MAMMOTH TRUMPET

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KNOWING IT IN THE BONE

Bones have always spoken to those who knew the proper way to listen, from the priest making an augury to grandfather predicting a change in the weather. David Glenn Smith, of the Department of Anthropology at the University of California, Davis, has discovered a scientific way to find the messages recorded in ancient bone, though the information he recovers concerns not the future but the past.

From human bone Smith has been able to extract a number of substances—albumin in particular—that are called serum proteins, because they have their origin in the blood serum. A number of times in history or prehistory, the genes which regulate the composition of human serum proteins have experienced mutations that have been passed on through genetically-linked populations. Mutations which have occurred in recent prehistory are potential genetic markers, telltale "fingerprints" that could identify certain language or cultural groups as genetically related, especially when used in conjunction with ethnic-linguistic comparative studies. The major problems have been that such mutations are relatively rare and that serum proteins are extremely difficult to isolate from human bone. More importantly, serum proteins in bone tend to be broken down or leached out of the bone under usual conditions of preservation.

Nevertheless, Smith and his colleagues, including Dr. Frederick W. Lorey (University of Minnesota), have been able to identify or "characterize" serum proteins from bone samples ancient and modern, including albumin from specimens from the 7000 year old Windover site in central Florida. Their method is an adaptation of the process known as electrophoresis, whereby mutations migrate differently from normal proteins within an electrical field. This promises to become an invaluable aid to ethnohistorical studies.

The whole subject is not so esoteric as its genetic and biochemical terminology might suggest. Smith explains: "A protein is just a series of amino acids that performs some function; it is synthesized at the direction of particular (usually invariate) sequences of nucleotide bases in the DNA, which controls how the amino acid subunits are put together. Many proteins found in body tissue are also found in the blood. The blood is the principle transport system to deliver proteins from a source where they're made—for example the liver—to other sites that need to use those proteins for growth and development. So proteins may serve a structural purpose, forming the basic support of certain connective tissues in the body: of bone matrix, and things like that. Proteins may also serve transport functions: they grab hold of something as hemoglobin grabs hold of oxygen and carries it to different organs in the body. Still other proteins act as enzymes: they catalyze or initiate certain chemical reactions through which other proteins are formed."

It is an accepted part of evolutionary theory that random mutations take place occasionally in the genetic material. "We know," Smith continues, "that mutational events occurring in the body as a result of spontaneous changes in DNA result in alteration of the structure of the amino acids, thereby changing the way the amino acids go together to make proteins. This substitution of one amino acid for another sometimes changes the electrical charge on the entire molecule, thereby altering the speed with which that molecule migrates through an electrical field. If an individual caries a mutation, we can identify it by placing the protein within an electrical field, which causes the two different forms, the common and the mutational (one inherited from each parent), to migrate to different positions within a gel matrix."

"Electrophoresis," as the separating process is called, "has been around for over a quarter of a century, and it's really been a boon to genetic studies because it's an unbiased way of searching for genetic

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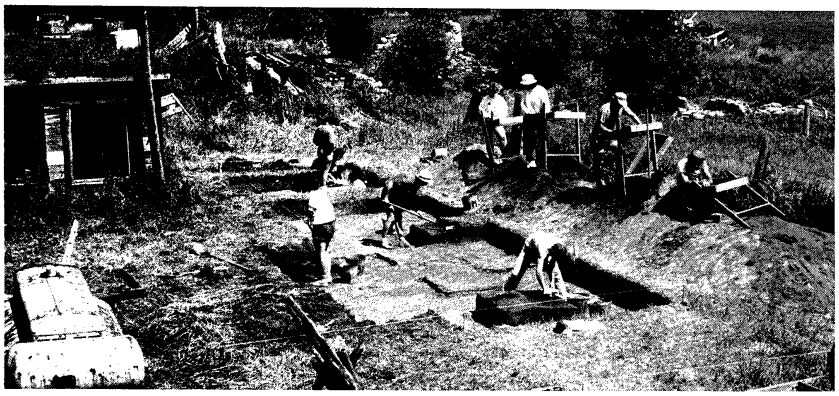
INSIDE . . . .

STRANDED IN THE PAST



(Photo courtesy of Peter Storck, ROM)

Archaeologists excavate the Udora site. The excavation grid, which is located in a stock drive lane and adjacent poultry yard, is centered on an occupation/activity area that was used by Paleoindians.

A team of Ontario archaeologists, excavating a site slated for destruction by a construction project, recently unearthed a rare Paleoindian feature. The find was discovered this past summer during investigations at Udora in the Lake Simcoe area of southern Ontario. The feature contained artifact fragments, flakes, and animal bone. Prior to the Udora discovery, only one site in the entire Great Lakes region, the Holcomb site in Michigan, had produced identifiable animal bone.

Udora was discovered in 1979 during the course of a long-term Royal Ontario Museum project, directed by Dr. Peter Storck, to locate Paleoindian sites by following glacial lake strandlines. A six-week excavation followed in 1980. The 1987 follow-up work, made possible by funding from the Royal Ontario Museum and the Social Sciences and Humanities Research Council of Canada, sought to determine whether undisturbed deposits of the site might exist in and amongst farm buildings and the house in the center of the site. Fortunately, the work resulted in the discovery of the bottom part of an undisturbed feature.

The Udora feature was "about one-half meter in diameter . . . and roughly conical," the concentration of flakes and bone fragments narrowing as the excavators went down into the subsoil. During excavation, the contents, "roughly 2,000 items, some no larger than a sesame seed," were plotted by triangulation to record an image of what the feature originally looked like. Although the feature was not marked by any soil coloring or textural differences (the passage of the last ten or twelve thousand years has obscured any visual evidence), it was clearly "delimited by a concentration of minute chert flakes and calcined (burnt) animal bone."

A number of larger flakes and artifact fragments, including the ears and bases of fluted points, were also contained in the feature. These ears and basal fragments appear identical to those found in Michigan which have been given the name Gainey, a Great Lakes point style typologically similar to Western Clovis.

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CENTER NEWS

THE FIRST AMERICANS EXPEDITION

The Center's First Americans project, sponsored by Earthwatch, the Bureau of Land Management, and the Center for the Study of Early Man, is a study focusing on late Pleistocene humans in southwestern Montana. The project is located in the South Everson Creek and Black Canyon drainage system at the base of the Beaverhead Mountains, approximately 50 miles southwest of Dillon, Montana. People have apparently been attracted to the area since Late Pleistocene times by the occurrence of fine-grained, multi-colored calcedonys that are well-suited to the manufacture of flaked stone tools. Surveys conducted during 1985 and 1986 by Robson Bonnichsen and Mort Turner demonstrate the presence of a rich record of glacial, geomorphological, pedological, palynological, and archaeological information. Collectively, these data suggest the southwestern Montana project has the potential for contributing much to our understanding of hunter-gatherer settlements, subsistence, and lithic procurement patterns.

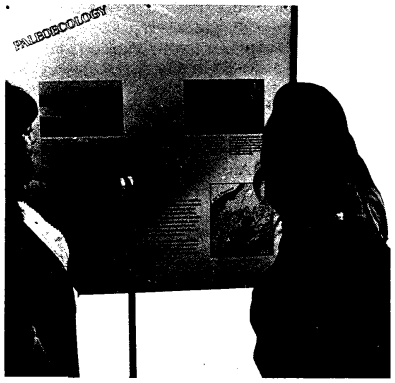
Sixteen terraces occur at the South Everson component of the project. Archaeological excavation and testing conducted during July and August, 1987, focused on the investigation of one workshop site on the bottom terrace (TI), where stone tools were produced and used, and on the testing of two aboriginal chacedony mines. Attention was concentrated at the Mammoth Meadow workshop site following the discovery of a fragment of large mammal bone in a backdirt pile late in 1986. Excavations at this site have resulted in the discovery of a long archaeological sequence containing evidence for projectile points including: Desert Side-Notched, Avonlea, Pelican Lake, Bitter Root, Cody, Intermountain Lanceolate, and Goshen or Plainview points.

Excavation at two mining localities, the Christmas Tree and Four Eagles mines revealed new information on aboriginal mining techniques. Few systematic studies have been conducted of aboriginal mining sites. Stratigraphic trenches through the South Everson Creek mines indicate the mines were excavated to a depth of about 3 meters below the surface. Additionally, the backdirt piles are stratified and suggest that mines were reopened and worked by successive groups who visited the area.

The multidisciplinary research team will return to the area next summer. The archaeological component will focus on the excavation of upper terraces which are producing tools that appear, on typological grounds, to predate the projectile points produced during the last 11,000 years.

