OLD BONES IN THE NEW WORLD

"Why would people want to date bone?" Dr. R. Ervin Taylor, director of the Radiocarbon Lab at the University of California at Riverside, asked this rhetorical question during a recent conversation with the Mammoth Trumpet concerning the radiocarbon dating of bone. Dr. Taylor has been a major participant in the C-14 dating of over a dozen supposedly very old New World skeletons, showing them to be no more than 11,000 years old.

"Bone is a difficult material on which to get accurate C-14 dates," Taylor notes. Various types of contamination—bacteria and organic substances in the soil for example—can alter the C-14 activity in bone. A radiocarbon specialist charged with dating bone, must perform extensive chemical pretreatments to remove organic contaminants before dating can even begin. Wood and charcoal, on the other hand, are usually much easier to work with. So why date bone?

"The reason," Taylor points out, "is that in many situations other sample types are simply not available." But bone is often preserved. A single human bone or, more frequently, a bone fragment, is often all the evidence that has survived. Wood or charcoal samples in the vicinity of a human bone can provide a date by association. "But many geological processes can disrupt the physical relationship between objects in sediment profiles. It is best to work with the bone itself."

The bones that date back to the period of the arrival of humans in North America are not, however, stout white shafts with Marmarukian knobs, but are more likely to be dirt encrusted, ground-water stained fragments with much chemical and physical alteration. Taylor explains that in the radiocarbon dating game as sample size decreases, analytical problems multiply. "In the conventional means of measuring radiocarbon by decay counting—inferred radiocarbon concentration by noting the decay events—up to several kilograms of material might be required."

Dr. R. Ervin Taylor examines skeletal specimens in the Radiocarbon Laboratory at the University of California, Riverside prior to dating them with the recently developed accelerator mass spectrometry technique. (Photo courtesy of R.E. Taylor)

"This," says Taylor, "is where accelerator mass spectrometry comes in." Accelerator (or atom) mass spectrometry—referred to as AMS—can accommodate carbon samples on the order of 1/1000 the size of that needed.

Interview with Julian Hayden

A BRIDGE OVER TIME

"I'm a bridge, in a way, between the old-timers—the giants—and some of the grad students and younger archaeologists of today," says Julian Hayden, recipient of the third annual Crabtree Award, presented by the Society for American Archaeology to non-professional archaeologists of distinguished achievement.

In the past 50 years, archaeology, similar to other disciplines, has become more professionalized and institutionalized, with advancement and recognition increasingly dependent upon academic credentials. Yet, the foundations of North American archaeology were laid by people whose education was acquired in the field, through hands-on experience and the seasoned advice of mentors. These pioneers were seldom funded, let alone salaried and guaranteed job security by an institution. They often worked alone, supporting themselves through a depression and a world war by taking whatever jobs they could find, and doing archaeology whenever they could spare the money and the time. Most of these explorers are gone now; Julian Hayden is one of the few who remembers both the people and the vision that fired them. Remembers because, indeed, at age 77 he is one of them, one of the last of a vanishing breed.

One of Hayden's few advantages when first entering the field was a father who was already an archaeologist. "My father got his master's in archaeology under Prof. F.W. Putnam at Harvard in 1909. For reasons of his own, he went to Montana and got a job in a sawmill, going on later to do many things, including being an editor, secretary of the chamber of commerce, and a Marine in World War I, and winding up eventually in southern California. In 1929, M.R. Harrington, of the Southwest Museum in Los Angeles, invited my father to go with him to Nevada to excavate Mesa House. My father did and took me along; he wrote the report on Mesa House and I illustrated it, having some small ability in drawing. So that's how I got into archaeology, though I'd heard about it all my life." Heard about it and become already drawn to it. "I found my first arrowhead and that cinched it—you know how that goes."

