apparent basket piece from Meadowcroft, radiocarbon-dated to 19,600 years ago).

However, some archaeologists—especially Southwestern specialists—remain conservative. Vance Haynes of the University of Arizona questioned some of the Monte Verde II artifacts, and pointed out that "Equivocal pre-Clovis sites are still equivocal, even if Monte Verde is accepted." He argued that "multiple working hypotheses" are the best approach. Throughout western North America, Mike Waters of Texas A&M University sees no examples of pre-Clovis sites that meet all the necessary criteria: identifiable artifacts or human remains, a definable geological context, and well-associated dating information (see pages 4-5). Others questioned why such a large and diverse region would be by-passed by earlier groups.



Four proposed migration routes. Accumulating evidence points to more than one migration, by more than one route, from more than one region of the Old World; early America may have been a melting pot of different peoples. Illustration by Rob Ciaccio.

Other topics included the distinctive characteristics of early American skeletons, and the genetic diversity among living Native Americans. From these data, some physical anthropologists argued that the Americas were colonized more than once and by different peoples, including some "failed migrations"—biological populations that did not survive after arrival (see page 8).

The conference was not without political undertones. Noticeable was frequent use of the terms "First Americans" or "Paleoamericans" instead of "Paleoindians," reflecting archaeologists' new awareness of the uncertain and possibly mixed cultural affiliations of very old human remains in the New World. Keith Kintigh, president of the Society for American Archaeology, said "Today, there are assumptions of cultural affiliation before a shovel hits the ground. First Americans are Native Americans, but they should be classified as culturally unidentified."

Many archaeologists also complained about current interpretations of the 1990 Native American Graves Protection and Repatriation Act (NAGPRA) that can result in reburial of these remains without scientific study. The opponents in this issue share a deep cynicism about the federal government's role, thinks Jo Ann Harris, a law professor at Pace University. "Scientists and Native Americans both think that government policy favors the other, and . . . that politics are implemented rather than laws," said Harris.

"Clovis and Beyond" lived up to its billing as an open forum. It also showed that American archaeology has been deeply shaken by new challenges to old ideas about the remote past, and by new restrictions on the study of early American skeletons. After more than seventy years of intense investigation, much uncertainty still surrounds the last time in history that humans colonized new continents.

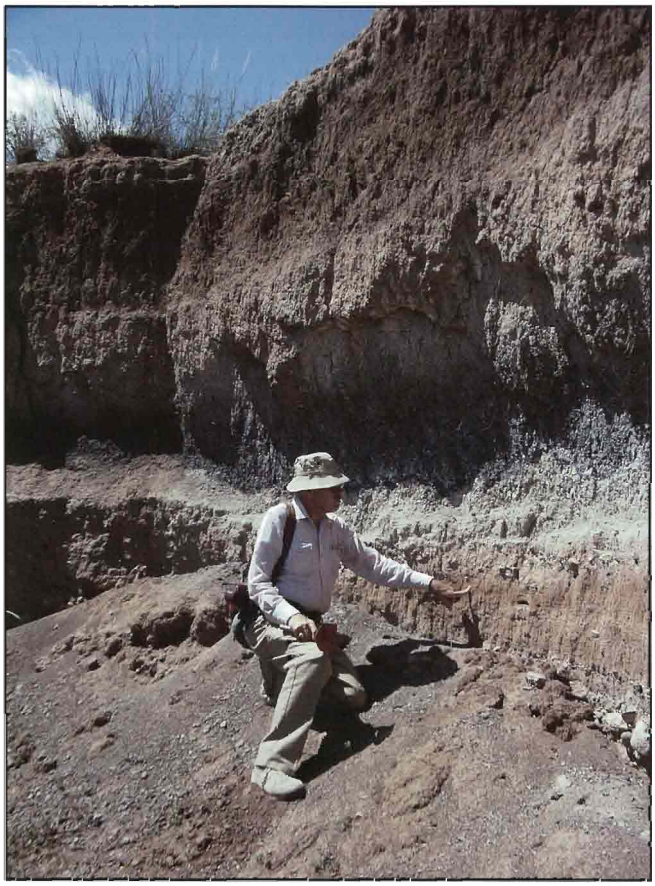
Stratigraphic Evidence of Climate Changes during Paleoindian Times

C. Vance Haynes Jr., University of Arizona

A REMARKABLY consistent sequence of sedimentary deposits at Paleoindian sites across western North America reflects global climatic changes. These changes probably played a role in the extinction of Ice Age "megafauna" (mammals larger than about 90 pounds), and forced human groups to adapt to dramatically and suddenly altered environments.

This sequence is well represented in the upper San Pedro Valley of southeastern Arizona, where strata representing the last 40,000 years are exposed in arroyo banks. Since 1952, four Clovis sites have been found in this region in definite association with mammoth bones. Two other finds were probable associations of Clovis artifacts with mammoth bones, and at least nine other mammoth skeletons of Clovis age were found without artifacts.

In each case, these remains were found upon an eroded surface representing a brief period of drought, and were buried by a black, organic clay (the "black mat") reflecting a water table that rose to the surface and hosted blue-green algae. The transition was very sudden; the black mat quickly covered mammoth tracks, butchered carcasses, and artifacts before they were disturbed by scavengers, plant growth, and erosion. Radiocarbon ages clustering near 11,000 years ago suggest correlation of the drought with the warm period in northern Europe called the Allerød, and the black mat with the global cooling period called the Younger Dryas, which started and ended suddenly.



