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LUBBOCK LAKE LANDMARK: STATE HISTORIC SITE

The ground-breaking ceremony of the Lubbock Lake National Historic and State Archaeological Landmark was held October 23, 1987. The dedication of the newly established state park marks the culmination of years of effort aimed at preserving and developing this unique site.

Lubbock Lake is a stratified, multicomponent site containing an archaeological, geological, paleontological, ecological, and climatic record of events exceeding 12,000 years. Scientific investigations reveal a continuous sequence of cultural occupations ranging in time from the Paleoindian period to the Historic. The site, according to researchers, is among the most important archaeological finds in the world, and the only one of its kind now known in North America.

Like all archaeological sites, Lubbock Lake is a fragile non-renewable resource. The unique stratigraphic and associated cultural record contained at Lubbock make it imperative that this site be preserved for future generations.

Friends and supporters of Lubbock Lake Landmark observed the establishment of the park by an all-day dedication ceremony. Following a morning public hearing held in the Lubbock city council chambers, celebrants adjourned to the site for the dedication. Speakers at the ceremony included Dr. Eileen Johnson, Director of the Lubbock Lake site, Texas Tech University, Robert Nash, Master of Ceremonies, Senator John T. Montford, D-Lubbock, Dr. Laura Cavazos, President of Texas Tech University, B.C. McMinn, Mayor of Lubbock, and Alton Brazell, County Commissioner. Dr. Robson Bonnichsen, Director of the Center for the Study of Early Man, Maine, gave the keynote address, entitled "The Significance of the Lubbock Lake

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Rob Bonnichsen, Director of the Center for the Study of Early Man, delivers the keynote address at the dedication of the Lubbock Lake Landmark site. Other dignitaries at the ceremonies include (l. to r.): Bob Nash, Lubbock City Council; State Senator John T. Montford; Dr. Eileen Johnson; Dr. Lauro F. Cavanos, President, Texas Tech University; Mayor B.C. "Peck" McMinn, Lubbock; and Alton Brazell, Lubbock County Commissioner. (*Photos courtesy of Eileen Johnson*).

ROCKING AROUND THE GEOMORPHICAL CLOCK: Dating by the Rock-Varnish Method

Let the stones speak
With tongues that talk all tongues.
—Dylan Thomas

Rock varnish: it sounds like something invented in California for preserving pet rocks; or perhaps like the name of a heavy-metal band. Actually, says Ron Dorn, geomorphologist from Texas Tech University's Department of Geography at Lubbock, "It's a paper-thin coating, also known as desert varnish, that accretes on rocks in virtually every terrestrial climate and environment." Rock varnish that has accumulated on artifacts from surface archaeological sites can now be dated, thanks to techniques newly developed by Dorn and his colleagues. Recently, in the Mojave River Basin in eastern California, this method produced a series of dates going back almost 22,000 years ago—the oldest dates on surface artifacts in North America.

In a 1983 **Quaternary Research** article, Dorn demonstrated that rock varnish on surface sites in semi-arid and arid environments is dateable by means of what is known as cation-ratio analysis. The problem with this method, however, is that it produces only relative dates. It can tell how much older one rock varnish surface is than another, but it cannot give an absolute age for either.

Therefore, Dorn began working with the Accelerator Research Group at the University of Arizona. Together, they worked out a new way of dating rock varnish—the C-14 dating technique. Although this method *does* given numerical dates, it has a disadvantage in that large surface areas of varnish are required in order to isolate a sufficient quantity of carbon for analysis. Reporting in the February, 1986 issue of **Science,** however, Dorn and his collaborators announced a method for *combining* cation-ratio analysis and radiocarbon analysis of rock varnish. If a series of radiocarbon dates can be obtained for an environment, an indefinite number of cation ratios can be calibrated against it. Small artifacts, themselves undateable by radiocarbon, can then be dated through cation-ratio analysis from the varnish that forms on them by using the established calibration. Although cation-ratio analysis must still be considered an experimental technique, startling results have, thus far, been obtained by combining the two methods: the dates from the Mojave region which, as mentioned above, suggest human occupation of the Southwest during the late Pleistocene.

"Rock varnish ranges in thickness from less than a micron to over 500 microns—that's half a millimeter," Dorn observes. "Its variable chemistry comprises clay minerals, manganese, and iron oxide, with a variable sweep of well over thirty trace elements, including carbon. Its' the trace elements that make desert varnish—or rock varnish, as I like to call it—suitable for dating. The reason I call it rock varnish is that although this manganese—iron clay coating is ubiquitous and most noticeable in arid environments, it also occurs in many others"—even in Iceland.

"Cation-ratio dating is based upon changes in the chemistry of trace elements over time. Some of the elements are fairly mobile, particularly potassium and calcium; some are fairly immobile, such as titanium." The varnish is removed from the rock with a tungsten-carbide needle under magnification, and purified by a filter system. Then the cation ratio of potassium plus calcium divided by titanium (K + Ca/Ti) is ascertained by particle induced X-ray excitation (or PIXE for short), a process conducted by Tom Cahill's Air Quality Group at Cracker Nuclear Laboratory, University of California at Davis. As the potassium and calcium are removed more rapidly than the titanium through cation exchanges, the cation ratio declines regularly over time, thereby becoming a potential measuring standard.

Despite the promising tools he is holding out to archaeology, Dorn is not an archaeologist himself, and emphasizes that he would never attempt to date sites or artifacts without the assistance of one. Dorn, who

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INSIDE . . . .

CENTER NEWS

RENEWALS

Did you recently receive a Renewal Notice (orange) or a Second Notice (postcard)? We send renewal notices to all members whose subscriptions are going to expire with the next issue of the **Mammoth Trumpet**. If you want to know just when your subscription will expire, check the mailing label on the renewal notice or on the **Trumpet**. The letter and number code in the upper left corner of the label is your membership level and the volume and issue number of the last issue your subscription will bring you. For example, R44 is a Regular membership that will expire with volume 4, issue 4.

Second Notices will have a date stamped on them; this is the last date we can receive your renewal and still guarantee your subscription will continue uninterrupted. Back issues are available for $3/issue.

Second Notices are sent to all members who didn't respond to the first notice. Occasionally, names get mis-sorted by our computer and Second Notices get sent to people who have renewed. We apologize for any inconvenience this may cause you and do appreciate you bringing the error to our attention so we can make sure you will continue to receive the **Trumpet**.

Occasionally, all members receive other mailings from us which may have a membership/renewal form on it. Although we are inspired by the loyalty of many members who take every opportunity to support the Center, at this time we cannot accept any more memberships (except Lifetime memberships) for more than 3 years in advance. Please check your most recent mailing label from us or the subscription notification that is mailed to every member to see when your membership does expire.

WELCOME

The staff at the Center for the Study of Early Man extends a welcome to its newest member—Research Associate Dr. John Tomenchuk. Dr. Tomenchuk, a specialist in lithic analyses, will assist in developing a long-term research project focusing on chipped stone tool manufacture and use.

A native of Poplar Bluff, Saskatchewan, Dr. Tomenchuk holds a Doctorate in Anthropology from the University of Toronto, Ontario. He recently completed a post-Doctoral Research Fellowship at the Peabody Museum, Harvard University.

Among other duties at the Center, Dr. Tomenchuk will supervise the establishment of an archaeometry laboratory centering on video-digital display imagery of artifacts. Following the establishment of this laboratory, a considerable task in itself, John and Center Director Rob Bonnichsen will embark on an extensive study of stone tool manufacture.

SUGGESTED READINGS

On Dating by the Rock-Varnish Method

Dorn, Ronald I. 1983 Cation-Ratio Dating: A New Rock Varnish Age-Determination Technique. **Quaternary Research** 20:49–73.

Dorn, R.I., Bamforth, D.B., Cahill, T.A., Dohrenwend, J.C., Turrin, B.D., Donahue, D.J., Jull, A.J.T., Long, A., Macko, M.E., Weil, E.B., Whitley, D.S., and T.H. Zabel 1986 Cation-Ration and Accelerator Radiocarbon Dating of Rock Varnish on Mojave Artifacts and Landforms. **Science** 231:830–833.

Dorn, Ronald I., and Theodore M. Oberlander 1982 Rock Varnish. **Progress in Physical Geography** 6:317–367.

