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 a prophet speaking 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 gleans 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, these proteins were used as a means of communication. For example, the composition of human serum proteins have an array of mutations that have been passed on through genetically-linked populations. Mutations which have occurred in recent prehistory are potent genetic markers, telltale “fingerprints” that could identify certain language or cultural groups as genetically related, especially when used in conjunction with ethnolinguistic comparative studies. The major problems have been that such mutations are relative 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 2000 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 promise to become an invaluable aid to ethnobiological and linguistic 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 forms some function; it is synthesized at the direction of particular (usually invariable) 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 cer-

tain 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 carries a mutation, we can identify it by placing the protein within an electrical field, which causes the two different forms, the common and the mutant (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 variation.”

(Continued on page 5)

STRAINED IN THE PAST

A team of Ontario archaeologists, excavating a site slated for destruction by a construction project, recently unearthed a rare Paleindian feature. The find was discovered this past summer during investigations at Udora in the Lake Simcoe area of southern Ontario. The feature contained artifacts, 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 Paleindian 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 houses 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 subsite. 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.

(Continued on page 8)
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 focused on late Pleistocene humans in southwestern Montana. The project is located in the South Eveson 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 calcite sources that are well-suited to the manufacture of flake 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 Eveson 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 (T1), where stone tools were produced and used, and on the testing of two aboriginal charcoal mines. Attention was concentrated at the Mammotw Meadow workshop site following the discovery of a fragment of large mammal bone in a back-dirt 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 Eveson 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.

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SUGGESTED READINGS

On Deciphering Data from Dung
On the First Albertans: The Ice-Free Corridor

On Stranded in the Past

On Knowing It in the Bone

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**SUGGESTED READINGS**

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**CAN YOU HELP?**

To 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.
THE FIRST ALBERTANS:

RESEARCH IN THE ICE-FREE CORRIDOR

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 being led 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, the corridor provides 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 east sites investigated by David Fedje of Parks Canada's Calgary office. The sites occur in a similar geological setting, an alluvial-type fan, where a stream once deposited its sediment load upon the confines of the Bow River Valley. The site appears to be a campsite, containing hearths, a possible shelter, and evidence of musk ox butchering in its lowest level. Charcoal obtained from hearths found in these levels has been dated at 10,400 years B.P. Although no fluted points were found, bifaces, scrapers, and a possible micro-core were recovered.

This discovery provides another example of a site location and type 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 people or may simply be the result of reuse and rehashing. The site was excavated by Eugene Gyrba, working on a cultural resource management project for the ASA.

As Ives explains, "There are at least two models for the kind of setting we would like to look for is sites. We are trying to pair that with the geographical 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."

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 Alwayne Hendrick (Environmental Research Officer), have extended the search to fans formed by the North Saskatchewan River. One fan, of particular interest, contains several layers of volcanic ash, deposited over stable soil surfaces. Below these buried surfaces are deltaic sands which have produced datable bone fragments. Further testing of this fan, including fieldwork 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 a large number of sites has been found, 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 a site on the 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 Wisconsin glaciation 18,000 years ago." Recent studies conducted by geoscientists, 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 people would have been tempted to venture down it. Vegetational reconstructions from lake sediment cores, done by Charles Schwager of the University of Alberta suggest that the corridor would have held 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 game populations could have resided in the corridor. Even were there to be conclusive proof... that the corridor was open almost... 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 have 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 American 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-Asian 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 deplicts 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..."
DECIPHERING DATA FROM DUNG

In southeastern Utah, researchers are looking for sandstone caves that contain a rich but fragile store of knowledge about prehistoric animal life: fossil dung. Headed by Dr. Jim I. Mead, Assistant Professor of Geology and Archeology 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. One example is the discovery by Mead at Red Canyons near Flagstaff, and at Horseshoe Canyon, of a dung deposit composed of horned cattle droppings. The deposit was located in an area that was covered by water 10,000 years ago, and the dung was preserved because it was buried in the sediments. Today, the deposit is exposed in a cave that is 20 feet high and 30 feet wide.

Mead has found that dung deposits can be found in many different types of caves, including those that are dry, moist, or flooded. He has also discovered that dung deposits can be found in a variety of environments, including desert, forest, and mountainous regions.

The discovery of dung deposits is significant because they provide insight into the diet and habitat of prehistoric animals. Dung is a valuable source of information about the food that was available to these animals and the type of vegetation that they consumed. This information can be used to reconstruct the environments of these animals and to understand their behavior.

Mead has also used dung deposits to study the history of human settlement in the region. By analyzing the composition of dung deposits, he has been able to determine the types of animals that were present in the area and the type of vegetation that was available.