—Robson Bonnichsen

ON THE ROAD



Two exhibits from the Center for the Study of Early Man are now on display at the New England Science Center in Worcester, Massachusetts. "Early Peoples in Northern Maine" and "Active Archaeology in Maine: Five Mini-Exhibits" were prepared by the Center as part of our public outreach program, and were funded by grants from the Maine Humanities Council. Both exhibits contain many photos, maps, and drawings, showing the work done to more fully understand and interpret the materials unearthed at archaeological sites throughout Maine.

Both exhibits have travelled throughout Maine to schools, libraries, and museums. We thank the New England Science Center for hosting the exhibits in their debut outside Maine. They will be on display in Worcester through January 8, 1988. For more information, contact the New England Science Center, 222 Harrington Way, Worcester, MA 01604; phone 617/791-9211.

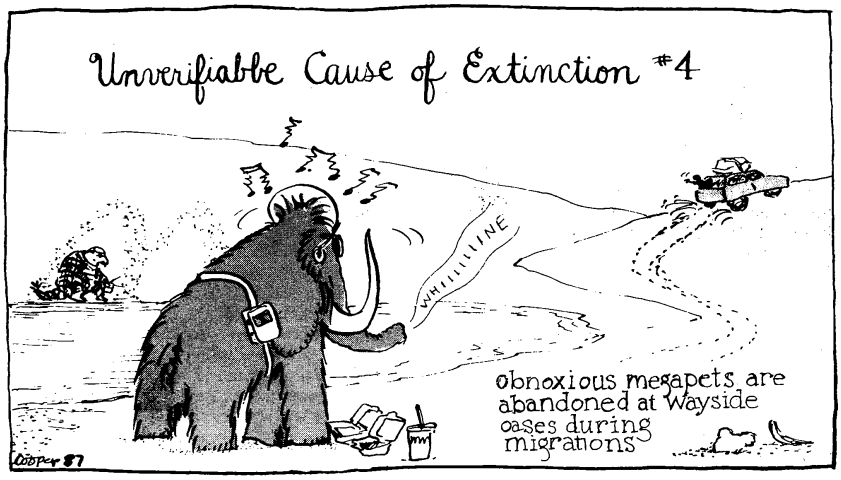
CAN YOU HELP?

Do you have, or know of, a private collection containing fluted points from Louisiana? J.L. (Buddy) Spiller, Jr. of Lake Charles, Louisiana has initiated a program to scientifically record all known fluted points found there. With your help, data can be compiled quickly and accurately.

Information requested on the survey forms includes a description of the physical aspects of the point (i.e., length, width, thickness), where it was found, who found it, and the date of discovery. Mr. Spiller stresses that he does not require the artifact itself, just information about it.

All completed forms will be turned over to the State of Louisiana Division of Archaeology for future scientific research. If you have information on a fluted point (either complete or broken) from the state of Louisiana, please write or call Mr. Spiller at the address below to receive a survey form.

J.L. Spiller, Jr., Route 11, Box 839, Lake Charles, LA 70611, phone 318/855-3190.



SUGGESTED READINGS

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On the First Albertans: Research in the Ice-Free Corridor

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THE FIRST ALBERTANS:

RESEARCH IN THE ICE-FREE CORRIDOR

"It is worth the risk of looking."

Thousands of years ago, humans entered the New World from Beringia and moved south of the North American ice sheets. Although it is generally accepted that this migration occurred, the exact timing and route taken by these early immigrants remain controversial questions among archaeologists.

One model of entry proposes that humans moved south of the ice by way of an ice-free corridor situated between the two major ice masses of North America, the western Cordilleran and the eastern Laurentide. Research suggests that instead of coalescing to form a single ice sheet, these ice masses were separated east of the Canadian Rocky Mountains by an ice-free area stretching some 2,700 kilometers from Alaska to southern Alberta along the eastern flank of the Canadian Rockies. An open seam between the two ice sheets, the corridor would have been a natural channeling mechanism for people moving south from Beringia.

A multi-disciplinary team from the Archaeological Survey of Alberta (ASA) has initiated a long-term survey project designed to trace passage of the first Americans through the ice-free corridor. The survey, which is headed by Dr. John W. Ives, Director, and Dr. Martin Magne, Head of Research, is part of a broader-based project—The First Albertans Research Project, which will focus research efforts on the eastern slopes and foothills of the Rocky Mountains in Alberta.

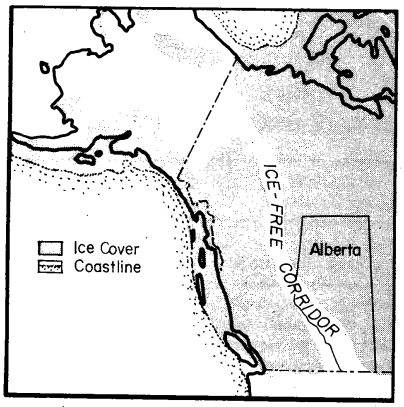
Despite the significance of this area, little systematic archaeological work has previously been attempted, owing largely to problems of accessibility. Most of the Alberta corridor region is located in remote wilderness, consisting of alpine forest or rugged foothills. Also daunting is the scope of the area. Alberta's portion of the corridor is 900 kilometers long and covers more than 150,000 square kilometers. "The scale of the land involved, even though it's a more narrowly defined corridor, is simply enormous," declares Ives. Because of the vast size of the area, helicopter overflights will be used to conduct much of the initial survey work.

Researchers plan to identify landforms in major drainage basins which are similar to those on which known Paleoindian sites are located. Geological deposits 10,000 to 14,000 years old, for example, are a primary criteria. Following the identification of these landforms, the "cream of the crop" will be tested. Two early sites in or near the corridor provide useful analogies—Vermilion Lakes and Sibbald Creek.

Vermilion Lakes, in Banff National Park, is a stratified site investigated by Daryl Fedje of Parks Canada's Calgary office. The site occurs in a special geological setting, an alluvial-type fan, where a stream once deposited its sediment load upon entering the confines of the Bow River Valley. The site appears to be a campsite, containing hearths, a possible shelter, and evidence of mountain sheep butchering in its lowest levels. Charcoal obtained from hearths found in these levels has been dated at 10,400 yrs B.P. Although no fluted points were found, bifaces, scrapers, debitage, and a possible micro-core were recovered.

Sibbald Creek provides another example of a site location type and is believed to be about 10,000 years old based on the type of artifacts recovered there. Also a probable camp, the site occurs on a high terrace which provides an excellent view of the extensive grazing areas below. Artifacts include a short, "stubby" variety of fluted point, which may represent either a different point style or may simply be the result of reuse and resharpening. The site was excavated by Eugene Gryba, working on a cultural resource management project for the ASA.

As Ives explains, "There are at least those two models for the kind of setting we would like to look for in sites. We are trying to pair that with the geological information we can get, and then look systematically in those places and see if we can deliberately discover a site in or near the corridor. Bearing in mind settings like Bluefish Caves in the Yukon, we will also look into cave and rockshelter reports."



Map indicates the supposed location of the ice-free corridor between the Laurentide and Cordilleran ice sheets.

Another method of locating sites in the northern part of the corridor involves the documentation of private artifact collections. Initiated by Magne in the Grand Prairie area, and carried northward by Milt Wright (Boreal Forest Archaeologist), this survey has recorded several Paleoindian artifacts contained in private collections.

With the corridor search only recently begun, Ives emphasizes that no new sites have, as yet, been located. Currently, the team is investigating several promising landscape settings. Rod Vickers, Plains Archaeologist of the ASA, will concentrate on major uplands and ridges in southern Alberta. Other members of the ASA team, Brian Ronaghan (Eastern Slopes Archaeologist) and Alwynne Beaudoin (Paleoenvironmental Research Officer), have extended the search to fans formed by the North Saskatchewan River. One fan, of particular interest, contains three layers of volcanic ash, deposited over stable soil surfaces. Below these buried surfaces are deltaic sands which have produced dateable bone fragments. Further testing of this fan, including backhoe work to reach the buried deposits, is planned for the future.

There is some evidence that deeply buried sites may prove the rule in Alberta. Unlike Wyoming and Montana, where substantial erosion has taken place, a number of Alberta archaeologists suspect that one of the reasons few Paleoindian sites have been discovered in Alberta is because exposure is much rarer. As an example, Ives cites the Fletcher site, a Cody-complex bison kill site which was discovered by accident when a rancher constructed a "dug-out." As Ives describes it, "Someone punched a hole in a suitable location."