Dorn, Ronald I., Tanner, Donna, Turrin, Brent D., and John C. Dohrenwend 1987 Cation-Ratio Dating of Quaternary Materials in the East-Central Mojave Desert, California. **Physical Geography** 8:72–81.

Guidon, N., and G. Delibrias 1986 Carbon-14 Dates Point to Man in the Americas 32,000 Years Ago. **Nature** 321:769–771.

Hayden, J. 1976 Pre-altithermal Archaeology in the Sierra Pinacate, Sonora, Mexico. **American Antiquity** 41:274–289.

Whitley, David S., and Ronald I. Dorn 1987 Rock Art Chronology in Eastern California. **World Archaeology** 19:150–164.

On Lubbock Lake Landmark: State Historic Site

Johnson, Eileen 1987 **Lubbock Lake: Late Quaternary Studies on the Southern Plains.** Texas A&M University Press, College Station, Texas.

STILL SEARCHING

In 1987, Earthwatch teams working with Center Director Rob Bonnichsen uncovered numerous stone tools and tool fragments as they excavated ancient stone quarries and workshop sites in the Beaverhead Mountains of southwestern Montana. This summer Earthwatch teams will continue investigating this area, seeking to uncover clues to the role stone tool technology played in early North American society. The results of the research will hopefully offer new insights as to how and when this continent was first populated by humans.

The expedition teams camp along Everson Creek. Both geological and archaeological skills will be used to search and test for new sites and to excavate the Mammoth Meadow site, where last year's teams found so many artifacts.

For more information about 'The First Americans' expedition, contact Earthwatch, P.O. Box 403, Watertown, MA 02272-9990.

CORRECTIONS AND COMMENTS

From our story, "Stranded in the Past": Prior to the Udora discovery, only one *Paleoindian* site in the entire Great Lakes region, the Holcomb site in Michigan, had produced identifiable animal bone. Additionally, we inadvertently failed to mention that Udora was initially discovered and defined by Lawrence Jackson, Gordon Dibb, Pat Boyer, and Jane Edward. Our apologies to these researchers, and our thanks to Dr. Heather McKillop (Trent University, Peterborough, Ontario) for bringing this to our attention.

From "Paleoindian Research in Canada", New Brunswick, the Principal Investigators were Christopher Turnbull and Patricia Allen.

Addendum to "Paleoindian Research in Canada": Due to a mix-up in the mail, Quebec's response to our survey arrived too late to be included in our last **MT** edition. Therefore, we are pleased to note that both amateur and professional archaeological societies are located in Quebec. The arrival of this information completes a 100% rate of response from the Canadian provinces and territories to our questionnaire. Thank you Canada!

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ROCKING AROUND THE GEOMORPHICAL CLOCK:

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holds a Doctorate in Geography with a specialty in geomorphology, began working with cation-ratio analysis about ten years ago, in conjunction with Ted Oberlander of the Geography Department, University of California at Berkeley. At that time, the problem was to find a means of calibration. Oberlander had the idea of going to the Coso Range in eastern California, where there were potassium-argon-dated volcanics, to see whether a calibration could be established between the varnish ratio and potassium-argon-dated material. The project later became Dorn's mater's thesis under Oberlander.

Dorn discovered that "When a calibration is charted on a semi-logarthic plot, with the cation ratio on the verticle axis and the age in logarithm (base 10) on the horizontal axis, it comes out to be pretty much of a straight-line relationship, or close to it."

"At the same time," Dorn continues, "I was messing around trying to extract carbon from varnish," hoping to learn how to concentrate it in sufficient quantities for radiocarbon dating. During the several years it took him to succeed at this endeavor, he made contact with Austin Long, Tim Jull, and Doug Donahue of the Accelerator Research Group at the University Arizona. "They agreed on an exploratory attempt at dating the C-14 in varnish using tandem accelerator mass spectrometry" (TAMS). The eventual result was the 1986 **Science** article, which, in Dorn's words, "really opened up the archeological time scale in the New World to rock varnish dating" and initiated Dorn's continuing collaborations with several groups of archaeologists.

"Because," Dorn explains, "although you can't date varnish on artifacts by radiocarbon dating, you *can* do it by cation-ratio analysis. There isn't enough carbon in the varnish on artifacts for even an accelerator radiocarbon date: the amount of varnish that I need is probably an order of magnitude or two greater in surface area than even a petroglyph, let alone a small artifact. It's just beyond the technology today. . . But the radiocarbon dating permits you to set up a calibration for cation-ratio dating virtually anywhere. So if you have a site in an arid enough area, where the varnish is bio-geochemically stable and doesn't erode, you can radiocarbon-date the varnish on landforms, set up a calibration between the accelerator dating and the cation ratio, and you're off and running."

How wide an area will such a calibration cover? "I'm experimenting on that in the eastern California area," Dorn replies. "I start out in the Coso Range, then the Cima Volcanic Field, and I'm looking at calibration points extending that. There's no good rule of thumb. It could be as limited as a few square miles: it could extend to tens of square miles, perhaps even

"Rock varnish accretes on rocks in virtually every terrestrail climate and environment."

to almost a hundred square miles, I don't know. One of the assumptions that you make is that the environmental conditions affecting the varnish cation exchange have been similar in an area over time. If you get a broad area where conditions have been similar, you may be able to use the calibration over that area.

In addition to its confinement to contexts in which the continuously-forming varnish is not eroded, either by an acidic environment or by dust- and sand-blasting, Dorn's method has two other shortcomings, both of them connected with calibration. First, he says, "It's not too good for material less than a thousand years old; it's better for older materials." Second, "A serious problem is the cost: and there's very little I can do about it. If a calibration doesn't exist for an area, it costs on the other of about $10,000 just to cover the analytical expenses for the accelerator radiocarbon

Scanning electron microscope photograph of varnish on a petroglyph from the Coso Range in the Mojave Desert. Radiocarbon analysis has dated the abstract image rock art to about 3700 yr B.P. The flaky lamellate structure is typical of varnishes in the Coso Range area. *(Dorn photo)*

dating and the PIXE analyses." Once a calibration is set up, analysis of a small artifact, with only enough varnish onit for one PIXE analysis, can cost as little as $50. "But if your artifact has lots of varnish on it," Dorn says, "and you want to be really sure of the analysis, you may want to do four different PIXE analyses; that will cost you $200. Thus, it's in the ballpark for radiocarbon dating for an artifact. Keep in mind we're speaking of surface material here, it can only handle artifacts exposed to the surface."

What may seem at first glance to be significant limitations can, nevertheless, be more than compensated for by advantages which are possessed by no other dating technique. These advantages occur with three types of materials, ranging from the small to the large to the *very* large: surface artifacts, petroglyphs, and geoglyphs.

A number of projects where Dorn has been involved with archaeologists have yielded surface artifacts, abandoned unburied on the desert surface and remaining there long enough to accumulate varnish. "One that I'm currently working on," he says, "along with Dave Proctor, W. Phillips, and B. Harrison, is to take classic point types, such as Plainview, that have been found on the surface of various sites throughout the Texas Panhandle, set up a calibration for the area, and then look at the varnish on them. For example, the Plainview points I've examined appear to be in the neighborhood of 9,000 years old, which is reasonably close to the dates assigned in stratigraphic context."

Comparative testing of this sort, in which the new method can be evaluated by comparing results with those of other dating methods used upon the same artifacts, is very important. Dorn hopes to do considerably more of it. As he observes, "The bottom line is: how accurate is it? How precise is the method? We're constantly looking for ways to assess accuracy and precision—and for ways to disprove the method, or to find out circumstances in which it won't work. It *is* an experimental technique. And yet, when you're careful in using it, it looks pretty good."

One such experiment in double-checking was conducted with Doug Bamforth of the University of Nebraska and Ed Weil and Mike Macko of the Applied Conservation Technology (ACT) project in the Mojave. "They took sequences of refitted flakes and cores and had me look at the varnish on them," Dorn recounts. "When you're processing samples, you don't know what's what, but since the whole refitted sequences was made at the same time, it gives you an assessment of the archaeological precision of the method. It came out to be that the date for the artifacts in the refitted sequence was statistically about ±10%."