In addition to his work with dung deposits, Mead is also interested in the use of dung as a fuel source. He has found that dung can be used as a fuel source, and he is currently working on developing a method for using dung as a source of energy.

Mead's research has been supported by the National Science Foundation and the National Geographic Society. He has also received funding from the Utah Department of Wildlife and the Utah Division of Natural Resources.

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Nancy Allison
KNOWING IT IN THE BONE

(Continued from page 1)

variation within organic materials. But, unfortunately, conventional electroforetic methods haven't been able to identify serum proteins in human bone, much less reveal genetic variation. Some 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 those more sensitive techniques to protein extracts of bone, in this case bone from the Winnower 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 serum proteins inside that bone may have been leached out long ago."

Winderover 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 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 this kind of protein. 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, "is that 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 populations 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 or three are found in 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 intermixing, with those in Central America.

The object of this research, which is being conducted in collaboration with Dr. Robert L. Bettinger, an archaeologist, and Dr. Janet Shibambo, 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 gene flow 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 qualified.

"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 certain groups."

Those that do show albumin polymorphism fall into two categories, albumin Naskapi or albumin Mexic, depending upon which genetic markers they carry. Albumin Naskapi, or Alna, appears in almost all Algonkian-speaking and Athapaskan-speaking groups, and provides confirming evidence that the Apache and the Athapascans of northern Athapascans, genetically linked with their northern Athapaskan 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 happened independently in the two groups is genetically related. Blumberg's interpretation is that the mutation occurred before the entry of the Athapascans into the New World."

"The Eti-Turks are one of a number of nomadic groups in the area of the Aral Sea, which have derived ultimately from the westward flow of Mongo-loid populations, such as occurred in the 12th century when Genghis Khan swept west of northern 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 north."

"If 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 Pleis-tocene. 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 Turric invasions to have occurred out of Mongolia."

"The unfortunate gap, of course," Smith says, "is that in all of those populations in south-central Siberia which have been sampled, the albumin genes are those 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 por- tions of these samples, so I can do, 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 group 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 Athapascans people. This might have caused a northerward surge of Athapas- cans, who could have travelled back into the Old World."

The other album variation found in native North Americans is called Mexic, or Alnex. It actually occurs in two forms, Mexic-1 and Mexic-2. The latter characterizes Uto-Aztecan speakers; the former is sometimes found in southern Athapascans (e.g. the Navajo) and in several Athapa- cans, but not northern Athapascans, may also exhibit albumin Mexic. It was previously assumed they had picked up albumin Mexic from the local

Uto-Aztecan people, such as the Pima. Since the discovery that the Uto-Aztecan and southern Atha- pascans carry two different variants, this is not con- sidered likely now. "Hokan-speaking groups, such as the Yuman, then carry albumin Mexic, 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 Mexic 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 linguisti- cally 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 Algon- kian tribes have a low frequency of this albumin and probably acquired it by admixture. Other Siouan groups, such as the Omaha, who lived far from Algonkin territory, lack it altogether. When you see it throughout an entire linguistic group you can usually infer close relationship; you see that only one or two groups have it, and those the ones that are in closest proximity, then you're likely looking at 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 expan- sion, probably out of southern California, into the en- tire 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

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 Numatic 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 main- tains. "Albumin is a pretty versatile protein; it does not 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 causes jaundice in newborns. Albumin-bound bilirubin is quickly removed from the body. If the level of bilirub- in reaches a high level, the infant is unable to bind it and it can be toxic to the nerve and brain tissue and cause severe damage." Infants with hemolytic disease, for example, in which excessive red blood cell destruction spills bilirubin, which is what cause jaundice in newborns. Albumin-bound bilirubin is quickly removed from the body. If the level of bilirubin reaches a high level, the infant is unable to bind it and it can be toxic to the nerve and brain tissue and cause severe 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:


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, Lemna, and Scotchtown 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 Cedy complex bison kill site, in southeastern Alberta. Initial surveys were also conducted in the Eastern Slopes area as part of the five-year "First Alters Project" (see "Ice Free Corridor" on page 3). Principal Investigator: Rod Vickers. Institutional Affiliation: Geological Survey of Alberta.


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


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 Grownow Bay, is proposed for 1988-89.

Other future investigations which may shed light on the period in question include: on-going mapping and collection of Clovis sites 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 Deer site on Nova Scotia.