Early thinking suggested the corridor was continuously open during the height of the Late Wisconsin glaciation. This accessibility, researchers believed, would have allowed passage of humans into what is now the continental United States at a fairly early date. "The early efforts of describing the corridor," says Ives, "attracted interest from archaeologists because they (geologists) were projecting a corridor that would have been ice free even at the height of the Late Wisconsinan glaciation 18,000 years ago." Recent studies conducted by glacial geologists, however, now indicate the corridor may have been partially closed at times between 14,000 and 25,000 years ago.

Even if the corridor was continuously open during the glacial maximum, there is doubt that early peoples would have been tempted to venture down it. Vegetational reconstructions from lake sediment cores done by Charles Schweger of the University of Alberta suggest that the corridor would have had little or no vegetation during this early period. As Ives points out, "Given that the corridor would have occurred between two substantial ice masses, it would have been an extremely inhospitable, cold environment. There would have been relatively little vegetation, and if that's the case, then there is some question about what kinds of

A resharpened Clovis of Plainview point from Grande Prairie, Alberta; possible evidence for occupation of the ice-free corridor.

game populations could have resided in the corridor. Even were there to be conclusive proof . . . that the corridor was open almost all the time throughout the last Wisconsin glaciation, I question how passable it would have been; particularly given that any individuals who tried to cross through it would not necessarily know that there was something at the other end. The length of it is substantial."

Although welcoming evidence to the contrary, "I would be delighted to hear confirmation that there was something dramatically Pre-Clovis in age," there is a rough consensus at the ASA that the peopling of the New World south of the ice sheets was a fairly recent event, occurring between 12,000 and 14,000 years ago. There is strong evidence that a climatic warming began throughout North America during this time period, which may have led to an expansion of ice-free land and improved environment within the corridor. "From that perspective, we're less concerned that it may have been open 18,000 years ago, at the height of the Wisconsin glaciation. We believe that the actual movement of people who became bearers of Clovis and other early fluted point cultures did take place on the order of 11,800 to 13,500 years ago. But not very much earlier than this."

Once the corridor expanded and/or opened, game populations would have moved into it. This would then have provided impetus for humans to also enter the Corridor area. Overall, the lines of evidence suggest that the humans and animals who entered North America via the corridor may have been small founding populations. "My own particular bias," says Ives, "is that the human biological evidence for native populations in the New World, and even . . . information concerning species such as elk or moose, suggest that the movement into the New World was rapid and accomplished by very small groups of people." Physical anthropologists have reported several forms of sharply circumscribed genetic variability for Amerindian populations. Zoologists who have examined the genetic make-up of elk and moose which appeared in interior North America between 11,000 and 12,000 years ago have also found that variability is reduced over their Euro-Asiatic counterparts. Ives emphasizes, "If the conditions were not that hospitable, you can see a relatively quick passage through the corridor being likely."

An alternative model of New World entry suggests passage took place by way of the Northwest Coast. This hypothesis depicts people as traversing the southern portion of Beringia, crossing the Alaskan panhandle, and moving southward along the coast of British Columbia. Although Ives and others at the ASA are cognizant of this model, Ives believes this is a less likely route than that of the corridor. In addition to requiring an early and sophisticated maritime adaptation, an adaptation for which there is little or no evidence at present, such a route would have been extraordinarily hazardous. As Ives explains, much of the coast of British Columbia is similar to that of Norway—sheer cliffs interrupted by major river valleys. During the Late Wisconsin glaciation, these river valleys were filled with ice, which flowed out onto the

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DECIPHERING DATA FROM DUNG

In southeastern Utah, researchers are looking for sandstone caves that contain a rich but fragile source of knowledge about prehistoric animal life: fossil dung. Headed by Dr. Jim I. Mead, Assistant Professor of Geology and Quaternary Sciences at Northern Arizona University, this research effort is providing new insight into the lifeways of extinct mammals.

Chance plays a large part in the preservation of dung, Mead explained in a recent interview. Dung quickly disintergrates when deposited on open ground and left to the elements, especially moisture. But if dung is deposited in dry caves, like those typical of the arid Southwest, it may be preserved almost indefinitely. Even when in a potentially preserving environment, however, it is a matter of chance whether or not a cave survives over millenia without being flooded or collapsing.

No one knows exactly why mammoth, sloth, bison, mountain goats, and other animals went into the caves, but Mead suggests several possibilities. "Perhaps they went there to escape bad weather. Perhaps females went there to calve." Or, using a modern analogy: "There is one cave well-known in Africa today that elephants will go into. There's a spring there, and they are also scraping the walls of the cave with their tusks to get salts out of the rock. That's one possible reason. . . . But it could also be that once every couple of hundred years an elephant, for any reason, went into a cave. It's chance."

Whatever the animals' reasons were for entering the caves, the result is well preserved deposits of dehydrated dung dating as far back as 40,000 years. Bechan Cave, in the Glen Canyon National Recreation Area of southeastern Utah, for example, contains approximately 300 cubic meters of mammoth dung. At other sites in the Glen Canyon region, the researchers have discovered the dung of shrub ox, mountain goat, and ground sloth, in addition to that of mammoth.

In some caves, Mead and his colleage Dr. Larry Agenbroad, also of Northern Arizona University, have found up to four vertical meters of sand, dung, hair, and plant remains, in alternating layers. "What we're getting is essentially a mummified barnyard," Mead says.

Dung can be analyzed microscopically, biochemically, by the use of radiocarbon dating, and by other mechanical and chemical techniques. Dung analysis yields a surprisingly wide range of information. First, it discloses what kinds of animals lived in the region. Mammoth dung is especially easy to identify, Mead explains. "You don't find many animals that can produce a dung bolus the size of a bowling ball." The mammoth dung can contain twigs 4–5 millimeters in diameter and 70 millimeters in length—"in other words, a pencil." The researchers have found great quantities of dung deposits from other animals as well. "You can make a bestiary, a list of animals, just based on the dung," comments Mead.

By examining dung under a microscope, it is possible to identify seeds and twigs that were not completely digested. These plant remains can disclose a good deal about the animals' diet, and about the types of vegetation that grew in the local area.

One microscopic plant remain found in dung is pollen. An animal may have ingested airborn pollen that happened to land on something the animal was eating, Mead explained, "just like when you eat a hamburger outside; you are ingesting pollen." Fossil pollen can be used to identify the types of plants that once grew in the area. The animal may also have eaten plants that were insect-pollinated. If the plant's flowering season is known, the pollen found in the dung can reveal the season in which the plant was eaten. The analysis might even show that the animal occupied the cave in question only during certain seasons of the year.

Some dung samples pose an enigma for the researchers because they reveal a good deal about an animal whose physical appearance is relatively unknown. As Mead explains, "Not all animals are as well known as, say, the mammoth, the bison, and the ground sloth. Some animals we know were there, but we really don't know what they looked like. For example, the shrub ox, *Euceratherium*."

"What we're getting is a mummified barnyard."

Dr. Agenbroad refers to one mystifying type of dung pellet as "Hershey's kisses," because, he says, "that's exactly what it looks like, a giant Hershey's kiss without the aluminum foil on it." Analysis of these dung pellets reveals that the animal lived on a green, lush, vegetation-rich diet. The pellets are large, resembling those of modern musk oxen, and also those found in the intestines of *Symbos*, a woodland musk oxen which became extinct about 11,000 years ago. Mead's analysis indicates that the "Hershey's kisses" were produced by the shrub ox. The shrub ox, a southern cousin of today's modern musk oxen, also suffered extinction about 11,000 years ago.

Hair is invariably present in dung deposits and samples are currently being studied at Northern Arizona University. Hairs have been found which resemble, but are not, musk ox hair. "They look most similar to the hair of modern musk ox," says Mead, "so maybe we have the hair of the shrub ox." More analyses will be performed.

Photo: Emilee M. Mead

Jim I. Mead displays a well-preserved mammoth dung bolus discovered in a dry cave in southwestern Utah.

Dung can also be dated using radiocarbon techniques. In fact, dung seems to be a particularly good candidate for radiocarbon dating. Mead explains, "Contamination usually follows from water percolation, carrying other organics, whether older or younger, and depositing them into the specimens you are trying to date. If water percolates through dung, it decays. The fact that we have the dung at all means that it hasn't been contaminated."

Chemical assays, another major form of dung analysis, are being done by Dr. Jerold Lowenstein, of the University of California, San Francisco, and Dr. William Rainey, of the University of California, Berkeley. They are working to establish what Mead calls a chemical signature for each type of dung. Many different species produce dung that is superficially similar. For example, ruminants in general produce pellets that appear the same. However, chemical analysis may reveal a different chemical structure, or signature, for dung from different animals. If this is the case, it may eventually be possible to identify the chemical signatures for the dung of musk ox, bison, cow, elk, deer, and sheep. Once established for modern dung samples, chemical signatures might be used to help identify fossil dung deposits of unknown animals.