The most dramatic results turned up by Dorn's radiocarbon/cation-ratio combination to date were also in the Mojave with ACT, near Lake Manix and the famous Calico site. "There's a geographer at UCLA, Norman Meek, who's doing his dissertation on the history of Lake Manix that will probably have implications for the archaeology in the area," Dorn explains. "There was a Pleistocene lake basin," he goes on, "that spilled into the eastern Mojave sink and emptied out, probably about 18-19,000 years ago. That lake basin is next to the Calico site, but the artifacts we examined were not at all connected with that site: this is surface scatter, of the type that exists all along the Mojave. I also went out with Fred Budinger and Dave Whitley; we scoured the surface around the Calico site for Manix Lake industry materials.

"Doug Bamforth and I are preparing an article on the Manix Lake lithic industry and the so-called pre-projectile point horizon. Some of the material that's been described as being in that lithic industry really looks to be Holocene. But some of them *are* quite old, clearly pre-Clovis—if you believe this dating technique. We're talking about flakes that are jet black with varnish and definitely yield cation-ratio dates over 20,000 years . . . If you look at the sampling of artifacts by Doug Bamforth and ACT, and you assume that it's a random collection, the dates we're getting indicate a fairly continuous occupation from the late Pleistocene on through the late Holocene."

These are not the only early dates the new method has produced. Dorn has also gone into the field with Julian Hayden, whom he describes as "the grand old man of the Sierra Pinacate in northern Mexico." He adds, "The cation-ratio analyses we obtained make it look as if his sequence of Malpais I, Malpais II, and San Dieguito is pretty good. Preliminary results strongly suggest that his Malpais material is pre-Clovis, probably over 20,000 radiocarbon calibrated years old. These are not projectile points but rather basalt assemblages with distinctive characteristics."

The radiocarbon/cation-ratio combination can, at times, succeed with surface artifacts that are otherwise undateable; the same is true when it is applied to the second category of materials: petroglyphs. Dorn elaborates: "I've worked on Mojave Desert and Coso

"It is an experimental technique. And yet, when you're careful in using it, it looks pretty good."

Range petroglyphs, mostly with Dave Whitley, a Research Associate of the Institute of Archaeology at UCLA. We've found that these petroglyphs are much older than previously thought."

The petroglyphs in question appear on basalt canyon walls; the Coso Range has over 30,000 of them. Previously estimated to be of Holocene age or a bit older, Dorn and Whitley have dated the petroglyph of a bighorn sheep at about 18,000 years, and an instance of "what's been called a curvilinear abstract" at about 16,500. "Even when you consider the errors in the calibrated curve and the plus-or-minus on the cation-ratio analysis," Dorn states, "the date is pre-Clovis." If confirmed, this may be the technique's most startling disclosure yet. Stone flakes from the pre-Clovis period would be one thing—but stone carvings! "Yes, and it greatly disturbed Dave," Dorn replies, because a carving of a bighorn sheep could be either Pleistocene or Holocene: the animal existed in both time periods." What would clinch the matter would be carvings of Pleistocene megafauna. Then Dorn adds a disconcerting comment: "There actually are reports of Pleistocene megafauna rock art in the Coso Range, but they were laughed at, so nobody bothered to report the exact position. Now we have to go back to find these motifs and try to get permission from the base archaeologists to look at the varnish on them."

To be sure, a number of petroglyphs have been dated without the help of the new method. "As far as I'm aware, Diedra Dragovich has had success in dating some petroglyphs in Australia, there are other people, like Karl Butzer, who have looked at material that has accumulated *next to* petroglyphs. Then there's a 1986 **Nature** article by Guidon and Delibries that deals with rock art in a cave in Brazil. There are pictograph

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Book Review

THE GREAT JOURNEY
Small Step or Giant Leap?

The Mammoth Trumpet asked Dr. Ruth Gruhn to review ***The Great Journey*** *because of her in-depth knowledge of North and South American early human occupation literature. The opinions expressed in this review are those of Dr. Gruhn, and not the* ***Trumpet****. We do, however, think a critical analysis of material presented via the popular press is useful in order to give the general public a balanced view of the current status of the search for the first Americans.*

—The Editor

The Great Journey: the Peopling of Ancient America. By Brian F. Fagan. Thames and Hudson, New York, 1987. 288 pp., 126 illustrations, index, bibliography.

In this well-constructed book, written for the popular market by a successful author of general textbooks in archaeology, Brian Fagan attempts to present the current picture of New World Early Man studies. The book opens with a discussion of early European ideas about the origins of American Indians. Fagan then provides a background summary of human biological and cultural evolution in the Old World from the beginning to the end of the Pleistocene. By that time he has brought the reader to the Bering Strait area, with a description of the environment and early cultural evidence in Beringia and the ice-free corridor. Fagan critically reviews evidence for human occupation of the Americas before 11,500 years ago, before he goes on to a presentation of the conventional Clovis model of initial entry, which he accepts. The book closes with a brief review of the later prehistoric developments in North America.

Upon first skimming through the book, I noticed a marked geographic imbalance. A surprising total of seven pages was devoted to the European/Southwest Asian pre-Neandertal and Neandertal population, and another 10 pages to a detailed description of the European Upper Palaeolithic complex. In contrast, the Upper Pleistocene archaeology and human paleontology of northern China was given hardly half a page. Almost 40 pages were devoted to Beringia and the ice-free corridor while Fladmark's alternative North Pacific coastal route of initial entry was given only ¾ of a page. South America received a total of nine pages in the entire book.

When I settled into reading the book, the explanation for the imbalance emerged. Fagan is operating with fundamental postulates that are bound to constrain severely his presentation and interpretation of the data. These basic postulates include (1) the rapid and complete replacement of a primitive "Neandertal" population in all areas of the Old World by migrations of advanced anatomically modern man only 40,000–35,000 years ago; and (2) the imperative need for a sophisticated and specialized Upper Palaeolithic technology in order for human populations to cross the arctic zone of the Bering Strait and enter the New World. The scenario which is set up on these fundamental postulates allows no possibility of entry into the New World before 35,000 years ago at the very maximum—indeed, the time of first arrival at the Bering Straits is placed at likely no more than 15,000 years ago (with 25,000 years considered the very oldest possible date). The presumed route of the ice-free corridor is considered to have been effectively closed between 25,000 and 15,000 years ago. Thus people could not have been south of glaciated North America before 15,000 years ago. As well, a sophisticated and specialized Upper Palaeolithic technology is made imperative for all of the initial colonists, presumed to have been terrestrial hunters. From these postulates, it follows that New World archaeological sites with unspecialized lithic technologies dated earlier than 15,000 years ago are impossible. There has to be something wrong with all the reports of such sites, and Fagan follows other recent writers (Stanford, Dincauze, Owen, Waters) in his efforts to discount each one of them that he reviews.

And like the others before him, Fagan, in his haste, makes significant errors and omissions in his description of pre-Clovis-age sites. To cite one example in detail: the El Jobo mastodon kill site at Taima-Taima. Here is Fagan's presentation of this site (pp. 167–168).

This illustration from the book is an artist's reconstruction of a small band of early immigrants travelling across Beringia.

> . . . Bryan and his wife Ruth Gruhn excavated the skeleton of a young, partially butchered, mastodon at Taima-Taima in northern Venezuela. The bones lay near the base of some grey, clayey sands, part of an old spring deposit, sealed off about 10,000 years ago. A broken so-called 'El Jobo' projectile point lay lodged in the mastodon's pelvic area. Four radiocarbon dates from a mass of sheared twigs that Bryan believes came from the mastodon's stomach indicate a date of 13,000 years ago for the kill. El Jobo points are almost cylindrical, willow-leafed artifacts that clearly belong within the general Paleo-Indian tradition. Fifteen radiocarbon dates from the sand levels range between 13,400 and 12,5000 years ago.
>
> The Taima-Taima mastodon kill comes from spring deposits that Bryan admits show 'local convoluting and particle-sorting.' Such geological layers are notoriously unreliable sources of dating information, because the upwelling spring water can shift and sort the deposits and their contents into stratigraphic confusion. The El Jobo point found with the skeleton is the sort of hunting weapon commonly used somewhat later, after 11,000 years ago. One suspects the Taima-Taima kill is therefore a little later than the radiocarbon dates suggest, but there can be no doubt about the association between the mastodon and the artifact. Bryan himself argues for the local development of a proboscidean [elephant] hunting complex certainly by 13,000 years ago.