Above: The "black mat" Haynes found at the Murray Springs site in southeastern Arizona, and other sites in western North America, represents a global cooling event just after Clovis time. Below: These fluted spearpoints, made of crystalline quartz, were among the artifacts found at the Lehner site in southeastern Arizona, on an eroded surface representing a drought during Clovis time. Photographs by Jonathan Mabry.

The apparently catastrophic extinction of megafauna in the San Pedro Valley may have been due to a rapid change from drought to a brief episode of deep freeze that denied water to megafauna at a time when Clovis hunters were passing through the valley. The extinctions of these animals were geologically simultaneous and instantaneous. No extinct megafaunal remains, other than bison, and no in situ Clovis artifacts have ever been found within the black mat. No in situ Folsom artifacts have ever been found below the black mat or in definite association with remains of mammoth, camel, horse, donkey, dire wolf, or lion.

Site stratigraphies in other areas of the Southwest show that a large species of bison did survive the drought to provide sustenance for Folsom hunters as springs began flowing again, ponds and marshes formed, and lakes rose during a moist interval. Wind-deposited silts and sands began accumulating during Folsom time. Alternating water-lain and wind-transported sediments indicate fluctuating wet and dry conditions within a general drying trend until the disappearance of Paleoindian bison hunters in the archaeological record at the beginning of a very dry period about 8,000 years ago.

The Role of Geology in the Search for the First Americans

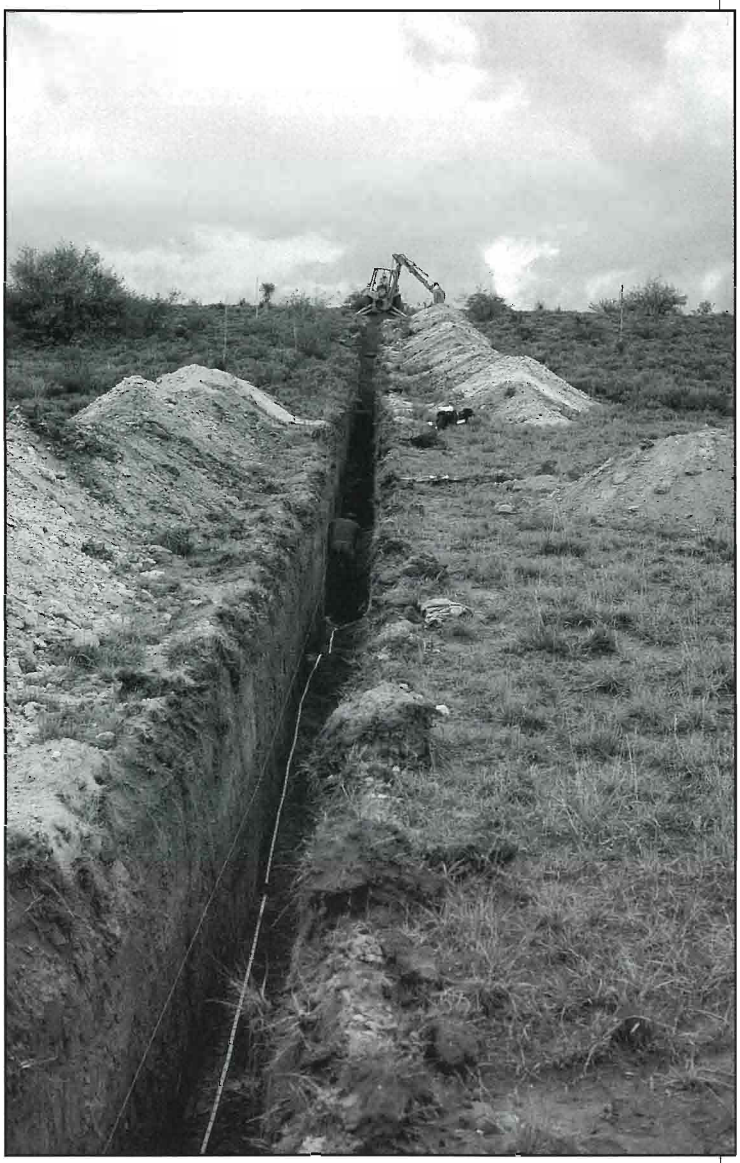
Michael R. Waters, Texas A&M University

MANY OF THE KEY elements to understanding the peopling of the Americas and acceptance of early sites hinge on the geological context: stratigraphic position, dating, and site formation. Since the search for the first Americans began during the nineteenth century, "geoarchaeology"—the field of study that brings geological methods and concepts to bear on archaeological research problems—has played a vital role in the evaluation of the stratigraphic, temporal, and environmental contexts of their archaeological sites.

Stratigraphy (the sequence of sediment deposits) is the framework on which hangs all the data from a site. A local stratigraphic sequence is crucial to conclusively demonstrate the antiquity of a site and the superposition of Paleoindian remains. When material is found in place within deposits, it is critical that the relationships between artifacts and stratigraphy are carefully documented. Detailed stratigraphic studies are also necessary for proper correlations from one part of the site to another, and to fully understand how the site formed through natural processes and postdepositional alterations. It is equally important to take a broader perspective and place the site stratigraphy within a regional stratigraphic framework that provides a secure geological context of a known age (see page 3).