The microscopic, macroscopic, chemical, and radiocarbon analyses of dung yield data that can help researchers understand many facets of prehistoric life. One intriguing question under study is the sudden, mysterious extinction of many species that occurred around 11,000 years ago. Early dung analysis undertaken by Dr. Paul Martin, of the University of Arizona, suggested that if the most recent dung deposits of an extinct species were located, these deposits could be used to ascertain the time of extinction. For example, dung found in caves might reveal that sloths entered these areas seasonally over a period of 40,000 years. If the dung deposits stop suddenly at about 11,000 years ago it may indicate the time of extinction for this species. Mead concurs, saying, "Chances are, if you go to cave after cave . . . and the last event is 11,000 years ago, something drastic happened then. At least the event is over by 11,000 years ago.

The date of the cutoff point of dung deposits is a current focus of inquiry. Mead recently expanded this research to include another extinct mammal, the mountain goat. When the horn sheaths and dung of extinct mountain goats were radiocarbon dated, the most recent appearance of this animal averaged 11,125 ± 160 yrs B.P. This date, which is statistically the same as the last sloth dung dates, is particularly notable, as mountain goats were presumably far more likely to go into caves than were sloths. Mead and Agenbroad are extending their study to include dung from a wide range of other animals.

In addition to "when," these researchers are also using dung analysis to explore "why" so many of the Pleistocene megafauna became extinct. Although none are conclusive, several explanations have been advanced to account for this extinction; among them: environmental change, disease, and overkill by humans. The excellent dietary record contained in dung has enabled Mead and his associates to tentatively rule out vegetational change as a direct cause of extinction for some of the megamammals in the Southwest.

As Mead explains, if vegetational changes had led to extinction, one would expect to see changes in dung content as taxa switched to different food sources. Early dietary studies conducted by Martin on the fossil dung of Shasta ground sloths revealed that the favorite plants of this animal are still abundant today in the areas where the sloths once lived. Mead reports similar results from his studies of mammoth and mountain goat dung, finding no evidence of change in the animals' diets. As Mead says, "So far, I have found nothing at all in the dung that indicates the animals were under stress."

In addition to dung analysis, Mead devotes a large part of his time to finding new caves that have preserved this unusual prehistoric resource. Before dung analysis can be done most effectively, however, a primary requirement of researchers is a large, comprehensive reference collection. The idea of collecting and studying fossil dung is a relatively new one, pioneered by Dr. Paul Martin in the early 1960s. For this reason, until very recently, only range management departments and wildlife researchers routinely inspected dung and occasionally established dung comparative collections. For the purposes of researchers like Mead and Agenbroad, a much broader collection which includes both modern and fossil samples is necessary. In order to form a basis for conclusive comparisons, Mead observes, "We have to collect everything."

Mead explains, with wry humor, how he sometimes feels as he goes about getting samples for his dung collection: "It's weird to go to the zoo and look at the animals, make your hit list, and then go to the curator and say, 'Hi, I want to collect some poop from your animals.' And so they look at you, smile, write you off, put you in a cart, and you drive around collecting bags of dung, labelling it, and taking it home and drying it." He adds, "You can't take it too seriously, because people think you're super-weird." Mead anticipates at least ten years of work locating and identifying dung samples to build the reference collection needed by researchers. "It keeps us busy," he concludes.

—Nancy Allison

KNOWING IT IN THE BONE

(Continued from page 1)

variation within organic materials. But, unfortunately, conventional electrophoretic methods haven't been able to identify serum proteins in human bone, much less reveal genetic variation in them. People have tried, but they haven't been successful, due to the scarcity of the proteins and the adverse circumstances of preservation. However, more sensitive techniques have now been developed which make it more likely that we can identify smaller amounts of protein."

"What we attempted to do," Smith continues, "was to apply some of these more sensitive techniques to protein extracts of bone, in this case bone from the Windover site that was quite old—7000 to 8000 years—but apparently in a good state of preservation. Although the visible appearance of the bone suggests that the *structural* proteins have been preserved, detectable amounts of the soluble serum proteins inside that bone may have been leached out long ago."

Windover archaeological site is near Titusville, near Clearwater, Florida. It originally lay under Windover Pond, a factor not insignificant for bone preservation purposes. "They had to have water pumps going constantly to get the water level down," Smith recounts. "Underneath was a heavy peat layer. It's

There are some things an anthropologist simply knows by feeling it in his bones.

believed that the very heavy rubbery peat may have excluded salt water that otherwise could have leached the serum proteins out of the bone. Anaerobic conditions are probably very important for the preservation of serum protein, but we don't know much about how rigorous those requirements are. That's one of our chief interests. We're trying to find out how much, and what kinds of, environmental insult these proteins can take." One of the serum proteins Smith and his associates characterized in the Windover bones was albumin, which unfortunately proved to be monomorphic—that is, it had no detectable genetic variability. The electrophoretic patterns were uniformly of a single type, albumin-A, common to all of the world's populations.

"The appealing thing about albumin," Smith adds, "and the reason we're focusing upon it, is that, first, it is the most abundant of the serum proteins and the one most likely to survive in detectable amounts. Secondly, there are several known rare genes for the albumin protein that serve as genetic markers for particular linguistic families of American Indians." Indeed, he explains, "The world's population has pretty much been sampled for albumin polymorphism; and the interesting thing is that, with one possible exception, albumin polymorphisms occur *only* in the North and South American Indians." Two or three have been found uniquely among native North Americans, while two are unique to native South Americans. As Smith points out, the genetic situation in this instance parallels the linguistic one: North and South America also have separate language groups, with a small amount of co-existence in Central America.

The object of this research, which is being conducted in collaboration with Dr. Robert L. Bettinger, an archaeologist, and Dr. Janet Shibamoto, a linguistic anthropologist, both at the University of California, Davis, is to trace these contemporary variations back into prehistory, where they can provide evidence about group relationships and migrations. Although there is presently more speculation than certainty, these hypotheses should prove testable by the analyses of bone samples collected from archaeological sites near proposed migration routes.

Not all American Indian groups, however, exhibit albumin polymorphisms. None, for instance, have yet been found in any of the eastern groups. "Of course, not all of them have been studied," Smith qualifies. "But a number of Muskogean-speaking populations from the Southeast and several of the Iroquoian groups have been studied. In general, even the Siouan groups studied lack polymorphism. It seems as if the variants are limited to north of the U.S.-Canadian border and to the western part of the U.S.—and then they occur only in particular linguistic groups."

Those that *do* show albumin polymorphism fall into two categories, albumin Naskapi or albumin Mexico, depending upon which of two genetic markers they carry. Albumin Naskapi, or Alna, appears in almost all Algonkian-speaking and Athapascan-speaking groups, and provides confirming evidence that the Apache and the Navaho are really southern Athapascans, genetically linked with their northern Athapascan neighbors, "One useful application of the ability to identify polymorphisms," Smith observes, "would be to try to reconstruct the migration route followed by the southern Athapascans, who are presumed to have separated from the northern group about 500-1000 years ago. Their characteristic gene, albumin Naskapi, has been identified in only one other population: a group from southern Turkey called the Eti-Turks. Barry Blumberg (University of Pennsylvania), recently delivered a paper in which he reported that the two groups showed mutations with the same amino acid substitution. The identity of the amino acid substitution is very unlikely to have occurred unless the groups are genetically related. Blumberg's interpretation is that the mutation occurred before the entry of the Athapascans into the New World, in some ancestral group of both the Eti-Turks and the Athapascans.

"The Eti-Turks are one of a number of nomadic groups in the area of the Aral Sea, which may have derived ultimately from the westward flow of Mongoloid populations, such as occurred in the 12th century when Genghis Khan swept out of western Mongolia and eventually reached Constantinople. This interaction brought many of these Mongoloid-Asiatic genes into eastern Europe, and is sometimes speculated to be the way albumin Naskapi might have gotten way over there to the Eti-Turks. But how the albumin variant got to the original eastern homeland of the Turkic-speaking peoples is another question. If it *originated* there, one would suspect that many of those other groups still carry it."

The lack of evidence that this gene is contained in other Turkic-speaking populations suggests to Smith that there is equal evidence for what is virtually an opposite conclusion. "Albumin Naskapi may instead have originated in the New World, perhaps in the late Pleistocene. Thus the presence of this gene in Asia may have resulted from outflow *back* across Beringia (the prehistoric land bridge between Alaska and the U.S.S.R.), arriving in time for the westward Turkic invasions to have occurred out of Mongolia."