Although Hayden possesses no formal degree, the lack of it has affected him only in the matter of getting

(Continued on page 7)
WORLD SUMMIT CONFERENCE ON THE PEOPLED OF THE AMERICAS

As announced in the last issue of the Trumpet, the Center for the Study of Early Man, as an affiliate of the Department of Anthropology and the Institute for Quaternary Studies, University of Maine, is convening a World Summit Conference on the Peopled of the Americas. This international gathering of scholars from more than a dozen countries will be held May 24–25, 1989 at the University of Maine campus in Orono, Maine.

The goals of this conference are: to synthesize current knowledge on early human colonization and adaptation in the western hemisphere; establish mechanisms to coordinate pertinent global research over the next decade; and foster public awareness of the need for conservation and preservation of archaeological sites.

Conference speakers and papers by topic include:

**GENERAL:**
- James Adovasio—An Application of Nitrate-dissolute Membrane for the Identification of Blood Residues on Artificial Material
- David Young et al.—Exploring the Usefulness and Validity of the Microfossil Approach to Lithic Analysis
- Tom Sudaroff—Accelerator 14C Dating of Human Fossils in the New and Old Worlds
- R.E. Taylor—Framework for Dating Human Bones Using C-14
- Merritt Ruhlen—Linguistic Evidence for the Peopling of the Americas

**ASIA:**
- Christy Turner II—Relating Eurasian and American Populations Through Dental Morphology

**WHAT'S NEW AT THE CENTER?**

It has been said that the more things change, the more they say the same. In many senses, that is very true here at the Center. In the midst of the many changes here, we neglected to send out renewal reminders to all the people whose subscriptions expire with this issue. Since these people will not have had adequate notice to re-subscribe without missing an issue, we are sending this note to those members in anticipation of their renewal. We apologize for any inconvenience or confusion our reorganization here may have caused you, and hope you will continue to support the Center by subscribing to the Trumpet.

Renewal notices will be going out shortly for all members whose subscriptions expired with volume 4, number 3 or 4. Please return your renewals by December 1, 1988 to guarantee that you will continue to receive the Mammoth Trumpet with no interruption. (An easy way to determine the period you are newest through is to check your mailing label. The number in the top left corner indicates the last volume and issue you will receive with your current subscription.)

Some of the changes at the Center involved the departure of two staff members and the arrival of two new. All three staff members are joint as our business manager, as well as replacing Kathi Waters as the person in charge of Mammoth Trumpet subscriptions and distribution. Pat holds degrees in economics and business from the University of Maine at Farmington, and has several years of managerial experience. Louise Bennett replaces Karen Hudgin as the Center's accountant. Louise, who recently moved from Maine to Easton, Massachusetts, brings to the Center 20 years of expertise in the secretarial field.

Although changes have occurred, we are still here, publishing the Mammoth Trumpet and carrying forward research on the peopling of the Americas and making the resulting information available to an ever-widening audience. Please continue to feel free to correspond with us; we enjoy hearing from our readers.

**SUMMIT '89**

**MAY 24-28, 1989**

**EDITOR'S COLUMN**

This issue of the Mammoth Trumpet is a tribute to all the men, women, and children who have picked up a fragment of stone or bone and bothered to ask: "What is it?" "Where did it come from?" "Who made it?" "What were those people like?" Much of the richness and diversity of archaeological discoveries comes to us due to the work of those all-too-frequently unheralded heroes of archaeology—our amateurs. Three articles in this issue will introduce you to the work of three outstanding individuals who, in their own way, have made significant contributions to the field of archaeology.

Julian Hayden is a noted southwestern avocational archaeologist whose career spans nearly six decades. Hayden, a self-taught expert on early desert cultures, has established a sequence of cultural complexes which appear to date back an incredible 29,000 years!

Montana rancher George Cremer has fostered avocational archaeology in a different way. Each year the Cremer Ranches host a gathering of approximately 150 people, from local ranching families to professional archaeologists. Flint-knapping demonstrations, trips to archaeological sites, and a barbecue are part of this two-day event that is one man's way of bridging the gap between the interests of the public and professional archaeologists. It is a fine example of citizens becoming actively involved in the preservation of prehistoric sites on private land.