Now, *using only the same published report which Fagan cites* (*Science* 200:1275–1277), here is a more accurate description of the site:

New excavations in 1976 at the waterhole of Taima-Taima exposed the semi-articulated skeleton of a juvenile mastodon near the base of a saturated grey sand deposit, Unit I. The animal had been butchered: the cranium, cervical vertebrae and upper thoracic vertebrae, and entire right forelimb were missing; and there were series of sharp cut marks on the left humerous and two ribs. A midsection of an El Jobo point was found in the pelvic cavity, and a utilized jasper flake near the midshaft of the left ulna. An associated concentrated mass of small wood twig fragments notably sheared as if masticated are believed to be remains of the contents of the stomach or intestines of the young mastodon, and gave a minimum radiocarbon date (from three laboratories) of about 13,000 yrs B.P., supporting a previous series of 14 radiocarbon dates ranging between 14,000 and 12,000 yrs B.P. for Unit I.

Although the original fine horizontal beds in Unit I have been locally distorted and convoluted by the upwelling water (which also sorted out the clay fraction), evidently the hydrostatic pressures were not sufficient to move bones enclosed in Unit I by any significant amount.

At the top of Unit I is a remnant paleosol, and an erosional disconformity; and no evidence was found of penetration of this extensive old land surface by upwelling water. Bone fragments on this disconformity included remains of horse, glyptodont, *Macrauchenia,* and land tortoise—extinct taxa all, supporting the early radiocarbon dates from the underlying Unit I. No mastodon remains and no artifacts were found on this disconformity or in the units above it. At the top of the 50 cm thick sterile colluvial sand deposit of Unit II overlying was another remnant paleosol. Unit III, overlying this second paleosol horizon, was a black organic clay which had previously yielded radiocarbon dates ranging between about 10,300 and 9,700 yrs B.P. Up to three meters of sterile colluvial yellowish-brown sand (Unit IV) overlies the black clay.

Fagan apparently took his interpretation of the geology of this site from previous writers who have never visited the site. Dincauze (1984), using outdated comments by Lynch and Haynes (written before the 1976 excavations) as well as a student term paper, also ignored the 1976 stratigraphic profile. Fagan for his part (but perhaps following Stanford 1982) stressed point typology as an argument th the El Jobo point at Taima-Taima was not as old as indicated by the radiocarbon dates, claiming that the type was "commonly used somewhat later." To my knowledge Taima-Taima is one of only two radiocarbon-dated sites with an El Jobo point, which is a quite distinctive point type in terms of its morphology and technique of manufacture. The point which Fagan illustrates, that appears to have been drawn from a photograph in a 1956 article by Cruxent, is not a typical form, as most El Jobo points feature a pointed or sometimes a straight base. The other radiocarbon-dated site with El Jobo points is Muaco (a few kilometers south of Taima-taima) which yielded 16,300 and 14,300 yrs B.P. bone dates.

In an effort to avoid another perpetuation of error, I must correct Fagan's account of the Toca do Boqueirão da Pedra Furada, which he is compelled by his basic postulates to view as "a Brazilian enigma," a site with a consistent series of more than a dozen radiocarbon dates on hearths in well-stratified occupation levels ranging back to 32,000 yrs B.P. Fagan is mistaken in his statement that the early occupants of the large rock overhang camped alongside a stream, which flowed through the site. The "stream" is a narrow channel which has, on occasion, taken torrential seasonal overflow from a specific fissure on the cliff face lateral to the rockshelter. The channel is at least six meters from the shelter's rear wall, and never entered the occupation area. The deposits within the occupation area are comprised of sand and angular sandstone fragments weathered from the walls of the overhang, which are consolidated sandstone. There is no possibility that the early artifacts of quartz and quartzite have spalled off the walls of the shelter. I have visited this site and examined the artifacts (no quotation marks needed) in Dr. Guidon's laboratory. When Fagan does the same, he will be embarrassed by his remarks about the site; especially the implication of a lack of rigorous scientific description and analysis.

Other more minor errors in the book need to be pointed out lest they be perpetuated as well. The second radiocarbon date from Wilson Butte Cave is 15,000 not 13,000 ± 800 yrs B.P. Monte Verde has mastodon remains, not mammoth (no mammoth have ever been found south of Nicaragua); and it is an Ice-

(Continued on next page)

An Appreciation of Bill Irving

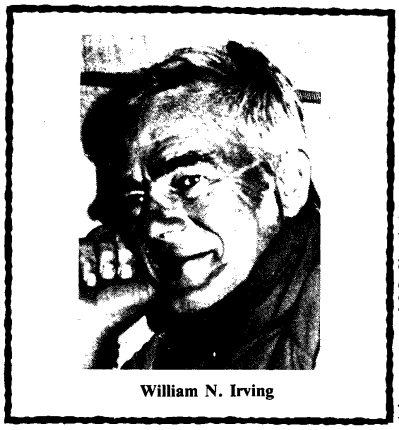
What is success? Prestige, honours, fortune, fame, or satisfaction—we all have our own Quest for Fire. Bill Irving chose to seek for truth and a solution to a problem that has puzzled anthropologists and palaeontologists for over a century—When did humans enter the New World?

Bill did not live to an old age, dying at age 60, and so did not gain the recognition that comes to the senior and retired savant. His contributions to North American archaeology were, however, significant, lasting, and appreciated during his lifetime.

William Nathaniel Irving was born on Armistice Day, November 11th, 1927, in Toronto, Canada. He died in that city on November 25th, 1987, having devoted his talents to North American prehistory above the 49th parallel of Latitude. He attended the Marion Military Institute, Alabama, studied at Bowdoin College, Maine in 1948, and then entered the University of Alaska at Fairbanks to gain a B.A. in Anthropology with minors in Geology and Biology in 1952. He attended Harvard University from 1953–57, doing graduate work in Anthropology, and entered the University of Wisconsin at Madison to gain his Ph.D. in Anthropology with a minor in Geology in 1964. Bill's academic mix of Anthropology with a strong natural history component of Geology and Biology, prepared him for projects in which sedimentological, taphonomic, or faunal considerations were mixed with anthropological or archaeological concerns. Service during 1946–47 as a 2nd Lieutenant in the 187th Glider Infantry Regiment in Hokkaido, Japan, gave him an early experience in organization and leadership which proved valuable during his fieldwork in northern Canada.

William Irving's first chance to investigate northern Canadian sites came when he joined the National Museum of Man in Ottawa, Canada, in 1964. He was instrumental in delineating the Arctic Small Tool Tradition while at the Museum.

Bill's publications generally reflect an abiding interest in northern archaeology. In 1968, the year that he joined the Department of Anthropology at the University of Toronto, the first paper on the Old Crow region of the Yukon Territory appeared. This was followed by a steady flow of reports on the Old Crow Flats, the relations of Beringia to Asia and central North America, and the peopling of the New World by humanity.



William N. Irving

(photo courtesy of C.S. Churcher)

Bill Irving heard of this find and, with his long interest in Arctic anthropology and environments, saw it as an opportunity to perhaps locate an early man site in Beringia. When Peter Lord showed a caribou-bone flesher to Dick Harington at a point bar on the Old Crow River in 1966, a new window opened on North American history.

Bill created the Northern Yukon Research Programme at the University of Toronto; a broadly based multidisciplinary project designed to investigate the Old Crow Basin, nearby areas of the Porcupine River, and sites such as Bluefish Cave in the surrounding mountains. The research team has published many papers in many areas, all with Bill's encouragement and interdisciplinary understanding. Further papers are in press or in preparation by his co-investigators.

Bill also advocated the recognition of some peculiarly broken bones and ivory as human tools. Although his identification of an "osteodontokeratic" culture in the Yukon resulted in much criticism and skepticism, it also forced many of us to think in new ways outside of the accepted orthodoxies under which we had been educated. Not all of us appreciated being made to reconsider what had become accepted assumptions. Some have fought strenuously to defend the status quo. However, the "earth tremors in the crust" started by Bill have acted to alter and adapt the "anthropological plate" to the new contours of evidence.