"The unfortunate gap, of course," Smith says, "is in all of those populations in south-central Siberia which have been studied for *some* genetic markers by Soviet scientists but which have never been studied for the albumin marker. My persistent efforts to get them to screen these sera for albumin, or to send me portions of these samples, so I can do it, have so far gotten no response, and I've never seen anything published on such research, either. . . . If we eventually find that the Eti-Turks are the *only* ones that carry that gene, then it seems more plausible to me that it originated in the New World and then leaked out by a sort of backflow."

How could albumin Naskapi have gotten back to the Old World? Smith replies: "Some people believe that the Eskimo people originated somewhere between the Mackenzie River and Hudson Bay, then expanded to the coast and moved on up into Alaska, and as a result of that displaced a lot of Athapascan people. This might have caused a northward surge of Athapascans, who could have travelled back into the Old World."

The other albumin variation found in native North American populations is albumin Mexico, or Almex. It actually occurs in two forms, Mexico-1 and Mexico-2. The latter characterizes Uto-Aztecan speakers; the former is sometimes found in southern Athapascans (e.g. Apache). Because southern Athapascans, but never northern Athapascans, may also exhibit albumin Mexico, it was previously assumed they had picked up albumin Mexico from the local Uto-Aztecan people, such as the Pima. Since the discovery that the Uto-Aztecans and southern Athapascans carry two different variants, this is not considered likely now. "Hokan-speaking groups, such as the Yumans, also carry albumin Mexico, but we don't yet know which form. If we find the Hokans have the Mexico-1 form, it seems more likely that the southern Athapascans acquired albumin Mexico by raiding and kidnapping Hokan victims."

The possibility of admixtures complicates the historical map of genetic variations. "The Athapascans and Algonkians share albumin Naskapi; yet linguistically and culturally there is no evidence to suggest that the two are closely related," Smith observes. Many would argue that the sharing of albumin Naskapi by the two are a result of some long-ago admixture, rather than a reflection of a close genetic relationship. Both hypotheses are possible. "We frankly can't tell whether two groups that have the same rare genetic variant share it because they're closely related or because of admixture. Some Siouan groups who lived near Algonkian tribes have a low frequency of Naskapi, and probably acquired it by admixture. Other Siouan groups, such as the Omaha, who lived far from Algonkian territory, lack it altogether. When you see it throughout an entire linguistic group you can guess that it signifies close relationship; when you see that only one or two groups have it, and those the ones that are in closest proximity, then it most likely signifies admixture.

"My hope is that by focusing on proteins with known and very discrete, limited distributions in living populations we can extend our understanding of the distribution and relationships of various ethnic and linguistic groups living today," Smith states. Migration routes are potentially reconstructable even for people quite separated from their original homeland. "The question, for example, has been posed: before the spread of the Numic peoples into the Great Basin, what kind of people inhabited it? That Numic expansion, probably out of southern California, into the entire Great Basin area is relatively recent, and included the ancestors of the Utes, Paiutes, and Shoshone, all Uto-Aztecan-speaking folk who carry the albumin Mexico gene. One would ask, then: were the peoples who used to live in the Basin also Uto-Aztecan? We

The whole subject is not so esoteric as its genetic and biochemical terminology might suggest.

ought to be able to determine that by the presence of albumin Mexico in bone samples, of the appropriate age. If albumin Mexico is uniformly absent in bones that date from the time period before the Numic spread, then we would presume that the folks that predated the Numic peoples were not Uto-Aztecan."

According to evolutionary theory, mutations that persist must have some sort of survival value for the organism. The question therefore arises as to what the survival value of the albumin variations is. Smith has done a fair amount of thinking on that question. "The evolutionary significance must depend on the function of that protein, on what the protein does," he maintains. "Albumin is a pretty versatile protein; it does a lot of things. Two of the most significant are to bind long-chain fatty acids and to bind a toxic by-product of the normal turnover of red blood cells in the body, a substance called bilirubin, which is what produces jaundice in newborns. Albumin-bound bilirubin is quickly removed from the body. If the level of bilirubin is so great that albumin is unable to bind it all, it can be toxic to nerve and brain tissue and cause severe damage." Infants with hemolytic disease, for example, in which excessive red blood cell destruction spills excessive levels of bilirubin into the system, have insufficient levels of albumin to prevent severe brain damage.

(Continued on page 7)

PALEOINDIAN RESEARCH IN CANADA

This summer, field investigations relating to the Paleoindian period took place throughout many areas of Canada. Thanks to the cooperation of numerous Canadian archaeologists who responded to our questionnaire, research activities at Paleoindian sites can be listed as follows:

Yukon: Bluefish Caves site excavation and survey work in the karst region of the Ogilvie Mountains. Principal Investigator: J. Cinq-Mars. Institutional Affiliation: Archaeological Survey of Canada.

Northwest Territories: Brief survey in the area near Nahanni Park to investigate a possible Clovis site. Principal Investigator: Charles Arnold. Institutional Affiliation: Prince of Wales Northern Heritage Centre.

British Columbia: Excavations at the recently discovered Pink Mountain site, 145 km northwest of Fort St. John. The site, which may be 11,500 years old, contained Clovis, Lerma, and Scottsbluff projectile point types. Principal Investigator: Ian Wilson and Roy Carlson. Institutional Affiliation: I.R. Wilson Consultants Ltd. and Simon Fraser University.

Alberta: Excavations at the Fletcher site, a Cody complex bison kill site, in southeastern Alberta. Initial surveys were also conducted in the Eastern Slopes area by two crews, as part of the five-year "First Albertans Project" (see "Ice Free Corridor" on page 3). Principal Investigator: Rod Vickers. Institutional Affiliation: Archaeological Survey of Alberta.

The survey of the ice-free corridor is sponsored by the Archaeological Survey of Alberta, which forms a part of the Historical Resources Division of Alberta Culture and Multiculturism. Through its program of cultural resource management, the ASA is also involved in the preservation of historical buildings, paleontological sites, and natural features. Other major functions of the ASA include a public educational role (grades K through 12, and university), publications production, and assistance with development of interpretive centers.

Saskatchewan: Niska site excavations. Principal Investigators: Henri Librion and David Meyer. Institutional Affiliation: Saskatchewan Research Council.

Ontario: Surface collecting at Collingwood and excavations at the Udora site, Lake Simcoe (see article elsewhere in this issue). Principal Investigator: Peter Storck. Institutional Affiliation: Royal Ontario Museum.

New Brunswick: A small survey in the southeastern part of the province resulted in the discovery of a fluted point. Further surveying was conducted at the Hillsborough mastodon site south of Moncton. Principal Investigator: Allen Turnbull. Institutional Affiliation: Department of Tourism, Recreation, and Heritage.

Prince Edward Island: Investigations at the Jones site, located on the eastern end of the island. Principal Investigator: Dr. David Keenlyside. Institutional Affiliation: National Museum of Civilization.

Although no excavations took place this summer on Nova Scotia, two new fluted point finds have been investigated in recent years. Labrador and Newfoundland were also quiet on the excavation front, in the area of Paleoindian studies. However, a survey of the Labrador coast, extending from the Strait of Belle Isle to Groswater Bay, is proposed for 1988-89.

Other future investigations which may shed light on the period in question include: on-going monitoring and collection of Ice Age mammal remains from the Old Crow Basin and Dawson goldfields of the Yukon; a survey of the St. John River in New Brunswick; surveys on Prince Edward Island; and possible further field work at the Debert Site in Nova Scotia.

Museums in Canada with Paleoindian exhibits and/or displays include: the McBride Museum, Whitehorse, and the Dawson Museum, Dawson, Yukon Territory; Prince of Wales Northern Heritage Centre, Yellowknife, Northwest Territories; the Simon Fraser University Museum of Archaeology, British Columbia; the Provincial Museum, Edmonton, Alberta; the Royal Ontario Museum, Toronto, the National Museum of Civilization, Ottawa, and the Museum of Indian Archaeology, London, Ontario; Basin Head Fisheries Museum, Kingsboro, Prince Edward Island; the Newfoundland Museum, located at St. John's; and the Nova Scotia Museum, in Halifax.

In addition to literature provided by the provincial museums, most of the Canadian provinces produce archaeological information for circulation to the interested public upon request. Jeff Hunston of the Heritage Branch of the Department of Tourism in the Yukon Territory has prepared an extensive bibliography, **Prehistory of Canada: Recommended General Introductory Reading**, which includes numerous Paleoindian references.