For nearly 50 years, Ed Lehner has also played host to scholars from around the world who specialise in the site on his Arizona ranch. The Lehner site contains an extensive faunal and Paleoindian record which has been the focus of several extensive excavations. Throughout it all, Ed Lehner has remained deeply involved in all the studies of the site, serving as tour guide to the public, assisting in the excavations, and arranging for housing (and even medical care) for the archaeological crews. Lehner, now 75, and his wife Lyn have decided to ensure the preservation of the site for future generations by donating the land to the Bureau of Land Management.

These three people, and many more like them, are the heart of archaeology. They share their time and their love of the land, past, present and future, with all who will take the time to listen and to marvel at what they have found. They point the way, not only to the actual sites, but to the future, as they share their interests and discoveries with their friends, neighbors and, most importantly, with the children who will inherit it all.
LEHNER RANCH SITE: OFFICIALLY ON THE MAP

On March 26, 1988, a ceremony was held in Hereford, Arizona, to celebrate the donation of an important archaeological site to the Bureau of Land Management (BLM). The Lehner Ranch site, one of the oldest cobb midden sites in North America, was owned by Ed and Jean Lehner for over 35 years. During that time, the Lehners preserved the site and gave generous help and encouragement to scholars from the world over who came to study it. In time, the Lehners decided to donate the land to the BLM to ensure that it would be preserved forever. Says Ed Lehner: "My wife and I both would like to see the site available to future generations for research." Both the academic world and the government were well represented at the ceremony, which drew a crowd of more than 200. Speakers included Kay Studly, District Manager of the BLM, Dr. C. Vance Hayes, Jr., Professor of Geological Sciences at the University of Arizona, Dean Bibles, BLM State Director, John Huber, an architect hired by Robert Buxford, Director of the BLM. As the close of the ceremony, a handshaded plaque was unveiled. The plaque describes the discovery of the site, lists some of its major characteristics, and commemorates the donation to the BLM.

In his remarks, Dr. Hayes spoke of the generosity of the vision displayed by the Lehners over the years. "Ed and his wife, Lyn, have hosted dozens of world-renowned scholars, hundreds of university students, and thousands of schoolchildren and other visitors..." Dr. Hayes said that there are many successful scientists around today who have profited scientifically by their participation in the Lehner Ranch site excavations and philosophically by their association with the Lehners.

Dr. Haynes went on to explain that the Lehner Ranch site has yielded some of the most important data researchers have concerning the Clovis culture. The site was the first to produce radiocarbon dates for a Clovis site, showing it to be about 11,000 years old. It also contained the greatest number of Clovis projectile points and мамmoth founds in situ in Arizona: thirteen projectile points and the remains of thirteen mammoths. In addition, the Lehner Ranch site was one of the first Paleomastodon sites to yield fossil grazers, which enabled scholars to reenact the environment. And if all the foregoing were not enough, the Lehner Ranch site also produced the first evidence that Clovis people ate small game, such as rabbit, in addition to mammoth and bison.

Ed Lehner made the momentous discovery of the site while inspecting the drainage on his newly purchased ranch. As he walked along the bank of an arroyo on the northwest corner of the property, Lehner noticed some bones protruding through a distinct black layer of dirt or silt. Taking a closer look, he was able to identify the bones as the tooth plate of a mammoth. When asked how he knew what they were, Lehner explained that he had had lifelong interest in archaeology and prehistoric cultures. "Part of my youth was misspent prowling Indian ruins and museums," he says cheerfully. Recognizing the significance of the find, he began removing some of the bone, and with a small shovel and a crowbar, he uncovered a number of mammoth and bison bones.