Bill's enthusiasm and energy seldom flagged. His ideas inspired his students and colleagues. His position as an eminent senior Professor was tribute to his activities in the classroom, laboratory, field, administration, and in guiding research.

Bill deserves a special place in all our memories for his level-headed generosity and understanding of his colleagues' views. He believed that ad hominem arguments or personal biases are out of place in science. Bill's understanding of the central position played by Beringia in allowing immigrant organisms from Asia to enter North America has assured his place in New World natural history.

I once joked with Bill that he was the modern 'Pliny' of Beringia and that 'Aliquid semper novum ex Beringia' ('there is always something new out of Beringia') should be his motto. Bill Irving was a visionary who looked for a future of knowledge about North America in the record of the past preserved in Beringia.

Footnote: I thank Bill's wife, Lila, and his friends at the University of Toronto—Alan Jopling, Howard Savage, John Reid, Bill Hurley, Ursula Franklin, and others—for talking to me about him and providing insights that have only deepened my appreciation of Bill Irving's stature.

—C.S. Churcher
Department of Zoology
University of Toronto

THE GREAT JOURNEY

(Continued from page 4)

Age settlement, not Iron Age. There are not "dozens" of Clovis site with remains of extinct fauna in direct association; but rather approximately *one* dozen (only two of which have monographic reports). It's Archie Stalker, not Andrew, and Wesley Hurt, not Hurd.

With all the errors and omissions in their own presentations, critics of early sites still gratuitously lecture the excavators on the need to be rigorously scientific. Fagan in his turn attempts to deny the legalistic aspect of Early Man studies, but he himself applies the usual double standard. The excavator of an early site is required to produce a multi-volume court case; while defenders of the conventional Clovis model need only a few general statements. Fagan's treatment of Lewisville is an example. A detailed report of extended excavations in the late 1950s at this deeply stratified site near Dallas produced evidence of simple stone artifacts in association with a variety of extinct taxa. Associated hearths yielded radiocarbon dates over 37,000 yrs B.P. More recent excavations of the upper levels at this locality led by Dennis Stanford are said to demonstrate that it is "almost certainly" actually a Clovis campsite by no means that old. To the best of my knowledge, Stanford has to date published only five general paragraphs on his 1979/1980 work at this site (two summary paragraphs in one general survey article in 1982, and three general paragraphs in another in 1983)—with no documentation at all. Fagan affirms the new interpretation. If there were no double standard, Stanford's presentation would be deemed unacceptable. Had Stanford proposed that the site is older than Clovis, Fagan would have demanded a detailed monograph. Why the difference? According to Fagan's scenario, an American site over 37,000 years old is simply impossible. It cannot be fitted into the model he is locked into by his basic postulates.

When I see sites likes Monte Verde, Taima-Taima, and Toca do Boqueirão d Pedra Furada, which fulfill all of the archaeological and geological conditions for acceptance listed by Fagan (p. 143), still discounted on the most frail of critiques, it becomes apparent that no amount of site data will be considered satisfactory, given Fagan's basic postulates. As Peter White and James O'Connell once observed about the situation in American Early Man studies, ". . . the acceptance and strength of data are conditioned by our ideas of what they ought to be."

The real core of the problem with Fagan's scenario of initial settlement of the New World, then, is the suite of fundamental postulates mentioned earlier in this review: the notion of a single origin and rapid worldwide spread of an advanced population of anatomically modern man no earlier than 40,000–35,000 years ago; and the idea that only people equipped with a complex and sophisticated Upper Palaeolithic technology could have entered the New World from Asia. Although these notions are long-standing among American archaeologists, they are now becoming outmoded as Euro-centric in origin. The archaeological and paleoanthropological record in China, virtually ignored by Fagan despite the citation of a significant paper by Jean Aigner, now indicates that there was a local transition from late Asian *Homo erectus* through archaic *Asian Homo sapiens* to anatomically modern Asian populations, a local evolution which took place gradually over the course of the past 200,000 years; with no material evidence of intrusion let alone replacement, by other populations or exotic Palaeolithic traditions in the late Pleistocene. We do not need a new population of anatomically modern man arriving from western Eurasia with a new Upper Palaeolithic technology late in the Pleistocene in order to start the clock on the settlement of the New World; capable indigenous populations were present in eastern Asia long before 40,000 years ago. We don't even need the Upper Palaeolithic technology—if the earliest settlers spread down the Pacific coast, as Knut Fladmark has suggested, a simple unspecialized lithic technology would have sufficed for a littoral adaptation (consider the ethnographic Yahgan of coastal Tierra del Fuego). Such a population, expanding linearly down the late Pleistocene coastline, could have reached South America before settlement of the interior areas of North America, accounting for the earlier dated occupation sites on the peripheries of the southern continent.

In other words, the great journey could have been earlier and shorter than Fagan would have it. With abandonment of outmoded postulates, an alternative model of the settlement of the New World becomes feasible—a model proposing indigenous Asian origins and a coastal route of initial entry by an early littoral-adapted population with an unspecialized lithic industry. This model would require not only the final discarding of the conventional Clovis model of initial entry, but also a fresh view of indigenous cultural evolution within the Americas. Fagan and others obviously aren't ready for such a truly revolutionary model as yet. Sooner or later, however, they must face up to a more realistic view of human biological and cultural evolution in east Asia, and to the evidence of the early South American archaeological sites. In the meantime, readers of Fagan's book should be aware that there is a fresher, alternative script for the drama of early human settlement of the New World, with a different route onstage, an earlier time frame, different props, and more complex action.

—Ruth Gruhn
Department of Anthropology
University of Alberta

Dating by the Rock-Varnish Method

(Continued from page 3)

elements—whole elements or parts of elements—found next to charcoal that dates to the late Pleistocene." A major article by Dorn on petroglyph dating in the eastern Mojave has just appeared in the October 1987 issue of **World Archaeology**.

"But," Dorn continues, "if you turn to all the rock-art panels in the western United States, you find that, although people have done a lot of work trying to make interpretations, there's been no really effective way of dating them." Until now. On some rock art, "the surface is pecked out and the varnish reforms," Dorn says. "The cation-ratio date is a minimum age for the petroglyph because it assesses the time for the onset of varnishing. The lag time, between initial surface exposure and the onset of varnishing, is about a hundred years. I've looked at historic surfaces in the western United States and in Australia, and it appears to take about a hundred years before varnishing is visible with a scanning electron microscope. So there's not much lag time."

> ***"It's important to stress for archaeologists that the method which I use is not destructive."***

A third use for the new method is in dating geoglyphs. "These are forms you can see only from the air, or can see best from the air," explains Dorn, artificial land formation or "disturbed desert pavements" that some people have construed to be landing strips for flying saucers, à la *Chariots of the Gods*. "We've done geoglyph work in Julian Hayden's Sierra Pinacate—looked at a spiral form and a human image several meters long, and found them to be early Holocene. This is the type of material that would have been undateable."

Dorn continues, "A perfect use of varnish radiocarbon dating is to look at the ages of the Nazca geoglyphs in Peru. There, you have a cobbled pavement coated with desert varnish; the disturbed surfaces have varnishes that have re-formed on them. . . . Years and years of study, yet these have never been dated. Persis Clarkson of the University of Alberta did a dissertation on a Nazca geoglyph; she tried varnish dating but had no calibration. And yet, you don't even have to mess around with cation-ration dating: there's enought surface area to gather material from so that you can go right to radiocarbon dating. She's interested in working with it, but for some reason nobody wants to fund it, and I haven't had the time to make a serious attempt at fundraising for it. Now, I wouldn't mind collaborating with Peruvians. . . "he trails off thoughtfully.

Funding, indeed, has been a recurrent problem—when isn't it in archaeology?—particularly due to the cost of setting up initial calibrations. Most of the original research has been supported by the National Science Foundation, but various archaeological groups such as ACT have chipped in to aid in further adapting the technique for archaeology.

Dorn reiterates, "I'm not an archaeologist, and don't pretend to be one. At all times I work with archaeologists: I don't try to do this by myself because I don't know what I'm doing!" He is even reluctant to try to push his technique with any hard-sell tactics for adaptation outside his own field: "I'm a geomorphologist, who just got sidetracked into this desert varnish stuff: a strong interest of mine is apply these techniques to geomorphology. How far they're useful to you," he tells archaeologists, "would be best evaluated by yourselves."