The Northwest Territories circulates a traveling archaeology exhibit which is available for community use. British Columbia has produced a traveling display on Rock Art. Also available from British Columbia are archaeological poster displays from Simon Fraser University, and artifact kits (stone and bone tools - mainly more recent periods) from the Heritage Conservation Branch. The Archaeology Branch of New Brunswick's Department of Tourism, Recreation, and Heritage, has a large traveling exhibit on the archaeology of the St. Croix River system. The Department has also provided a film on the 3,000 year history of an Indian village in northeast New Brunswick, entitled **Metepenagiag: A Village Through Time.** In Nova Scotia, the Media Services Branch of the Department of Education has available videotapes on archaeological investigation and Micmac prehistory.

At present, there are amateur archaeological societies in the Yukon Territory, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Newfoundland, and Nova Scotia. In addition to the Canadian Archaeological Association, professional archaeological societies are located in Alberta, Saskatchewan, Manitoba, and Ontario.

Several programs are now in effect throughout Canada which enable avocational and professional archaeologists to work closely together. The Yukon Heritage Branch offers student job placement on field projects, as well as, providing educational lectures to the interested pulbic. The Archaeological Survey of Alberta is currently preparing a comprehensive program to document private collections, and involve amateur archaeologists in field and laboratory work. The Archaeology Branch of the Manitoba History Resources Branch provides the provincial archaeological society with an annual operating grant, and supervises training in field techniques. The Ministry of Citizenship and Culture in Ontario, in cooperation with the Ontario Archaeological Society, is presently initiating a training program for amateurs. New Brunswick has a "Private Collections Registration Programme" to catalogue collections and, thus, preserve knowledge in a permanent fashion. Prince Edward Island is researching the establishment of an avocational "Site Watch" program, to monitor known sites and identify newly discovered ones. Avocational underwater archaeologists in Newfoundland and Nova Scotia work closely with professionals. Newfoundland amateurs also work as field assistants and maintain a site watch program.

A word of thanks is extended to all the professionals who responded to the Center's inquiries. A special note of thanks to Dr. C.S. Churcher of the University of Toronto, who not only suggested this survey of Canada, but contributed to its success by providing contact names.

—Marilyn Roper

GLOSSARY

Albumin - Any of a large class of proteins which are soluble in water and coagulate by heat. They function in osmotic regulation and in transportation.

Beringia - The land bridge that existed between Siberia and Alaska during the Late Pleistocene.

Bilirubin - A yellow bile pigment resulting from the breakdown of hemoglobin. A build up of bilirubin in the blood and urine causes jaundice.

Cody Complex - A group of sites dating 9,500 to 8,300 years ago. Alberta, Scotsbluff, and Eden points occur in Cody Complex sites as do knives of the same name.

Geoarchaeology - Archaeological research using the methods and concepts of the earth sciences. Primary study components include landscape context, stratigraphic context, site formation processes, site modification processes, and landscape modification processes.

Glacial Erratic - A rock of a different kind than the bedrock underlying it, transported to its present location by glacial action.

Nucleotide - A compound consisting of a five-carbon sugar, a phosphate group, and a nitrogenous base. The structural unit of nucleic acids (RNA and DNA).

Nucleotide Base - Either a purine or pyrimidine. These two classes of nucleotide bases form bonds in RNA or DNA holding the double strands together.

Serum - Essentially blood plasma without the materials necessary for clotting.

Serum Albumin - A mixture of albumins which are synthesized in the liver and make up more than half of the total protein in blood.

Serum Proteins - Proteins found in the blood serum.

Structural Proteins - Proteins involved mainly in organization and support.

Wisconsin Glaciation - The last Pleistocene glacial stage, which occurred approximately 70,000 to 10,000 years ago.

NEW REFERENCES AND RESOURCES

ARTICLES

Agogino, George and Anthony Bodurian 1987 Review of **The Colby Mammoth Site,** by Frison and Todd. **Plains Anthropologist.** 32:105.

Aigner, Jean S. 1987 New Information on China's Remote Past, review of **Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China,** by Wu Rukang and John W. Olsen. **Reviews in Anthropology.** 14:19-28.

Boldurian, Anthony, et al. 1987 Folsom Biface Manufacture, Retooling, and Site Function at the Mitchell Locality of Blackwater Draw. **Plains Anthropologist.** 32:299-312.

Custer, Jay F. 1987 Review of **A Palaeo-Indian Site in Central Nova Scotia,** by George F. MacDonald. **North American Archaeologist.** 8:263.

Gruhn, Ruth and Christy G. Turner II 1987 On the Settlement of the Americas: South American Evidence for an Expanded Time Frame. **Current Anthropology.** 28:363-364.

Haynes, Gary 1987 Review of **The Colby Mammoth Site: Taphonomy and Archeology of a Clovis Kill in Northern Wyoming,** by George C. Frison and Lawrence C. Todd. **North American Archaeologist.** 8:282-284.

Kelly, Robert L. 1987 A Comment on the Pre-Clovis Deposits at Meadowcroft Rockshelter. **Quaternary Research.** 27:332-334.

Kimbel, William 1987 Review of **Human Origins: The Fossil Record,** by Clark Spencer Larsen and Robert H. Matter. **American Anthropologist.** 89:212-213.

Meltzer, David J. 1987 Review of **New Evidence for Pleistocene Peopling of the Americas,** edited by Alan Bryan. **American Antiquity.** 52:655.

Ruppe, Reynold 1987 Review of **Quaternary Coastlines and Maritime Archaeology: Towards the Prehistory of Land Bridges and Continental Shelves,** edited by P.M. Masters and N.C. Flemming. **American Antiquity.** 52:429-430.

Tankersley, Kenneth B., Cheryl Ann Munson, and Donald Smith 1987 Recognition of Bituminous Coal Contaminants in Radiocarbon Samples. **American Antiquity.** 52:318-329.

Turner II, Christy G. 1987 Late Pleistocene and Holocene Population History of East Asia Based on Dental Variation. **American Journal of Physical Anthropology.** 73:305-322.

Vehik, Rain 1987 Review of **The Knife River Flint Quarries: Excavation at Site 32DU508,** by Ahler. **Plains Anthropologist.** 32:329-330.

Young, Diane, Suzanne Patrick, and D. Gentry Steele 1987 An Analysis of the Paleoindian Double Burial from Horn Shelter No. 2, in Central Texas. **Plains Anthropologist.** 32:275-298.

BOOKS

Callahan, Errett 1987 **Primitive Technology: Practical Guidelines for Making Stone Tools, Pottery, Basketry, etc. the Aboriginal Way.** Piltdown Productions, Lynchburg, Virginia.

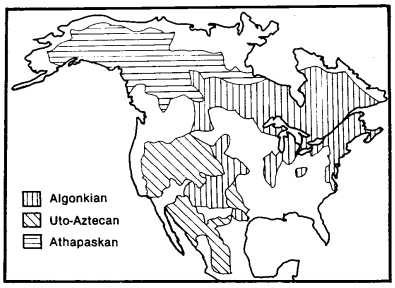
Helgason, Gail 1987 **The First Albertans: An Archaeological Search.** Lone Pine Publishing, Edmonton, Alberta.

MISCELLANEOUS

Storck, Peter 1987 Imperialists Without a State: The Cultural Dynamics of Early Paleo-Indian Colonization as Seen from the Great Lakes Region. **Paper being prepared for the XII International Congress of INQUA.**

Washington Archaeological Research Center 5,000+ site records and 3,000+ entry Archaeological/Ethnographic bibliography on computer, accessable via phone modem hookup. Washington State University Computing Center, Pullman, WA 99164-1220.

KNOWING IT IN THE BONE



Map indicates the locations of language groups associated with genetic mutations in albumin type. Plotting the known occurrences of such mutations may allow researchers to plot the migration of groups carrying these genetic markers.

(Continued from page 5)

"But there are a number of substances that can compete with bilirubin for binding with albumin. These substances bind to albumin at or near the bilirubin-binding site, and thereby interfere with bilirubin binding. So we're operating under the assumption that the evolutionary significance of the albumin polymorphism in the New World might have to do with the mutation of a different form of albumin that enabled bilirubin to compete in the presence of these other binding substances.

Albumin also binds with fatty acids. Smith notes that "the albumin variants in the American Southwest coincide with populations that are notoriously high in diabetes. Certain people have intimated that there might be some connection between the high risk of diabetes in, say, Pima, Papago, and River Yuman groups and a high incidence of the albumin Mexico

"My hope is that we can extend our understanding of the distribution and relationships of various ethnic and linguistic groups living today."

polymorphism. But so far as I know, no one has followed through to see whether those people who get diabetes tend to be less frequently one genotype or the other."