The Lehner Ranch site has now attracted hundreds of visitors each year. About four to five hundred school children visit on field trips every year, and about 200 adults. Ed Lehner personally takes many of the groups on tours of the ranch. He has loudly stated, "Since I'm retired I do most of the lying about the site!" When asked why the children's reactions differ from the adults, he says, "The adults ask questions to show their knowledge, and the kids ask questions to find out. You tell me which is the better question.

Ed Lehner, right, tends a path often taken as he leads a tour of the excavations on his Arizona ranch.

"The adults ask questions to show off their knowledge, and the kids ask questions to find out. You tell me which is the better question."

not be positively identified as skull bones. In any case, these fragments were not enough to account for all the animal remains present at the site. Since a cranium had been found at the Naco dig, the absence of skulls at the Lehner Ranch site was puzzling. The researchers could find no reason to account for the absence of skulls and assumed that they simply did not survive. In February of 1956, a second excavation was undertaken adjacent to the first. It revealed two charcoal hearths, also located on top of the sand, as well as the bones of at least one horse, bison, and tapir. Positioned among the bones, although not embedded, were thirteen Clovis fluted projectile points, eight cutting and scraping tools, a chopper, and miscellaneous flakes and chips. Small amounts of charcoal were also found. It was the discovery of bones and tools together that made this site so exciting. Researchers postulated that the site contained the remains of animals killed by human hunters. By examining the sand and gravel surrounding the bones and artifacts, the scientists determined that the kill had taken place on a sand and gravel bar in an ancient stream, a tributary of which is now the San Pedro River. They also concluded that the animals had been killed in a series of hunts that occurred over a fairly brief period of time.

Interestingly enough, no conclusively identifiable animal skulls were found. Although several masses of badly crushed flat bone were excavated, these could have been mustelid bones or alternatively bones from a young mammal. The only reason for this was that none of the remains of mustelid bones were discovered. The excavation also yielded a completely unexpected find: a prehistoric well, probably from a Clovis occupation. Radiocarbon dating of specimens indicated they were about 1,000 years younger than the Clovis occupation. No other Clovis artifacts were found.

The Lehners have been deeply involved in all studies of the site, acting as gracious hosts, as well as volunteer labor. Summarizing their involvement over the years, Ed Lehner says, "Whenever I could spare the time I was there with a trowel or whisk broom or whatever. We arranged for outside labor and all sorts of things: housing, medical care for some of the diggers, that sort of thing.

In addition to working with scientists and students, the Lehners soon found themselves responding to the interest of the media. In particular, Mr. Lehner likes to recall an article called "The Arizona Hunt" published in 1956 in Sports Illustrated. "The mammoth made the centerfold," he says with a laugh. "I think that's somewhat of a distinction!"

In 1967 the ranch was put on the National Register of Historic Places. In 1974 the mastodon site was prominently featured in a documentary, produced by Shell Oil, called "The Early Americans."

The Lehner Ranch site now attracts hundreds of visitors each year. About four to five hundred school children visit on field trips every year, and about 200 adults. Ed Lehner personally takes many of the groups on tours of the ranch. He has loudly stated, "Since I'm retired I do most of the lying about the site!" When asked why the children's reactions differ from the adults, he says, "The adults ask questions to show off their knowledge, and the kids ask questions to find out. You tell me which is the better question.

After listening to him speak with energetic enthusiasm about the site and everything related to it, it is hard to believe that Lehner, 73, suffers from what he calls "youth deficiency." Nevertheless, in view of that supposed deficiency, he and his wife Lyn decided to ensure the preservation of the site by giving it to the Bureau of Land Management. Of the ceremony held in March, Lehner speaks with his usual modesty and humor. He says, "C. Vance Haynes made a speech. Kolbe made a speech. Burford made a speech. Lehner made a speech—if that's not enough specifying for one day, I'll eat my shirt!"

At the present time, the BLM's plans for the site are uncertain. The 6.1 acres donated by the Lehners about the 45,000-acre San Pedro Riparian National Conservation Area, also owned by the BLM. This conservation area includes the Murray Springs mammoth site. While no plans for the region have been confirmed, the BLM is considering projects that would enable the public to visit the Lehner Ranch site.