If the sequence of deposits at a site is misinterpreted or is not placed within a regional stratigraphic context, errors can occur. For example, some archaeologists working in southeastern Arizona thought that artifacts were temporally associated with the bones of extinct Pleistocene fauna in stream deposits along Whitewater Draw and in beach deposits on the shoreline of Lake Cochise (the Pleistocene predecessor of Willcox Playa). However, detailed stratigraphic studies showed that the Ice Age fossils in Whitewater Draw were redeposited along with artifacts in early Holocene sediments, and that the artifacts on the shore of Lake Cochise were actually within a late Holocene sheetwash deposit covering the ancient beach.

Similarly, Malpais and San Dieguito I artifacts were thought to occur in Pleistocene desert pavements on the Pleistocene shoreline of Lake Cahuilla, a large lake that filled the Imperial Valley in southeastern California. However, examination of the stratigraphy revealed that the desert pavement and the incorporated artifacts were associated with younger slopewash deposits that covered the Pleistocene shoreline. The only secure stratigraphic context where San Dieguito I artifacts have been found is the Volcanic Debris layer at Ventana Cave in southwestern Arizona. From this deposit, Vance Haynes and Bruce Huckell have recently obtained radiocarbon ages between 9500 and 8700 b.p. (see page 6).



A backhoe trench excavated through the 14,000-year-old shoreline of Lake Cochise in southeastern Arizona revealed that artifacts were not in direct association with bones of Ice Age animals. Photograph by Michael R. Waters.

Geoarchaeological studies also contribute to the dating of archaeological sites. While there are many techniques available to date archaeological sites, the most trustworthy method for dating early sites in the Americas is the radiocarbon method. This technique is the most thoroughly tested and investigated method for dating sites in the New World. We are aware of the strengths and weaknesses of this method and are constantly working to improve and test our

knowledge of this dating technique.

When using the radiocarbon method, the investigator must still be careful. Many different types of organic materials can be dated; however, dates from each of these materials vary in reliability. Wood, charcoal, seeds, and purified organic fractions from bones are the most reliable materials. But even ages derived from these materials must be evaluated. Charcoal can be contaminated by older soluble organics, and this contamination may go undetected unless cross-checks are conducted. Geoarchaeological studies examine the site setting for avenues of sample contamination and determine the best ways to test for such contamination.

Further, because small samples can now be dated by atomic accelerators, we must be concerned that the samples we collect are in place and have not been moved in the sediments by insects or other burrowing animals. For example, burrowing packrats appear to have churned the deposits at Pendejo Cave, a proposed pre-Clovis site in southern New Mexico (see page 7). This is demonstrated by numerous date reversals within the stratigraphy. In addition, archaeologists should be aware of the inherent limitations of the radiocarbon method, especially atmospheric variations in radiocarbon over time and how these variations affect dates.

Geoarchaeological studies can also assess the buried contexts of artifacts and determine whether they are really human-made. "Geofacts" are objects that appear to be artifacts, but instead are created by natural processes in high-energy depositional environments where stones may fracture in ways that mimic human manufacture. But geofacts lack the patterning and flaking characteristics of human manufacture: their flake scars may have been removed at different times and thus show differential wear; and their "worked edges" lack evidence of microscopic use wear. Also, geofacts usually occur in reworked contexts devoid of cultural patterning. Perhaps the best-known example of the artifact-geofact debate is the Calico Hills site in southern California. At Calico, chunks of easily fractured rocks appear to have been flaked as they tumbled downslope in a high-energy slurry of mud and rocks.

A Malpais or San Dieguito I flaked stone chopper in southwestern Arizona—how old is it? The crude manufacture, thick coating of desert varnish, and context in a Pleistocene desert pavement are all thought to represent a very great age. The age of the landform on which the pavement formed provides an upper age limit. Photograph by Michael R. Waters.

Geoarchaeological studies are also useful in the search for sites of the earliest Americans. First, models should be developed defining the types of environments that may have attracted Paleoindians. Then we need to identify the parts of the landscape that formed during and since the last Ice Age, define their stratigraphic sequences, and then prospect in deposits of the correct age for early sites. In other words, to find "old sites" we need to look in "old dirt" in places humans would have been.

Dating Paleoindian Sites

ARCHAEOLOGISTS HAVE USED a variety of methods to determine the ages of Paleoindian sites. These include relative dating based on stratigraphy, degree of soil development, and amount of weathering and varnish on stone artifacts; cross-dating based on the known ages of widespread sediment deposits and associated animal bones; and radiocarbon-dating of associated organic materials—currently the most precise method.

Developed in1949 by University of Chicago scientist Willard F. Libby, radiocarbon-dating is based on the decay of ^{14}C, a radioactive isotope of carbon that is absorbed by all living organisms. This isotope begins to decay at a known rate when an organism dies, and measurement of the remaining amount allows calculation of age.

Radiocarbon ages vary from "real" calendar ages because of fluctuations in ^{14}C in the atmosphere over time. This variance can be corrected by calibration with radiocarbon-dated tree-ring sequences. However, tree-ring sequences currently do not extend back farther than about 11,800 years, and calibration with other methods is still experimental.

All ages mentioned in this issue of *Archaeology Southwest* are in uncalibrated radiocarbon years before present (b.p.). For the radiocarbon age ranges of Paleoindian cultures in the Southwest, see our website <www.cdarc.org>.