Bone serum protein studies are not performed very extensively as yet. In addition to the fact that the improved electrophoretic techniques have only recently been perfected, there is the problem of obtaining samples. Smith and his associates have put out a call for suitable skeletal material. However, the nature of their work forces potential donations to fit three requirements: (1) the bone must be frozen soon after it is recovered, and shipped without unfreezing; (2) precisely because the variations are so rare, samples should be taken from more than one individual if there is to be much probability of discovering polymorphisms; (3) the bone must be expendable, because the samples (50–100 grams) are destroyed by the analytic process. Smith hopes that as analysis of serum proteins extracted from human bone become more established, freezing bone samples will become routine in all excavations, even when analysis is not scheduled for the immediate future. Anaerobic conditions and unvarying temperature are preferable but, may not be absolutely necessary, given the new, more sensitive electrophoretic techniques.

Meanwhile, he pursues his work on serum proteins, confident that their importance as a means of filling in gaps in the ethnohistorical record will continue to increase. There are some things an anthropologist simply knows by feeling it in his bones.

—Michael Dolzani

CONFERENCES

UPCOMING CONFERENCES

January 15–16, 1988 SOUTHWEST SYMPOSIUM, Arizona State University, Tempe AZ.
Contact: Paul Minnis, Amerind Fdn., P.O. Box 248, Dragoon, AZ 85609; 602/586-3666, or Charles Redman, Dept. of Anth., Arizona State University, Tempe, AZ 85287; 602/965-6213.

March 17–20, 1988 NORTHEAST ANTHROPOLOGICAL ASSOCIATION, Annual Meeting, Turf Inn Hotel, Albany, NY.
Contact: Dean Snow, Dept. of Anthropology, SUNY at Albany, NY 12222.

March 17–23, 1988 11th ANNUAL CONFERENCE OF THE SOCIETY OF ETHNOBIOLOGY, Mexico City, Mexico.
Contact: Robert Bye, Jardin Botanico, U.N.A.M., Apdo. Post. 70-614, 04510 Mexico, DF, Mexico or Jan Timbrook, Santa Barbara Museum of Natural History, 2599 Puesta del Sol Road, Santa Barbara, CA 93105.

March 24–26, 1988 AMERICAN ASSOCIATION OF PHYSICAL ANTHROPOLOGISTS, 57th Annual Meeting, Hyatt Regency Hotel, Crown Center, Kansas City, MO.
Contact: B.J. Williams, Prog. Chair, AAPA, Dept. of Anthropology, Los Angeles, CA 90024; 213/825-3366.

March 24–27, 1988 CENTRAL STATES ANTHROPOLOGICAL SOCIETY and AMERICAN ETHNOLOGICAL SOCIETY MEETING, Day's Inn, 333 Washington Avenue, St. Louis, MO.
Contact: Alice Kehoe, Dept. of Soc. and Cult. Scis., Marquette University, Milwaukee, WI 53233.

March 25–27, 1988 MIDDLE ATLANTIC ARCHAEOLOGICAL CONFERENCE, Annual Meeting, Henlopen Hotel, Rehoboth Beach, DE.
Contact: Laurie Steponaitis, Prog. Chair, Dept. of Anth., SUNY-Binghamton, Binghampton, NY 13901.

April 27–May 1, 1988 SOCIETY FOR AMERICAN ARCHAEOLOGY, 53rd Annual Meeting, Adams Hilton, Phoeniz, AZ.
Contact: Sylvia Gaines, Prog. Chair, Arizona State University, Tempe, AZ 85287.

May 20–22, 1988 SOCIETY FOR CULTURAL ANTHROPOLOGY, Capital Hilton Hotel, Washington, DC.
Contact: Jane Atkinson, 7110 SW 55th, Portland, OR 97219.

May 22–25, 1988 GEOLOGICAL ASSOCIATION OF CANADA - MINERALOGICAL ASSOCIATION OF CANADA - CANADIAN SOCIETY OF PETROLEUM GEOLOGISTS, Joint Annual Meeting, St. John's, Newfoundland.
Contact: John Fleming, Newfoundland Dept. of Mines and Energy, P.O. Box 4750, St. John's, Newfoundland, Canada A1C 5T7: 709/576-2768.

May 29–June 3, 1988 WORLD CONFERENCE ON WATER RESOURCES, Ottawa, Canada.
Contact: Secretariat, 6th World Conference on Water Resources, Univ. of Ottawa, 648 King Edward Avenue, Ottawa, Ontario, Canada K1N 6N5.

July 4–8, 1988 46TH INTERNATIONAL CONGRESS OF AMERICANISTS, Amsterdam, Holland.

July 24–31, 1988 12TH INTERNATIONAL CONGRESS OF ANTHROPOLOGICAL AND ENTHNOLOGICAL SCIENCES, Zagreb, Yugoslavia.
Contact: Linda Bennett, Amer. Prog. Coord., Dept. of Anth., Memphis State Univ., Memphis, TN 38152.

August 2–5, 1988 5TH INTERNATIONAL CONFERENCE ON PERMAFROST, Tronheim, Norway.
Contact: VICOP, Norwegian Road Research Laboratory, P.O. Box 6390 Etterstad, N-0604 Oslo 6, Norway.

September 1988 ARCHAEOLOGICAL WOOD SYMPOSIUM, Los Angeles, CA.
Contact: Dr. Roger M. Rowell, USDA, Forest Products Laboratory, 1 Gifford Pinchot Dr., Madison, WI 53705.

September 23–25, 1988 19TH ANNUAL BINGHAMTON GEOMORPHOLOGY SYMPOSIUM, Brock University, Canada.
Contact: K.J. Tinkler, Brock University, St. Catharines, Ontario, Canada L2S 3A1: 416/688-5550, Ext. 3486.

October 31–November 3, 1988 GEOLOGICAL SOCIETY OF AMERICA, Annual Meeting, Denver, CO.
Contact: Jean Kinney, GSA Headquarters, Box 9140, 3300 Penrose Place, Boulder, CO 80301: 303/447-2020.

Ice Age Origins

A conference entitled **Americans Before Columbus: Ice Age Origins** was held September 26, 1987 at the Smithsonian Institution in Washington, D.C. in honor of T. Dale Stewart. The one-day symposium focused on some of the issues and controversies surrounding the early human occupation of the Americas.

Approximately 300 people registered for the symposium, which was free of charge and open to all interested individuals. In order to foster a better lay understanding of the issues, discussions were non-technical in nature. Several distinguished scholars presented the results of their research on Pre-Clovis and Clovis Peoples, late Ice Age environments, and megafaunal extinctions.

The symposium gave a good general overview, providing non-professionals with the opportunity to understand some of the underlying theories and controversies concerning the initial peopling of the Americas.

Symposium topics and speakers included:

Primeval America: Late Ice Age Landscape Dr. Stephen Porter (University of Washington) and Dr. Jared Diamond (University of California, Los Angeles)

Pre-Clovis People: Early Discoveries of America? Dr. Richard Morlan (National Museums of Canada) and Dr. James Adovasio (University of Pittsburgh)

Clovis People: Late Ice Age Americans Dr. C. Vance Haynes (University of Arizona) and Dr. Larry Agenbroad (Northern Arizona University)

Extinctions: What Happened to the Mammoth? Dr. Paul Martin (University of Arizona) and Dr. Ernest Lundelius (University of Texas)

Readaptation: Life without Mammoths Dr. Dennis Stanford (Smithsonian Institution) and Dr. George Frison (University of Wyoming)

Americans Before Columbus: Perspectives on the Archaeology of the First Americans Dr. Donald Grayson (University of Washington)

A special workshop for teachers organized by Scott Silsby of the Gulf Branch Nature Center in Arlington, Virginia was held the following day. For more information and a reading list developed for the Conference, send your request and a self addressed, stamped envelope to: Ice Age Origins, Quincentenary Program, 1100 Jefferson Drive S.W., IC-3123, Washington, DC 20560.

MAMMOTH BRIEFS

A family of woolly mammoths has recently moved into downtown Ottawa as part of a display produced by the **National Museum of Canada.** The three life-like, life-size denizens of the Ice Age made their first public appearance at the opening of the XII International Congress of the International Union for Quaternary Research (INQUA).

The mammoths began as 1/12 scale plasticine models built by artist/modeller **Doug Watson,** in consultation with **Dr. C.R. Harrington,** Chief of the Museum's Paleobiology Division. The models were based on detailed measurements and examinations of actual mammoth skeletons and well-preserved mammoth carcasses excavated in Siberia. The models then went to a team headed by Ron Seguin, who undertook the "mammoth" task of constructing life-size replicas from colored, durable fiberglass.