Proposed plans for the Lehner Ranch site include a visitor's center that would contain displays of bones and artifacts, dioramas, and maps. Outside, facsimiles of original bones and artifacts may be repositioned in the location where they were originally found during the excavations.

In addition, plans call for trails to be built through the site with explanatory plaques and signs positioned along the way, thus enabling self-guided tours. Eventually, guided tours may also become available.

-Nancy Allam
A BRIDGE OVER TIME

(Continued from page 1)

jobs. "And I've never worried about that anyway," he responds. "Because I've always been able to do whatever I set out to do. My father used to say that the more things a man had done in life, the better archaeologist he would be, because he was dealing with people. In this sense, Hayden was well prepared indeed: it is not every archaeologist who can list among his publications The Facts of Life with Septic Trenches."

Hayden and his father later worked for the 1934/35 season at the Snaketown site for Gila Pueblo (a research organization), but were laid off for the summer. Instead, in August, I met my bride there," he recounts. "I went home, put two Model TIs together to make a Model T pickup, and picked her up when she came back to Arizona. We went to Mexico and elsewhere on our honeymoon," during which time he claims to have taught her how to cook. More activities followed: a second season at Snaketown, and three and a half years for the CEC (Civilian Conservation Corps) at the great ruin of Pueblo Grande in Phoenix, Arizona.

In 1936, Hensley was asked by his friend, Malcolm Rogers, of the San Diego Museum of Man, to help excavate a site, and his career began at last to move in the direction in which it has traveled ever since. "I took leave from the Civilian Conservation Corps, went over and excavated the Harris site with him north of San Diego under a Carnegie grant. That's the first stratified early-man site that was ever done in this country, dating to 8,000 years B.P., which Rogers placed in Phase II of his San Diegoito Complex."

Rogers was, in Hayden's description, the grand old man of archaeology in the deserts of southern California, Nevada, and western Arizona. Unlike most others, Rogers did not devote himself to the three Ps of Southwestern archaeology: pueblos, pottery and projectile points. Instead, he concentrated on trying to identify the desert cultures which lacked pottery or the like. He worked in the Yuma area for two and a half years, later at Edwards Air Base in the Mojave Desert, somehow still managing to do a little desert archaeology on the side. "When the war was nearly over," he continues, "I was transferred back to Tucson, where I set up a couple of squadrons until we could get enough of an adobe house to live in, and brought the family over and started an excavation business."

Before the war, however, Hayden had worked at one of the three places that later enabled him to extend Rogers' series of cultural complexes back further into prehistory—so far back that, at the present hour, late in his career and long after his retirement from construction contracting, Hayden has become a controversial figure.

In 1942, Hayden assisted Dr. Emil Haury of the University of Arizona, in excavating Ventana Cave in southeastern Arizona, the only stratified cave of its kind to be excavated in the Southwest. The strata, made by a permanent spring in prehistoric times, yielded in the two lower levels, the bones and tools fragments of extinct horse, camel, dire wolf, and other animals. The cave also contained charcoal and bifacial tools. Rogers, examining the tools and flakes, identified the site as belonging to his earliest designated phase, the San Diegoito I (SD-I). All of Rogers' identifications were subjective; he worked before the advent of C-14 dating. Yet, 20 years later, the organic material from Ventana Cave was finally analyzed, the bone from the lowest level yielding a radiocarbon date of 12,600±2500 years B.P. and the charcoal from the second level a date of 11,300±200 years B.P. Not only did this lend credence to Rogers' sequence of complexes, including the two early, pre-projectile point phases SD-I and SD-II, it also contributed to Hayden's gradually growing hunch that there might exist cultural complexes underneath and earlier than the San Diegoito. Rogers himself had theorized as much early on; even producing a name for them, the Malpais. But, manent except for human disturbance. Tools dropped on the desert pavement remain lying atop it and are thereby identified as being more recent tools within or projecting through the pavement are necessarily as old or older than it is, as the composition of the pavement prevents anything from sinking through it.