New Investigations at Sout

Badger Springs. A recently published description draws attention to a little-known late Paleoindian campsite with a cremation burial in a sandy blowout found in 1970 near Inscription House Trading Post in northeastern Arizona. Lanceolate spearpoints, ground stone milling tools, a skull of an extinct species of bison, and burned animal and human bones were found near three possible hearths. The points share characteristics with Angostura, Agate Basin, and Foothill-Mountain types found in the Great Plains and Rocky Mountains.—*India S. Hesse, SWCA, Inc., William J. Parry, Hunter College CUNY, and Francis E. Smiley, Northern Arizona University*

India S. Hesse

Ventana Cave. An earlier radiocarbon date indicated an age of about 11,300 b.p. for the deepest artifact-bearing stratum in this cave in the Castle Mountains of southwestern Arizona, excavated in 1941-1942. However, the majority of ten new radiocarbon dates on charcoal from this stratum cluster between about 9500 and 8700 b.p. Also, the bones of extinct fauna in this layer appear to be redeposited, and the two projectile points found with them resemble Western Stemmed and Plainview points—Early Archaic and late Paleoindian types. —*Bruce B. Huckell, Maxwell Museum of Anthropology, and C. Vance Haynes Jr., University of Arizona*

Jonathan B. Mabry

El Bajío. New fieldwork has begun in a large basin in Sonora, Mexico, where arroyos have cut through a buried Clovis site over an area of about one and a half square miles. The exposed strata include the distinctive "black mat" found at Clovis sites in southeastern Arizona (see page 3). The site, discovered in 1971, includes a large basalt quarry. It has yielded more than twenty-five Clovis spearpoints and a wide variety of other flaked stone tools, all of them covered with well-developed "desert varnish." Included in the assemblage are large blades and conical blade cores (right), Clovis artifact types that are more common in Texas and the southeastern U.S. The artifact diversity indicates many types of activities in addition to lithic raw material procurement. —*Guadalupe Sanchez, University of Arizona, and John Carpenter, Universidad de las Americas-Puebla*

John Carpenter

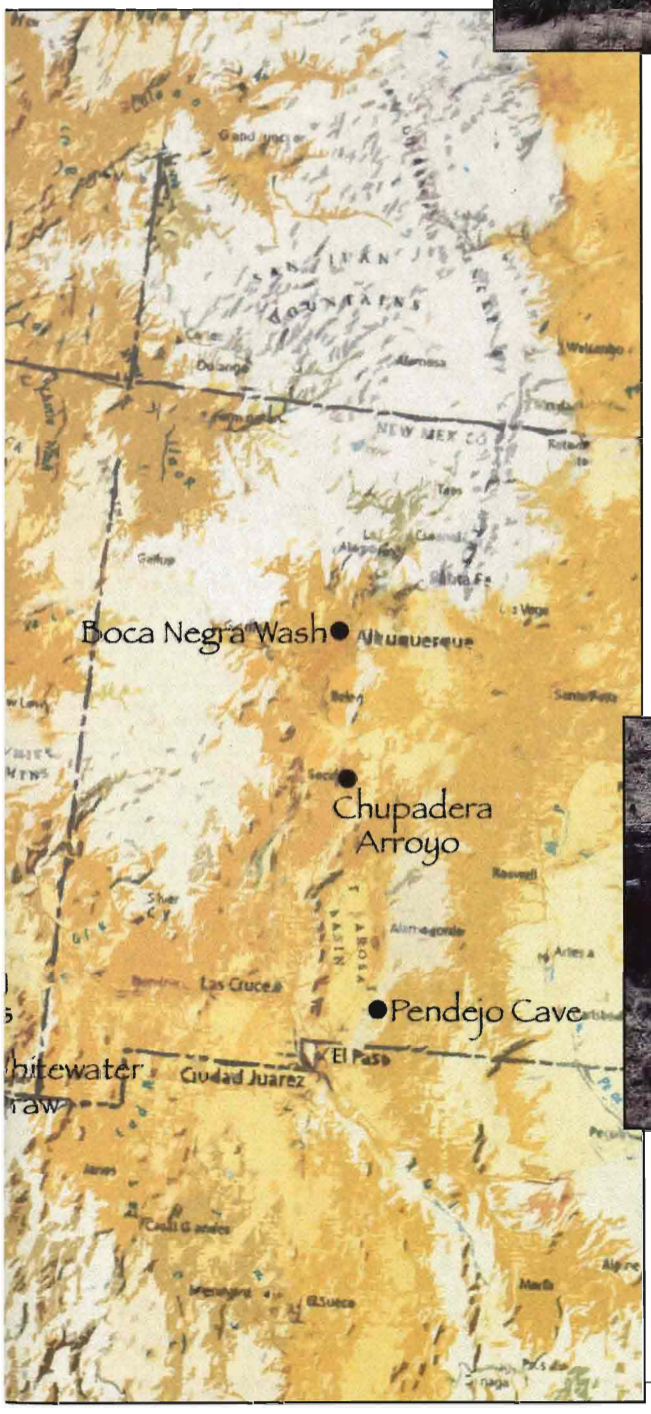
DURING THE LAST DECAD
new dates have changed archa
prehistory in the Southwest. Discove
tions in a cave; the largest Clovis si
Pleistocene rock art (see page 10); the
hunters; and one of the few known
radiocarbon dates significantly revise
Paleoindian occupations in the region
and illustrations of some of these rece
please visit our website at <www.cda