That does not mean he is not convinced that his method has its archaeological advantages. Beyond its primary advantage of being able to date otherwise-undateable artifacts and objects, Dorn says "It's important to stress for archaeologists that the method which I use is not destructive. You simply remove the varnish mechanically; the artifact is not harmed. Furthermore, PIXE is a non-destructive method, in that even the varnish itself does not get destroyed; it's still there for subsequent analysis.

Speaking of destruction, archaeologists attracted to Dorn's method are urged to go easy on the cleaning of their specimens. I don't like to work with an artifact that has been modified in any way. Archaeologists sometimes do funny things and clean their artifacts in peculiar ways. I haven't run all the tests possible to find out what type of treatment would affect a cation ratio. In general, I would strongly advise that, if people want their artifacts to be looked at, they do not bother taking anything to them but a toothbrush and some distilled water. They might want to mark which side was bottom and which side was top—but you can usually tell those things anyway."

Someone who develops a technique with many new possibilities is likely to caught up for a time in an initial whirlwind of activity, and Dorn has been enjoyably but rather exhaustively busy with projects and publications for several years now. Nevertheless, he is strongly aware of the need to communicate the existence and the details of his method to the archaeological community. "I would like to publish an introduction for archaeologists in a major journal sometime soon," he says hopefully. "What I want to do first is to publish a complete introduction to radiocarbon-dating varnish, then present an archaeological article." For rock-varnish dating is, as he hopefully declares, "a technique that is here to stay for archaeology."

—Michael Dolzani

NEW REFERENCES AND RESOURCES

**indicates a gift to the Center's library*

JOURNALS AND JOURNAL ARTICLES

Behrensmeyer, Anna K. and Susan M. Kidwell 1985 Taphonomy's Contributions to Paleobiology. **Paleobiology** 11:105-119.*

Callahan, Errett 1987 Metallic Powder as an Aid to Stone Tool Photography. **American Antiquity** 52:753-767.

Gruhn, Ruth 1987 On the Settlement of the Americas: South American Evidence for an Expanded Time Frame. **Current Anthropology** 28:363-365.*

Harwood, Ray 1987 J.B. Sollberger: Master of Folsom. **Flintknapping Digest** 4(2).*

Holliday, Vance T. 1987 Geoarchaeology and Late Quaternary Geomorphology of the Middle South Platte River, Northeastern Colorado. **Geoarchaeology** 2:317-329.

Holliday, Vance T. 1987 A Reexamination of Late-Pleistocene Boreal Forest Reconstructions for the Southern High Plains. **Quaternary Research** 28:238-244.

Martin, Paul S. 1987 Clovisia the Beautiful! **Natural History** 96(10):10-13.*

Nelson, Lisa 1987 Mammoths Resurrected After 26,000 Years. **Horizons: Research at Northern Arizona University** Fall:17-20.*

Sheppard, John C., Peter E. Wigand, Carl E. Gustafson, and Meyer Rubin 1987 A Reevaluation of the Marmes Rockshelter Radiocarbon Chronology. **American Antiquity** 52:118-125.*

Simons, Dwight D., Thomas N. Layton, and Ruthann Knudson 1985 A Fluted Point from the Mendocino County Coast, California. **Journal of California and Great Basin Anthropology** 7:260-269.*

Bulletin No. 12 of the **Central Texas Archeologist** is an entire issue devoted to the Horn Shelter burials, describing the burial's geology and grave goods dated at 10,000 years ago. This bulletin may be ordered from the Baylor University Bookstore, Waco, TX 76798.

OTHER

Mayer-Oakes, William 1986 South American Paleo-Indian Projectile Points. Paper presented at the World Archaeological Congress, September 1, 1986, Southampton, England.

Storck, Peter 1987 **A Question of Time.** Royal Ontario Museum Archaeologicla Newsletter Series II, No. 23. Toronto.

1959 Pleistocene Geology. Bibliography prepared for Geology 134 at Harvard University.

CONFER

UPCOMING CONFERENCES

March 10-13, 1988 NORTHWEST ANTHROPOLGICAL CONFERENCE, Annual Meeting, Sheraton Tacoma Hotel, Tacoma WA.
Contact: L. Klein, Conf Chair, or G. Guldin, Prog Chair, Dept of Anth, Pacific Luthern U, Tacoma WA 98447.

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, UNAM, 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 23-26, 1988 SOUTHWESTERN ANTHROPOLOGICAL ASSOCIATION, Annual Meeting, Monterey Beach Hotel, Monterey, CA.
contact: Myreleen Ashman, Prog Chair, SWAA, 600 Hudis St, Rohnert Pk, CA 94928.

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 Anth, 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 Ave, St Louis, MO.
Contact: Alice Kehoe, Dept of Soc and Cult Scis, Marquette U, 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 15-16, 1988 BETWEEN BANDS AND STATES: SEDENTISM, SUBSISTENCE AND INTERACTION IN SMALL-SCALE SOCIETIES, Southern Illinois University, Carbondale.
Contact: S.A. Gregg, Ctr for Arhcaeological Investigations, Southern Illinois U, Carbondale, IL 62901.

April 21-23, 1988 SOUTHERN ANTHROPOLOGICAL SOCIETY, in conjunction with the SOCIETY FOR APPLIED ANTHROPOLOGY, Annual Meeting, Hyatt Regency Westshore Hotel, Tampa, FL.
Contact: SAA Prog Chair—1988 Meeting, Dept of Anth, U South Florida, Tampa, FL 33620. Also Ruthbeth Finerman or Thomas Collins, SAS Prog Chairs, Anth, Memphis State U, Memphis TN; 901/454-2080.

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

May 8-15, 1988 FOUR-YEARLY NATIONAL SOILS CONFERENCE, sponsored by AUSTRALIAN SOCIETY OF SOIL SCIENCE, Canberra, Australia.
Contact: Australian Convention and Travel Service, GPO Box 1929, Canberra, ACT 2601, Australia.

May 11-14, 1988 CANADIAN ARCHAEOLOGICAL ASSOCIATION, Annual Meeting, Whisler Conference Centre, Whistler Mountain, British Columbia, Canada.
Contact: Jon Driver, Dept of Arch, Simon Fraser U, Burnaby, British Columbia, Canada V5A 1S6: 604/291-4182.

May 11-15, 1988 CANADIAN ETHNOLOGY SOCIETY, SOCIETY FOR APPLIED ANTHROPOLOGY, and the CANADIAN ASSOCIATION FOR MEDICAL ANTHROPOLOGY, Joint Annual Meetings, University of Saskatchewan, Saskatoon, Canada.
Contact: A.M. Ervin, Anth and Arch, U of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 0W0.

May 16-22, 1988 26TH INTERNATIONAL SYMPOSIUM ON ARCHAEOMETRY, Toronto.
Contact: Ursula Franklin, Dept of Metallurgy, U of Toronto, Toronto, Ontario, Canada M5S 1A7: 416/978-3012.

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, and the CANADIAN SOCIETY OF PETROLEUM GEOLOGISTS, Joint Annual Meeting, St. John's, Newfoundland.
Contact: John Fleming, Newfoundland Dept of Mines and Energy, PO 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, U of Ottawa, 648 King Edward Ave, Ottawa, Ontario, Canada K1N 6N5.

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

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June 6–8, 1988 AMERICAN QUATERNARY ASSOCIATION 10TH BIENNIAL MEETING, University of Massachusetts-Amherst.
Contact: Hal Borns, Prog Chair, 304A Boardman Hall, U of Maine, Orono, ME 04469.

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 U, Memphis, TN 38152.

July 26–30, 1988 SYMPOSIUM ON ASIAN PACIFIC MAMMALOGY, sponsored by AMERICAN SOCIETY OF MAMMOLOGY, and the MAMMALOGICAL SOCIETY OF CHINA, Kunming, Yunnan Province, People's Republic of China.
Contact: Dr Andrew T. Smith, Dept of Zoo, Arizona State U, Tempe, AZ 85287.