Several programs are now in effect throughout Canada which enable avocational and professional archeologists to work closely together. The Yukon Heritage Branch offers student job placement on field projects, as well as, providing educational lectures to the interested public. The Archaeological Survey of Alberta is currently preparing a comprehensive program to document private collections and involve volunteer amateur archaeologists in field and laboratory work. The Archaeology Branch of the Manitoba History Resources Branch provides the province with a professional 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 Archeological Society, is presently initiating a training program for amateurs. New Brunswick has a "Private Collections Registration Program" to catalogue collections, and 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 sites. 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.

MARMOUTH TRUMPET
NOVEMBER, 1987

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.

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

Bilinumin - 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, Scotchtown, and Eden points occur in sites which appear to differ in the same fashion. The northernmost site at the region.

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

Glacial Erratic - A rock of a different kind than the bedrock underlaying the site, 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.

Sodium - An element with only one electron and no intrinsic tendency to form 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 proteins 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


Rupke, Reynold 1987 Review of Quaternary Coastline and Maritime Archeology: Towards the Preliminary of Land Bridges and on Rock Art. Also available from British Columbia are archaeological poster displays for Simon Fraser University, and artifact kits (stone and bone tools - mainly more recent periods) from the Northern Heritage Conservation Branch. The Archaeology Branch of New Brunswick's Department of Tourism, Recreation, and Heritage, has a large traveling exhibition on the archeology 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, New Brunswick, and Nova Scotia. In addition to the Canadian Archaeological Association, professional archeological societies are located in Alberta, Saskatchewan, Manitoba, and Ontario.

Several programs are now in effect throughout Canada which enable avocational and professional archeologists to work closely together. The Yukon Heritage Branch offers student job placement on field projects, as well as, providing educational lectures to the interested public. The Archaeological Survey of Alberta is currently preparing a comprehensive program to document private collections and involve volunteer amateur archaeologists in field and laboratory work. The Archaeology Branch of the Manitoba History Resources Branch provides the province with a professional 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 Archeological Society, is presently initiating a training program for amateurs. New Brunswick has a "Private Collections Registration Program" to catalogue collections, and 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 sites. 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


BOOKS


MISCELLANEOUS

Storck, Peter 1987 Imperialist Without a State: The Cultural Dynamics of the Late Prehistoric Northern Plains Region. Paper being prepared for the XII International Congress, NOGAC, Washington Archaeological Research Center. 5,000 - site records and 5,000 entry archaeological/Ethnographic bibliography on computer, accessible via phone modem hookup. Washington State University Computing Center, Pullman, WA 99164-1220.
KNOWING IT IN THE BONE

Map indicates the location 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.

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"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 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 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 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. An aerobic condition and unsavory 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 ethnobiological record will continue to increase. There are some things an anthropologist simply knows by feeling it in his bones.

—Michael Doltani

SPECIAL OFFER FROM THE SMITHSONIAN

The Arctic Ocean and Its Coast in the Cenozoic Era

A.I. Tolmachev, editor

This volume is concerned with problems of the origins, evolution, and paleogeography of the Arctic Ocean and its coast during the Tertiary and Quaternary. The emphasis is placed on the evolution of modern Arctic flora and fauna, both terrestrial and aquatic. These problems are discussed on the basis of hydrological, paleontological, biogeographical, climatological, and archaeological data. The book itself is free. You pay only the shipping and handling charges listed below. Inside U.S. - $3.00, Canada - $6.00, Mexico - $7.00, outside North America - $13.00 — per book.
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/modeler 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

(Continued from page 3)

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 maneuver yourself down the coast like that," says Ives, "would be difficult. There are 'e' 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 Paleolindian 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 one time," states 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 here 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 curiosity. It is worth the risk of looking."

—Bill Belcher

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

STRAINED 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 glowing appearance and "pottinglode" (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 Udoara 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 Paleolindian sites in the Great Lakes region," Storck observes. "The nearest date, to my knowledge, in a straight-line distance, is from the Shawnee-Minink site in New Jersey," approximately 550 kilometers away.

In addition to the feature, the recently excavated area at Udoara 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 similar 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 unusual piece of bone which "may have been a piece of site furniture, such as a seat or wind-break." In total, the 1987 Udoara investigations produced several hundred formal artifacts, including beaked scrapers or slotting tools (unifacially worked, extremely narrow scrapers), side scrapers, and flake gravels.

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 Paleolindian period, were collected during the excavations. In contrast, the Fisher site, a Paleolindian site northwest of Udoara 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 Udoara may be indicative of a specialized skin-working area, perhaps used exclusively to flake 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 Udoara 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 Paleolindian 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 Paleolindian 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, discovered the then known sites, 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-