ıwestern Paleoindian Sites

:, new fieldwork, new analyses, and logists' understanding of Paleoindian s include possible pre-Clovis occupa- ; ever found; some rare examples of esternmost campsites of Folsom bison :e Paleoindian cremations. Also, new he age of one of the first discovered These pages contain brief descriptions investigations. For more information, ɔrg>.—Editor

Bruce B. Huckell

Boca Negra Wash. A walk with my dog led to the 1998 discovery of a new Folsom site on the West Mesa near Albuquerque, New Mexico. Surface collections and test excavations at the site, located on a low ridge above a small playa, have documented a diverse artifact assemblage and subsurface cultural deposits. Augering in the nearby playa revealed a lake-bed deposit that may be the same age as the Folsom occupation. *—Bruce B. Huckell, Maxwell Museum of Anthropology*



Chupadera Arroyo. Recent archaeological testing for a road improvement project in central New Mexico identified several new sites in the cluster of Paleoindian and Archaic sites extending three and a half miles along Chupadera Arroyo in the northern Jornada del Muerto Basin. The cluster includes the 35-acre Mockingbird Gap site, a Clovis campsite that has yielded more than 150 Clovis spearpoints and many other kinds of flaked stone tools since its discovery in the late 1960s. The stratigraphy of the area includes wind-deposited sediments thought to indicate an increasingly dry climate during the early Holocene, with the small perennial stream of Clovis time becoming an intermittent wash during subsequent Folsom, Cody, and Early Archaic occupations.*—William Doleman and Janette Elyea, University of New Mexico Office of Contract Archaeology*

Michael R. Waters

Pendejo Cave. Richard S. MacNeish and colleagues have recently announced the discovery of what they believe are pre-Clovis occupations in this cave in southern New Mexico. From strata radiocarbon-dated between 40,000 and 12,200 b.p., they report crude flaked stone tools, bone tools, human fingerprints on pieces of fired clay, and human hair directly dated to 12,400-12,200 b.p. Other archaeologists await the full publication in order to evaluate the claims. *—Jonathan B. Mabry, Desert Archaeology, Inc.*

Skeletal and Genetic Data on the Peopling of the New World

Erik G. Ozolins and Joseph F. Powell, University of New Mexico

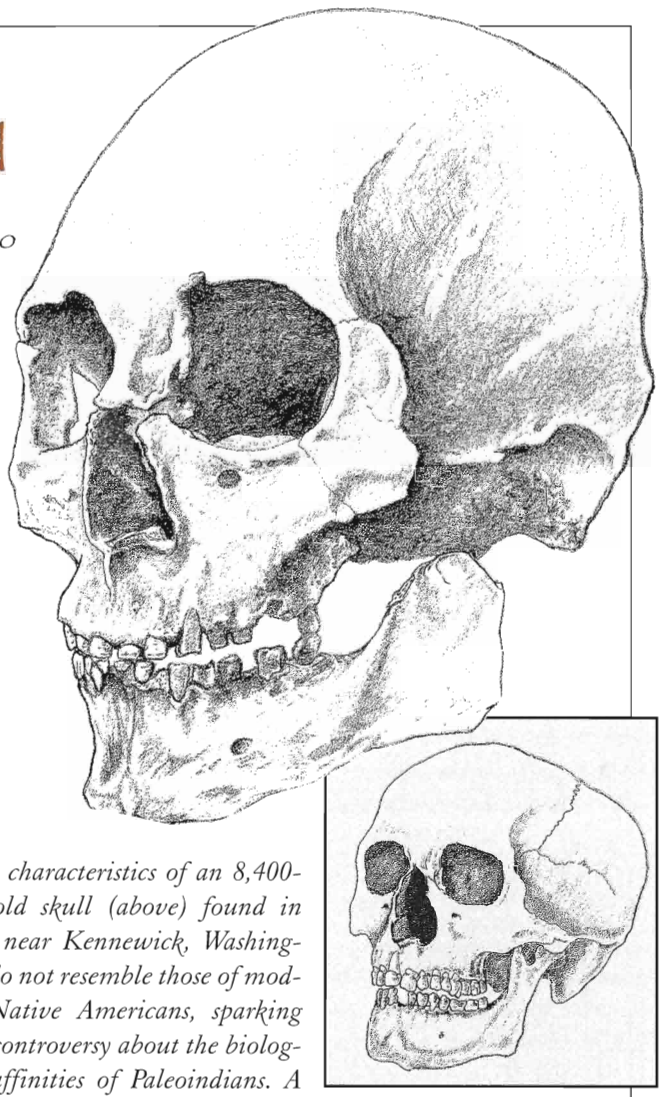
SINCE THE RECENT DISCOVERY of "Kennewick Man," questions about the peopling of the Americas have increased. However, this is only one of several Paleoindian skeletons that have been scientifically examined. In the past decade, numerous studies have added to our understanding of the evolutionary and migratory processes involved in the peopling of the Americas.

New models have come from one of two sources: prehistoric human skeletons or modern genetic variation. Some researchers have concentrated on Paleoindian and Early Archaic physical remains because they provide direct evidence of morphological (and therefore also genetic) relationships of the first Americans. There is some agreement that Paleoindians do not share a similar morphology with modern Native Americans, but instead are more similar to modern Polynesians and Australians.

Certain researchers interpret this as indicating that the initial Paleoindian population was derived from the same ancestral population from which Australians and Polynesians are descended, and that this first group was subsequently replaced by East Asian migrants ancestral to modern Native Americans. Others have shown that the morphological differences can be accounted for by a model of genetic drift if the effective population size of the initial colonists is considered. Statistical analyses on cranial measurements of about 2,000 individuals have led other researchers to propose that three different populations colonized the Americas.