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

August 29–September 2, 1988 FIRST CONGRESS OF THE AUSTRALIAN ROCK ART RESEARCH ASSOCIATION, Darwin Performing Arts Centre, Beaufort Hotel Convention Complex, Darwin, Australia.
Contact: Australian Rock Art Res Assn, PO Box 216, Caulfield South, 3162, Victoria, Australia.

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 5–9, 1988 FISSON TRACK DATING, 6th International Workshop, Besancon, France.
Contact: J.-L. Janier-Dubry, Laboratoire de Microsnalyses Nucleaires, UFR des Sciences et Technology, 16 Route de Gray, 25030 Besancon Cedex, France.

September 19–23, 1988 INTERNATIONAL SYMPOSIUM ON ENGINEERING GEOLOGY AS RELATED TO THE STUDY, PRESERVATION, AND PROTECTION OF ANCIENT WORKS, MONUMENTS, AND HISTORIC SITE, organized by the INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY, Athens, Greece.
Contact: Paul G. Marinos, Greek Committee of Engineering Geology, PO Box 19140, GR-117 10 Athens, Greece; Telex: 45-4312 POLX (c/o Marinos).

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

September 23–October 2, 1988 UNSPECIALIZED BONE INDUSTRIES, 6th Meeting of Working Group No. 1, Sardinia, Italy.
Contact: Dr. Marylene Patou, Institut de Paleontologie Humaine, 1 rue Rene Panhard, 75013 Paris, France.

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.

November 10–13, 1988 HOUSEHOLD COMMUNITIES: THE 21ST ANNUAL CHACMOOL CONFERENCE, Calgary, Alberta, Canada.
Contact: 1988 Prog Chair, Dept of Anth, U of Calgary, Calgary, Alberta, Canada T2N 1N4. Appstracts and curriculum vitae due April 1, 1988.

January 5–9, 1989 ARCHAEOLOGICAL CONFERENCES, Baltimore.
Contact: Joan C. Brown, Conference Manager, c/o AIA, 675 Commonwealth Ave, Boston, MA 02215.

May 24–28, 1989 WORLD SUMMIT CONFERENCE ON THE PEOPLING OF THE AMERICAS, University of Maine, Orono, ME.

August 2–6, 1989 CIRCUM-PACIFIC PREHISTORY CONFERENCE, The Seattle Center, Seattle.
Contact: Dr. Dale R. Cross, WSU, c/o Pacific Celebration '89, 1001 4th Avenue Plaza, Seattle, WA 98154-1101; 206/622-2536.

AAPA Conference to Convene

The 57th Annual Meeting of the American Association of Physical Anthropologists will be held March 24–26 in Kansas City, Missouri. Hosted by the University of Kansas, Lawrence, the conference will feature 33 sessions focusing on topics in paleoanthropology, paleopathology, forensic anthropology, primate behavior, genetics, and evolution.

A symposium, organized by Dr. Wakefield Dort, Jr. and Larry D. Martin, both of the University of Kansas, Lawrence, promises to be of particular interest to archaeologists. This session will concentrate on Pleistocene human and animal osteological remains recovered from surface sites along the Kansas River.

In addition to the AAPA functions, there will also be meetings of the Paleopathology Association (March 22–23), the Human Biology Council (March 23), and the Dermatoglyphics Association and the Dental Anthropology Association (during AAPA sessions).

Those readers wishing to attend the meetings may register on site or in advance by contacting Paul Forio, Conferences and Programs, Division of Continuing Education, University of Kansas, Lawrence, KS 66045.

Ice-Age Hunters of the Rockies

A symposium focusing on the earliest human inhabitants of the Rocky Mountain Region will be held in Denver, Colorado, April 8–10, 1988. Co-sponsored by the Denver Museum of Natural History and the Smithsonian Institution of Washington, D.C., "Ice-Age Hunters of the Rockies" will feature 16 papers dealing with this area of Paleoindian Studies.

Scheduled papers will be given by: James B. Benedict (Center for Mountain Archaeology, Ward, Colorado) "Earlyman Above Timberline"; Dr. Robson Bonnichsen (Center for the Study of Early Man, Orono, Maine) "Earlyman in Montana"; Dr. Leslie B. Davis (Montana State University) "The Montana Paleo Period"; Dr. Brian M. Fagan (University of California, Santa Barbara) "The First Americans and World Prehistory"; Dr. Jack Fisher (Museum of Natural History, Smithsonian Institution) "The Mammoth Level at Lamb Springs, Colorado"; Dr. George C. Frison (University of Wyoming) "The Wyoming Paleolithic Period"; Dr. C. Vance Haynes, Jr. (University of Arizona) "New Radio Carbon Dates for Folsom, from the Lindenmeier and Folsom Sites"; Dr. Jack Hofman (Oklahoma Archaeological Survey, Norman, Oklahoma) "Folsom Sites: Oklahoma and the Texas Panhandle"; Eric Ingbar (University of Wyoming) "Hansen Site, Wyoming"; Pegi Jodry (Museum of Natural History, Smithsonian Institution) "The Cattle Guard Site in Southern Colorado"; Dr. Dennis J. Stanford (Museum of Natural History, Smithsonian Institution) "The Smithsonian Institution's Paleo Research: Colorado and New Mexico"; Dr. Christy G. Turner (Arizona State University) "New World Origins: New Research from the Soviet Union"; Dr. Joe Ben Wheat (University of Colorado Museum) "The Upper Paleolithic in Colorado".

In addition, short papers will be presented by guest speakers Dr. John Cotter (University of Pennsylvania), Dr. Cynthia Irwin-Williams (Desert Research Institute, Reno, Nevada), and Dr. Glen Evans (Austin, Texas).

A subscription dinner in honor of Dr. Marie Wormington will be held Saturday evening, April 9, 1988.

Registration for the symposium and other programs is required. For further information, contact the Denver Museum of Natural History, Public Programs Department, City Park, Denver, Colorado 80205.

Mammoths, Mastodons, and Human Interaction

In Waco, Texas, October 30-November 1, 1987, symposiasts convened to address the intertwined issues of the Peopling of the New World and mammoth/mastodon behaviors. Held in conjunction with the 58th annual meeting of the Texas Archaeological Society, the conference had as its workshop the 28,000-year-old Waco Mammoth site. Approximately 500 people attended the symposium "Mammoths, Mastodons, and Human Interaction," which was hosted by John W. Fox and Calvin B. Smith (Baylor University), co-principal investigators of the Waco Mammoth site. Fox and Smith are presently editing the conference proceedings for publication.

S. David Webb (University of Florida) discussed North and South American proboscidean distributions. Ernest Lundelius (University of Texas, Austin) delineated changing Southwestern late Pleistocene faunal zones and climatic regimes. Karl Butzer (University of Texas, Austin) presented a model to account for the hiatus in the American plains record of sites predating Clovis, even though 20,000- to 30,000-year-old sites seemingly exist in South America. This model draws comparisons from interfluves on the grasslands of Southern Africa, which also experienced temporal gaps in population during similar dry periods. James Adovasio and Anthony Boldurian (University of Pittsburgh) argued for a pre-Clovis presence in the eastern woodlands, indicated by findings at Meadowcroft. Joel Gunn (University of Texas, San Antonio) examined Clovis and Plainview site frequencies with regard to oscillating global energy and resultant climatic changes. Larry Agenbroad (Northern Arizona University) discussed adolescent mammoth behaviors inferred from the 40 individual mammoths recovered from Hot Springs, South Dakota, and presented new data on mammoth coprolite deposits discovered on the Colorado plateau. Jeffrey Saunders (Illinois State Museum) discussed possible mastodon and mammoth behavior suggested by his work at Boney Springs, Arkansas. Gary Haynes (University of Nevada), who gave both a symposium paper and the keynote address at the convention's banquet, described day-to-day African elephant routines, and what can be inferred from skeletal remains in reference to his fieldwork in the game parks of East Africa. John Fox and Calvin Smith (Baylor University) argued seasonal migration and defensive herd bunching of *Mammuthus columbi*, the Columbian mammoth, based on characteristics of the Waco mammoth herd. Gentry Steele and David Carlson (Texas A&M University) proposed a model for identifying human activities at "low profile" proboscidean sites lacking lithics. Pat Shipman (Johns Hopkins) presented quantitatively generated models for recognizing bone expediency tools. Site reports were given on the South Dakota Clovis-kill site, Lange-Ferguson, By Adrien Hannus (Augustana College) and on a megafaunal deposit at Ft. Hood, Texas, by Frederick Brieur. Tom Dillehay (University of Kentucky) spoke on human scavenging of mastodon remains based on his work in Monte Verde, Chile. Discussant Robson Bonnichsen (University of Maine) summarized the presentations.