Although Hayden has been working in Sierra Pinacate since the 1950s, he could not begin to verify his more startling observations until he had acquired a dating technique: not radiocarbon, but the analysis of desert varnish, a technique pioneered by Ron Doran, whose work was featured in a recent issue of the Mammoth Trumpet (Vol. 4, No. 2). Desert varnish is a black deposit of clay, manganese, and other substances formed by microbes on bones and other rocks in the desert pavement following extremely dry climatic periods.

A thorough search by Alan across Ron Doran," Hayden recounts, "when he asked me if I would like to read his bachelor's honors paper. He'd gotten interested in varnish, and had read some papers I'd written. So he took it from there, and we've worked very closely ever since." What Doran developed was a method of dating the varnish through cation ratio analysis; when he had done so, various pieces of a puzzle began to come together.

Rogers himself had noted in the Colorado desert back in the 1950s that San Diegoito I tools, bifacially flaked and thinly varnished, differed from other tools found in the same area which were unifacially flaked and heavily varnished. Indeed, it was the latter to which he had tentatively applied the name Malpais before abandoning the notion in favor of a basal stage as untenable, in the absence of a reliable non-subjective technique of dating. Hayden had noticed a similar phenomenon in Ventana Cave.

When he got to Sierra Pinacate, Hayden not only found tools which differed in their amount of varnish, but observed that the SD-I tools, as well as those of a more recent culture called Anamaguan, lay on top of the desert pavement. The heavily varnished unifacial tools either projected from the similarly varnished pavement or had been dropped upon still older pavement, establishing a sequence. Hayden therefore revived the name and theory of a basal Malpais Complex.

How much older you ask? As the San Diegoito I Phase at Pinacate and in Ventana Cave is roughly contemporaneous with Clovis, the Malpais Complex appears to be clearly pre-Clovis, or older than 11,500 years B.P.

At this time another piece of the puzzle fell into place. From Malpais times until recently, a number of tools were made out of shell which were brought from the Bay of Adair. East of the present shoreline, Hayden found acostal dunes with food shell remains: occupied dunes. The weathered surface shell yielded a radiocarbon date of 33,500±600 B.P., lower level dates in excess of 37,000 years B.P. It has been only in the last few thousand years that the sea level has risen and the shoreline close enough to place. At this time another piece of the puzzle fell into place. From Malpais times until recently, a number of tools were made out of shell brought inland from the Bay of Adair. East of the present shoreline, Hayden found acostal dunes with food shell remains: occupied dunes. The weathered surface shell yielded a radiocarbon date of 33,500±600 B.P., lower level dates in excess of 37,000 years B.P. It has been only in the last few thousand years that the sea level
The Crabtree Award was instituted in 1986 by the Society for American Archaeology to honor the distinguished careers of non-professional archaeologists. The first award was presented to Dr. Louis M. Caperton, professor at the University of South Carolina, and in 1987 to Dr. John T. Clark, director of the South Carolina Historical Society.

The award is presented to an individual who has made a significant contribution to the field of American archaeology. The recipient is selected by a committee of professional archaeologists and is presented with a cash award of $500 and a plaque.

The award is given annually and is open to all qualified individuals. Nominations are accepted from all over the world and are reviewed by a panel of experts in the field of archaeology.

This year's recipient is Dr. Ruth E. Knudson, a professor of anthropology at the University of Texas at Austin. Dr. Knudson has dedicated her career to the study of ancient cultures and has made significant contributions to the field of American archaeology.

Dr. Knudson's research focuses on the prehistoric cultures of the Southwestern United States, and she has conducted numerous archaeological excavations in the region. Her work has helped to shed light on the lives and cultures of the peoples who lived in the region thousands of years ago.