Because the skeletal data can support such diverse interpretations, many researchers have turned to genetic data to estimate the timing and origin of the initial colonists. The majority of this genetic research has focused on mitochondrial DNA (mtDNA), although Y-chromosome data have also been used. One study determined that most living Native Americans belong to one of four mtDNA lineages (called haplogroups) named A, B, C, and D. Another study of the ancient mtDNA in a late prehistoric skeletal population from eastern North America showed that all four haplogroups were present in the New World prehistorically. Analyses of some Early Archaic skeletons from western North America found that the B and C haplogroups have a very ancient presence.

Still other studies have identified a fifth mtDNA haplogroup named X, which possibly represents a minor founding lineage in Native Americans. Unlike haplogroups A-D, haplogroup X is also found in European populations. However, the European X is so dissimilar from the Native American X as to indicate that it is a very ancient haplogroup that diverged before colonization of the New World.



Some characteristics of an 8,400-year-old skull (above) found in 1996 near Kennewick, Washington, do not resemble those of modern Native Americans, sparking new controversy about the biological affinities of Paleoindians. A protohistoric Native American skull from southern Arizona (shaded box, above) is shown for comparison. Illustration by Rob Ciaccio.

Based on haplogroup (and the more precise haplotype) variability, geneticists have variously concluded that there were four migrations from Asia between 21,000 and 14,000 years ago; that a single migration from Siberia occurred between 34,000 and 17,000 years ago; that all Native Americans are descended from one migration from northeast Asia between 37,000 and 23,000 years ago; and that Mongolians are the likeliest ancestors of most Native Americans.

Clearly, no single and comprehensive summary of the peopling of the Americas is possible with current data. Because very few Paleoindian skeletons have been carefully measured, and most of the genetic studies have used modern Native American populations, any future morphological and genetic research conducted on Paleoindian remains is of utmost importance for narrowing the possibilities of who they were, and when they arrived.

Linguistic Models of Early American History

Jane H. Hill, University of Arizona

IT IS ESTIMATED that several hundred languages were spoken in the Americas at the end of the fifteenth century. Linguists group them into as many as 142 "language families" thought to represent historical relationships among their members. There cannot have been 142 separate entries into the Americas, so much of this diversity must have developed in the New World from a few "founder languages."

Work on identifying these founder languages, using standard historical-linguistic methods such as identification of shared word roots and grammar features indicating a common origin from an ancestral "proto-language," has been discouragingly slow. Recently, however, two new models using controversial methods have been proposed: Joseph Greenberg's three-family classification, and Johanna Nichols' quite different four-part system.

Greenberg groups the languages of the Americas into three major units: Amerind, Na-Dene, and Eskimo-Aleut, representing three separate migrations. He believes Amerind is the most widespread, and developed from the language spoken by the Clovis people, who may have arrived in the New World from northern Eurasia about 12,000 years ago. The Na-Dene and Eskimo-Aleut units are thought to represent the second and third colonization events from northeast Asia during the last few thousand years. While the latter two units and their relative ages are mostly accepted by other linguists, the Amerind grouping is widely contested.

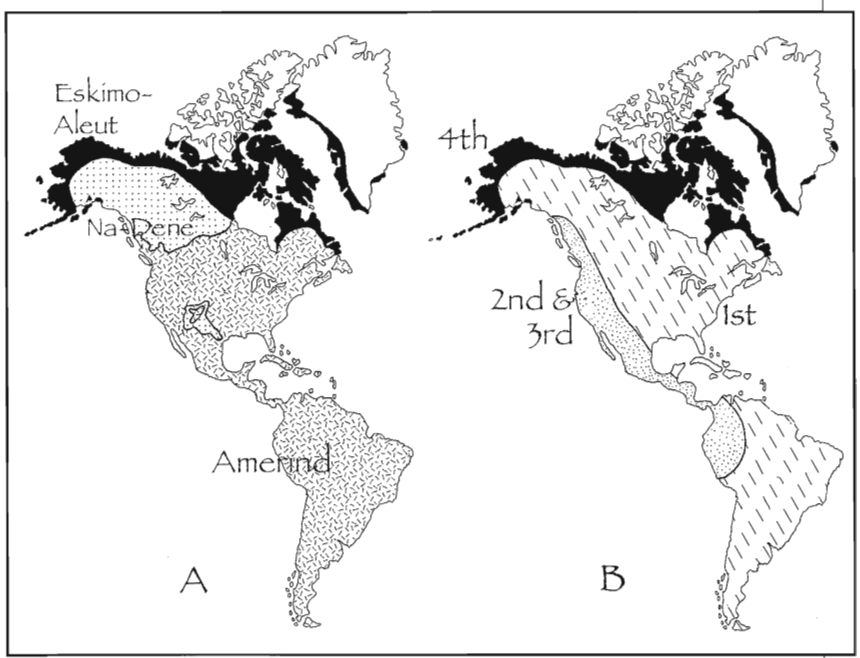
At the heart of the controversy is Greenberg's nontraditional method of "multilateral comparison," in which word lists and morphological elements believed to be resistant to borrowing are assembled for as many languages as possible on a continental or global scale, and then searched for patterns of resemblance in sound and meaning. Greenberg's ideas are intriguing, but are difficult for other linguists to assess because of the lack of systematic sampling and statistical comparisons.