A total of 19 papers were presented at the symposium, affording conference participants a memorable experience.

—John W. Fox
Department of Anthropology and Sociology
Baylor University, Waco, Texas

LUBBOCK LAKE LANDMARK

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Landmark and the Question of the Peopling of the Americas".

Late afternoon activities included a slide presentation on Lubbock Lake Landmark research and public programs, and an exhibit of materials recovered from the site. Festivities culminated in an evening barbecue.

Although sporadic attempts have been made to preserve Lubbock Lake for 40 years, plans to protect the site began in earnest in 1970. At that time, the Lubbock Chamber of Commerce, concerned about the potential for vandalism at the site, appointed Robert Nash, a prominent citizen of Lubbock, to chair a committee charged with developing Lubbock Lake into a park.

Nash, a long-time amateur archaeologist with a deep sense of history, entered into the task with enthusiasm. Acting as a liaison between the City of Lubbock and the Texas Tech excavators, Nash set about the goal of making Lubbock Lake a household name. His enthusiasm was contagious. As word of the project spread, an increasing number of the townspeople of Lubbock began visiting the site. Unlike many sites which are located far from easy access, the situation of Lubbock Lake on the edge of a metropolis made it particularly visible to the public.

A self-proclaimed "moonlight requisitioner" (or the "Radar of Lubbock Lake"), Nash cajoled townsfolk into augmenting the excavation budget with needed supplies. Ranchers donated meat. A catering service trucked in sandwiches. "We made a lot of fun out of it," says Nash. "It was," he adds, "kind of like a family picnic."

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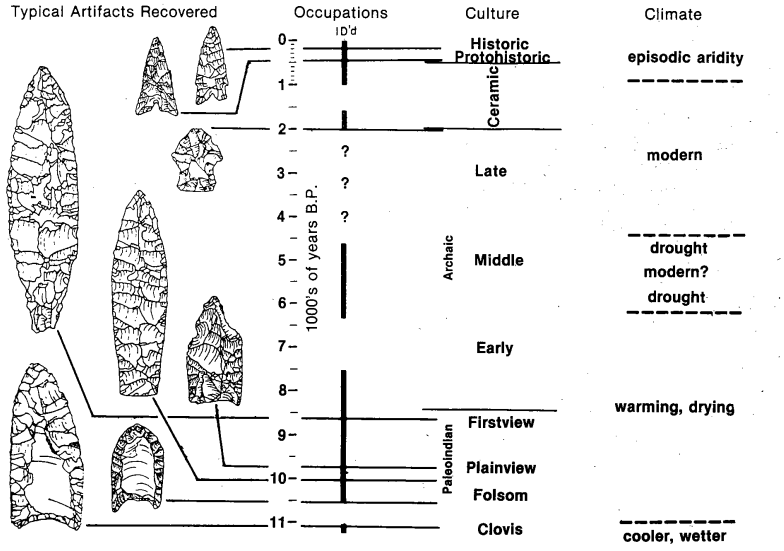
As public awareness of the importance of Lubbock Lake increased, so did a realization of the necessity to preserve the site. By the beginning of 1987, despite close cooperation between the City of Lubbock, the county, and Texas Tech University, the move to make Lubbock Lake Landmark a state park seemed at a standstill. Although plans for the park had been drawn up in 1983, funding for the project had met a series of dead ends. "We knew," Nash comments, "Lubbock Lake contained a gold mine of information, but no one wanted to open the door." Now, in addition to the ever-present danger of vandalism, the site was threatened by rising water tables.

In desperation, the supporters of Lubbock Lake enlisted the aid of Senator John T. Montford. Senator Montford, convinced of the urgent need to protect Lubbock, moved quickly to spearhead legislation geared towards preserving and developing the site. Within a matter of months, the red tape entangling Lubbock Lake had given way to the dedication of a new state park. "Lubbock Lake," emphasizes Senator Montford, "is a worthy heritage to pass on to future generations."

As the result of a cooperative agreement between the City of Lubbock, Texas Tech University, the Texas Tech Museum, and the Texas Department of Parks and Wildlife, plans are now underway for the construction of a three to five million dollar educational facility. The proposed land use pattern for the Lubbock Lake Landmark State Park calls for an archaeological preserve open to the public, with an on-going research program.

Lubbuck Lake Landmark is a 307 acre archaeological site located on an old meander of Yellowhouse Draw, a tributary of the Brazos River. Situated on the northern outskirts of the City of Lubbock, the site is in an area of formerly active springs. A 1936 attempt to reactivate springs in the draw led to the discovery of the site, when Folsom points and the bones of extinct Pleistocene animals were dredged from the deposits.



Illustrations of points from the Lubbock Lake Landmark sites are aligned with a timeline identifying the known cultural periods (solid vertical lines) which produced them. The column on the far right describes the climate of the time, as determined by analysis of sediments and other climate-sensitive indicators at the site. *(After Johnson, drawings by J. Cokendorpher).*

Subsequent investigations resulted in the recovery of 12,000 year old Clovis material, found in conjunction with the butchered remains of several extinct mammals, including horse, camel, mammoth, short-faced bear, and giant armadillo. "The bear and armadillo," notes Dr. Eileen Johnson, Director of the current Lubbock Lake Project, "are particularly important since these remains are the most recent known for these extinct animals and the first found in direct association with humans."

At another area of the site, excavators unearthed evidence of a Folsom bison kill/butchering locale. Here, explains Johnson, "Small herds were stalked, and bones from individual bison were stacked in small piles reflecting the butchering operations."

Moving up the stratigraphic column, researchers discovered a third Paleoindian occupation. "Plainview," says Johnson, "is the earliest post-Folsom occupation of the Southern Plains representing a continuation of bison economy, but a change in point technology." Three bison kill/butchering locales from the Plainview period have been identified at Lubbock Lake.

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Eileen Johnson

Plainview was succeeded by yet another Paleoindian occupation—Firstview. This period is represented at Lubbock Lake by two bison/kill butchering locales and a camping area, the latter containing evidence of plant gathering and processing.

In addition to these subdivisions of the Southern High Plains Paleoindian period, other archaeological excavations at Lubbock Lake Landmark have resulted in the discovery of Archaic, Ceramic, Protohistoric, and Historic material.

In conjunction with archaeological research, the ongoing Lubbock Lake Project has integrated research focusing on the geology, paleoecology, and paleontology of the site. This multidisciplinary approach has contributed greatly to an understanding of past environmental and climatic conditions on the Southern High Plains. Additionally, the 12,000-year-long paleoenvironmental record provides an ideal framework for reconstructing specific human adaptation patterns.

When the new facility is complete (target date October, 1989), an Interpretive Center, a laboratory for research conducted by the Museum, and trails, overlooks, and picnic areas will exist at the site. Dr. Robson Bonnichsen, speaking at the dedication ceremony, noted, "The outstanding record of Lubbock Lake is well suited for the investigation of unanswered research questions, graduate education, and public exhibits. The new Lubbock Quaternary Research and Archaeology Education Facility presents an opportunity to break with the academic tradition of scientists preparing papers for scientists."

The Interpretive Center is currently envisioned as a single floor structure of approximately 7,973 square feet. Three main units reflect the public programs thrust: an exhibit area for both long term and changing displays; a children's learning center for exploration and enhancement; and an auditorium to accommodate a variety of programs and audiences.

The Research Building, a single floor structure of about 3,535 square feet, will accommodate both Lubbock Lake Landmark and visiting scholars' research space needs. This, along with two other structures, a dining hall and an accommodations facility, will function as the proposed Quaternary Research Center.

The combination Research Facility/Interpretative Center will be the first state park to include a Paleoindian site. "Lubbock Lake," Senator Montford observes, "has the potential to become a world-class park of international interest." The Lubbock Lake National Historic and State Archaeological Landmark promises to provide a valuable model for other states engaged in similar endeavors.