The mammoths—a male, female, and baby—are depicted in life-like poses, providing viewers with a realistic idea of how these magnificent creatures may once have behaved. The adult male is in an alert posture with trunk held high, perhaps in response to a nearby predator. The female, her attention momentarily distracted, turns to watch the approaching male, while her baby, freed from parental supervision, seems about to wander off. Undoubtedly, Ottawa's new and unusual family will delight visitors and residents alike for years to come.

ICE-FREE CORRIDOR

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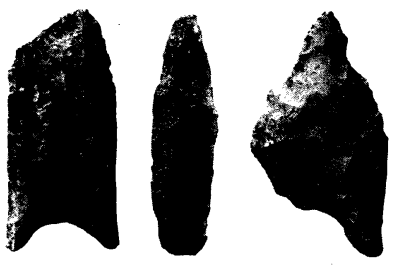
continental shelf. On this shelf, the glacier's terminus (end) would have been continuously breaking off and forming icebergs, adding to the already substantial difficulties of passage. "To manoeuver yourself down the coast like that," says Ives, "would be difficult. There are few landfalls, and with glaciers coming out and calving, this would have been an extremely dangerous environment.

Depending on the success of the researchers in locating sites, the Alberta corridor project will run from three to five years. The systematic, selective approach used in the survey is such that it can be run without substantial cost. In addition to Paleoindian sites, the team of archaeologists and environmental scientists expect to discover later prehistoric and historic fur-trade sites during the course of the survey. Even in the event that few early sites are found, Ives is confident that several significant sites of these other types will be located.

In addition to conducting systematic research in the corridor, this pioneering survey project plays an additional role in providing a framework for later work. "We are trying to do two separate levels of research at the same time," stresses Ives, "which makes it difficult and also very important." The scope of the work and the size of the area to be covered is extremely challenging. "Given the size of the corridor, we're relying on having some good fortune to actually discover sites in this very early period."

Only time will tell the extent of the survey's success. However, as Ives points out, "There is tremendous international interest in what significance the corridor may have; there is tremendous curiousity. It is worth the risk of looking."

—Bill Belcher



Some of the artifacts recovered from the Udora site include (left to right): fluted point; complete beaked scraper; beaked scraper tip; notched and spurred end scraper; drill made from a fluted point base. Artifacts are shown actual size. (*Photo courtesy of Bill Robertson, ROM*)

STRANDED IN THE PAST

(Continued from page 1)

Despite the absence of fire-cracked rocks in the feature, many of the chert artifacts and flakes have obviously been subjected to heat, exhibiting a glossy appearance and "potlidding" (flake scars produced by spalls popped off during heating).

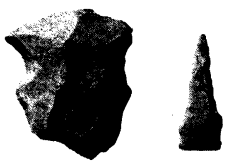
Because analysis of the calcined bone has only recently begun, the exact taxa of the feature bone is not yet known. Storck conjectures the bone is probably "fragments of a medium-sized animal, such as a deer." The small size and calcined appearance of these fragments, considered in conjunction with the "heat treated" artifacts, suggests to Storck that the early site occupants may have been involved in the manufacture of bone grease. In this process, bone is broken up into small pieces, put into water, and boiled to remove the animal fat. The resulting grease is then scooped off and used in making food. The bone fragments which remain are similar to those recovered from the Udora feature.

Although no radiocarbon dates have yet been obtained from the feature material, Storck is hopeful the calcined bone has retained enough organics to allow for a Carbon 14 date. "There are no radiocarbon dates for early Paleoindian sites in the Great Lakes region," Storck observes. "The nearest date, to my knowledge, in a straight-line distance, is from the Shawnee-Minisink site in New Jersey," approximately 550 kilometers away.

In addition to the feature, the recently excavated area at Udora yielded two artifact concentrations, each 4 to 5 meters in diameter and separated by a relatively sterile area of 2 to 3 meters. The two concentrations produced a similiar assemblage of tools, including a sample of about a dozen fragments of fluted points. These fragments, Storck notes, appear to have been broken during use and returned to the site for discard. In the northernmost concentration, excavators also unearthed a very large glacial erratic which "may have been a piece of site furniture, such as a seat or windbreak." In total, the 1987 Udora investigations produced several hundred formal artifacts, including beaked scrapers or slotting tools (unifacially worked, extremely narrow scrapers), side scrapers, and flake gravers.

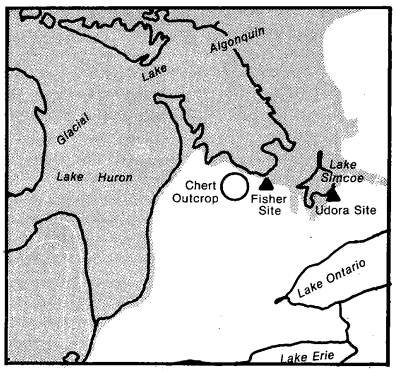
Particularly noteworthy is the high proportion of end scrapers recovered from the site. Over eighty end scrapers, many of them spurred and notched, as is typical of the Paleoindian period, were collected during the excavations. In contrast, the Fisher site, a Paleoindian site northwest of Udora which Storck also discovered and excavated, produced 30,000 artifacts, but less than a dozen end scrapers. Storck suggests that the unusually high end scraper tally at Udora may be indicative of a specialized skin-working area, perhaps used exclusively by women. No evidence of fluted point manufacture appeared in this area, indicating—as evidenced at the Fisher site and elsewhere in Ontario—"that different activities were likely conducted in different parts of a site during a single occupation."

Findings from the 1987 Udora excavations form the latest addition to a long-term research program initiated during the late 1960s and early 1970s by Storck and several of his colleagues. At that time, Dr. William Roosa, and D. Brian Deller and Chris Ellis, then students, at the University of Waterloo, entered into a cooperative research effort geared to locating and excavating Paleoindian sites situated on glacial lake strandlines. Strandlines are ancient beaches or shorelines, "either depositional or erosional" formed along glacial lakes during periods of high water levels. Within the Great Lakes region, they have found a consistent pattern of Paleoindian sites occurring on such strandlines.



Prior to this project, only one Paleo site and about 50 isolated fluted points had been reported from Ontario. Storck, who joined the search in the early 1970s states that, since then, the four researchers and several other more recently involved colleagues have been "independently, but collaboratively" exploring Ontario's recently discovered Paleo prehistory. Presently, these investigators have discovered "several dozen sites, half a dozen of which are quite significant for Paleoindian studies in the Great Lakes region, and in North America generally."

Many of these sites are associated with a specific glacial lake strandline, Glacial Lake Algonquin, which occupied the Huron and Georgian Bay basins, bordering southcentral and southwestern Ontario. Strandlines, Storck suggests, may have been instrumental in influencing and channeling the movement of game animals, as well as providing ease of travel and well-



Map of Ontario, Canada locates the Udora site.

drained campsites for early human inhabitants. Since the mid-1970s, much of Storck's fieldwork has centered on the Lake Algonquin strandline, using geoarchaeology to focus the search for Paleoindian sites.

In recent years, Storck has employed a second type of geoarchaeological focus as well, the location of chert sources. Tools made of a distinctive white stone, known as Fossil Hill Formation chert, are particularly prevalent at many of the Ontario Paleoindian strandline sites. A search for its source conducted by Storck and Dr. Peter von Bitter, an invertebrate paleontologist at the Royal Ontario Museum, eventually led them to the Georgian Bay region, some 175 to 200 kilometers distance from many of the sites containing artifacts made of this material.

Tracing the limestone outcroppings in which the chert was formed, Storck located a large "factory site," devoted to chert acquisition and the manufacture of rough bifaces. Following the initial shaping of such blanks, the material was then apparently transported to more general-purpose occupation sites, where finished tool manufacture took place.

Although the distances involved in moving this chert are impressive, Storck observes they are consistent with ranges shown elsewhere in North America. "These people or peoples apparently carried stone great distances." However typical the Ontario pattern of chert movement may be, the question of why this long-distance transport so frequently occurred remains. Despite the presence of closer chert sources of equal quality, Ontario Paleoindian peoples exhibit a marked preference for the Fossil Hill Formation chert. Dr. Chris Ellis has suggested the use of this chert may have been a "marker" or symbolic indicator of social cohesion. As Storck puts it, the use of this particular chert may carry the message "We are here; this is the stone we are using."

As Storck and his associates continue their investigations into Ontario prehistory, we are provided with ever-increasing glimpses of what life was like in the Great Lakes region 10,000 years ago. The farm area recently excavated at Udora was soon after destroyed for a machinery parking lot. Before returning elsewhere to continue his search for Ontario's first occupants, Storck thankfully noted, "In the last 12,000 years, we made it by about a month."

—Mark Petersen