Nichols has proposed an alternative method of identifying larger language groups representing deep historical connections. It uses statistical sampling of the global distributions of linguistic traits that are believed to be relatively enduring, independent, and resistant to spreading by contact. Where these traits cluster in a group of languages, the clustering is thought to represent some ancient historical association—contact or common descent.

Nichols argues that evidence of the first colonization event can be seen among the languages of North America east of the Pacific Coast and most of South America, where there are no clusterings of traits. This, she believes, suggests an age in excess of 20,000 years for the historical events that created this group, which originated in Australasia. The second and third colonizations, also originating from the Pacific Rim of Asia in pre-Clovis time, are represented by languages of the Pacific Coast of North America, Central America, and the Upper Amazon. The traits in these languages cluster into two different groups. The fourth colonization event from northeast Asia is represented by Eskimo-Aleut languages.

Nichols' innovative work has not been fully published, so other linguists cannot yet evaluate it. But her assumption that languages diversify and split at a relatively uniform rate is problematic, as such rates can be altered by major cultural innovations and events—such as the colonization of a virgin continent.

These two very different proposals by respected linguists about the peopling of the Americas are untestable with conventional historical-linguistic methods. They must be evaluated on their own terms, according to their explicit methods and assumptions. Both proposals are flawed, but could be refined with improvements in data, quantitative methods, and assumptions about rates of language change.

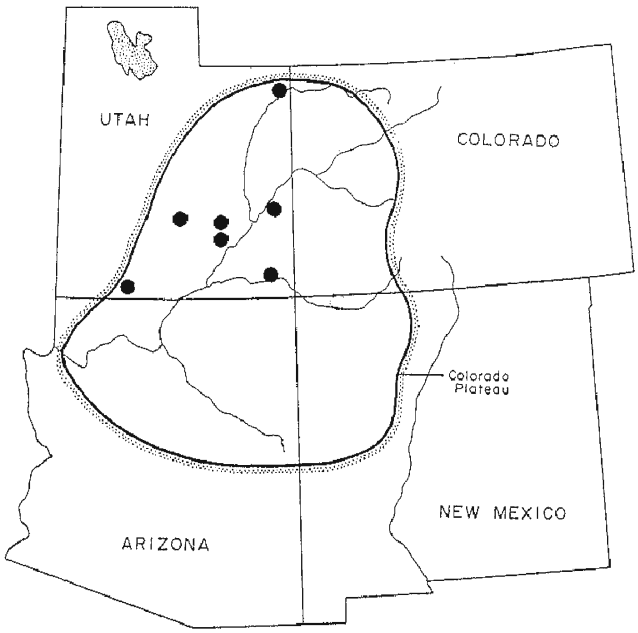


According to Greenberg's model (A), Amerind languages represent the initial colonization of the Americas by the Clovis people about 12,000 years ago. Nichols' model (B) reconstructs an initial colonization before 20,000 years ago, followed by two more pre-Clovis migrations. Illustration by Rob Ciaccio.

Paleoindian Rock Art of the Colorado Plateau

Larry D. Agenbroad, Museum of Northern Arizona

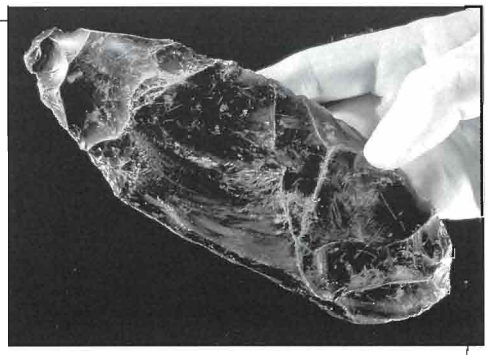
THE "MOAB MASTODON," the first known example of Paleoindian rock art, was first reported in scientific literature in 1935. Only in the last decade have more North American examples—most of them also located on the Colorado Plateau—come to the attention of archaeologists. Known Paleoindian rock art on the plateau includes petroglyphs (pecked images) and pictographs (paintings) of mammoths and possibly bison. It is possible that the pictographs are modern, but the petroglyphs appear to be ancient, based on their weathering and redevelopment of desert varnish. Because mammoths became extinct in North America about 11,000 years ago, these images are at least that old. They may have been made during "hunting magic" rituals to bring luck in the hunt.



The petroglyph of the Moab Mastodon (above right, center) has suffered from both well-meaning people, who "refreshed" it with new pecking, and vandals, who used it for a rifle target. These Ice Age images can be preserved only through education about their importance and irreplaceability. The pictographs of mammoths (above right, top and bottom) resemble Upper Paleolithic rock art found in caves in Europe. The map (above, left) shows the locations of known Paleoindian rock art on the Colorado Plateau. Photographs by Larry D. Agenbroad.

Clovis Tool Technologies

Bruce Bradley, Primitive Technology Enterprises, Inc., Cortez, Colorado



The Clovis technique of "overshot flaking" produced large, flat flakes that were perfect blanks for knives and scrapers, while leaving a well-thinned biface (above) from which to make a lethal spearpoint. Photograph by Peter A. Bostrom.

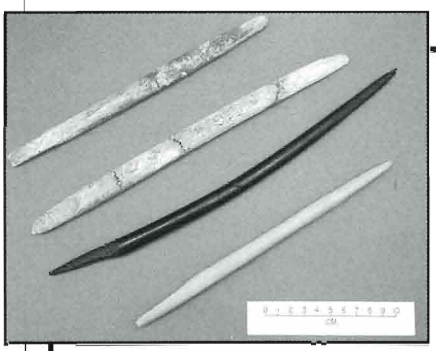
WITHIN THE RELATIVELY SHORT span of half a millennium, at the end of the last Ice Age, Clovis people explored and occupied all of the ice-free areas of North America. The ravages of time have taken from us all but the most durable of Clovis artifacts, specifically their flaked stone tools and a few ivory and bone implements. Based on the complexity of their flaking technology, if organic Clovis artifacts are ever found, we may be truly astonished.

The Clovis flaked stone tool kit is seemingly simple in that there are only a few forms: spearpoints, knives, butchering tools, engravers, and scrapers. Archaeologists have found that most prehistoric human groups modified their tools as they adapted to new environments. Distinctively, Clovis tools were rather standardized, serving their makers in virtually every known environment between the Arctic tundra and the Central American tropics.

Clovis flaked stone technology had two basic components: bifacially flaked tools and unifacially flaked tools. It is the bifacial technology that has captured the attention of most archaeologists. Although there are many ways to make a tool such as a spearpoint or butchering knife, and many later cultures developed different approaches, the Clovis solution was particularly well suited for a group on the move. Large bifacial cores were roughed out where the best quality stone occurred, and then carried; flakes were struck off as needed, and the cores could later be turned into tools.

Experiments by archaeologists have shown that Clovis knappers also used an ingenious flaking method, striking off large flakes that traveled completely across the biface, often removing a portion of the opposite edge. The resulting flakes could be made into knives and scrapers, and the remaining biface could be made into a spearpoint. This "overshot flaking" technique is so distinct that it is often possible to identify a Clovis site even if there are no Clovis points, associated dates, or a geological context.

Although Southwestern sites—such as Lehner and Murray Springs in southeastern Arizona, and Blackwater Draw in eastern New Mexico—have contributed greatly to our knowledge of Clovis culture, the best examples of Clovis flaking technology have come from caches of artifacts in the Plains and the Pacific Northwest. One is the Fenn Cache, which is the subject (and title) of a recently published book I coauthored with George Frison.



C. Vance Haynes Jr.

Clovis tool technology was not limited to flaked stone. Tools made of bone and mammoth ivory have also been found, including flintknapping billets; spear foreshafts (left) and sockets for foreshafts; and a spear shaft straightener or spearthrower from the Murray Springs site in southeastern Arizona (right).

Barney T. Burns

THE CENTER FOR DESERT ARCHAEOLOGY, a private, nonprofit organization, promotes stewardship of archaeological and historical resources in the Greater Southwest through active research, preservation, and public education.

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Back Sight

THE QUEST to document the peopling of the Americas has a deep history. A striking theme in that history is the important role of ranchers, farmers, and interested citizens in the discovery process. The story of Ed Lehner is an exceptional one. In the early 1950s, he visited Emil Haury at the Naco site in the upper San Pedro Valley where Haury and his research team were documenting a direct association between extinct mammals and ancient Clovis artifacts. Lehner said he knew of a nearby ranch where similar material was present. Lehner later bought that ranch and subsequently worked with Haury, Vance Haynes, Larry Agenbroad, Bruce Bradley, Bruce Huckell, and others as they carried out scientific studies at Lehner and other early sites.

Peter L. Kresan

Ed Lehner examines a mammoth tooth from the Clovis site on his ranch in southeastern Arizona.

Rather quickly, Lehner became something of an authority on Clovis culture. Ultimately, he became such a believer in the important story that was to be told that he donated the Lehner archaeological site to the Bureau of Land Management so that it could be made available to the public.

Vance Haynes recently noted that some ranchers are less willing than Lehner was to cooperate, to share finds of other possible early sites. Some ranchers fear that the government might take over the site or restrict ranchers' use of private property. This concern extends to sites of any time period and, while such fears are unfounded, getting the word out to that effect is not an easy process.

Getting the word out is part of why the Center for Desert Archaeology's San Pedro Archaeological Preservation Program focuses so heavily on grass-roots methods. This program received a big boost in January when Patrick Lyons, our new Preservation Archaeologist, started work out in the San Pedro. He's been attending meetings of several Natural Resource Conservation Districts, making presentations at local schools and other organizations, and getting to know many individual land owners. It has been an extremely rewarding and productive process, and has already led to our exploration of several potentially important sites on private lands.

Building long-term relationships can be time consuming and costly. But the ultimate goal is worthy of the effort. Through this preservation and long-term research program, our commitment is to share the story of the human history of the San Pedro River with its current residents and with the outside world. A worthwhile goal, indeed.

William H. Doelle

Clarification/Correction: The Winter 2000 issue on Chaco Canyon unfortunately contained several errors. On page 3: No Hopi clans *originated* in Chaco Canyon. Multiple clan histories recount living in the canyon during a portion of their migrations. In the article entitled "Expanding Cultural Perspectives" on page 15: *There is not an inter-tribal dispute*. Instead, the Hopi tribe, supported by the Pueblo of Zuni and the All Indian Pueblo Council, disputed the National Park Service's determinations of cultural affiliations of human remains and funerary objects in its collections under the Native American Graves Protection and Repatriation Act (NAGPRA). Furthermore, the statement that "several groups claim the canyon" under NAGPRA is incorrect. Claims of cultural affiliation are made with human remains and Native American cultural objects.

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