In addition to her research, Dr. Knudson has also been an active member of the Society for American Archaeology and has served on several committees and task forces. She has also been involved in the development of educational programs for K-12 students and has worked to promote public awareness of the importance of archaeology.

The crabtree award is a testament to Dr. Knudson's dedication to the field of archaeology and her tireless efforts to advance our understanding of the past.
A BRIDGE OVER TIME

He remembers: "I had about 13–16 young men from Scorpius Philo and me and what not, we were tough guys. But they became interested very quietly. I taught them how to file percussion tools the way Rogers had taught me, taught them something about percussion and artistry, and, you know, they knew more about any aspect of it than the master's classes from the University of Arizona that were taught in once a week to see what we were doing. It is only fair to add that lathes and soils were not noticed in those days."

Of course, it could be argued that archaeologists with an interest in the period may be claiming in the field for awhile, when they do eventually pick up experience they may miss the trend those who have extensive experience are limited in theory and textbook knowledge. Hayden is not so sure it actually works that way. Not only may some academics avoid the field for the most part, but academic and institutional policies can generate pressure to distort interpretations upon which careers are perceived to be hanging. "Another thing I tell graduate students: don't ever take any archaeological report at face value, mine or anybody else's. Because you know, and you cannot know, the intermanual and intramural politics of the time. I know what lies behind a lot of our major reports because I was enmeshed in them, or my friends were involved in them. And I wouldn't give you two bits for some of them."

But should the universities beware of narrowing the perspective of becoming job-training centers? Well, Hayden is not convinced that the stress and competitiveness of modern academic life is really conducive to serene Olympian detachment and broad intellectual vision. "I've known so many promising young folks who have turned out, or have been driven out, for departmental reasons, for political reasons..." if Hayden's view is not entirely beyond argument, neither can it be dismissed as simple job-hunting materialism. He and his wife never pursued money, and funded all their work out of their own earnings. "We even paid for our own C-14 dates and all the rest of it," he says. "We had graduate students when they were available, helping themselves through school by working in my laboratory in one of my shop buildings. We managed to do some..."

Hayden's criticisms are hardly sour grapes: never involved in skirmishes for money and position, he spends his retirement enjoying archaeology full time, traveling back and forth to Mexico and writing and talking shop. "Nor is it necessarily biting the hand that feeds to express concern over the direction in which the discipline to which he has devoted his life appears increasingly to be drifting. Far from being eccentric, his concern is shared by many, and the Crabtree Award itself represents an effort on the part of the professional community to redress some perceived injustices, to address a problem symptomatic of some of archaeology's deepest tensions."

Hayden was taken by surprise when he won the Crabtree Award. "If it hadn't been for Carla Van West, who's working on her doctorate here, this would never have happened. She's the one who started this whole thing and got other people working on it, piling up a lot of information on me." The choice, however, seems a natural one. Hayden was not only a friend of Don Crabtree's but resembles him in a number of ways. As Hayden explains, "We had a great deal in common. We were both non-degree engineers of sorts. And certainly non-degree archaeologists; both of us were silversmiths and jewelers; we both had lost our wives. As a matter of fact, we were planning a trip to Australia and Japan when he died."

When asked about his feelings on receiving the award, Hayden remarked that Don Crabtree once told him it was the most interesting that a man should be honored for doing exactly what he wanted to do with his life. And he adds: "I feel that way myself. I've done this regardless—and I still do regardless. I don't give a damn; I'm an independent old curmudgeon and always was."

"One thing I always keep in mind from the days when I was digging Ventana cave and the Lockheed bombers were flying overhead to Britain, we field archaeologists are on the fringes of life, we are all ex-cops to a degree and not one of us has ever put a bean in a person's pot. So let's enjoy the fullest our most privileged lives."

—Michael Dolan

MYSTERY OF THE RED PAINT PEOPLE


Gourly North America have been colonized by a maritime culture from across the Atlantic? Mystery of the Lost Red Paint People explores this possibility and others as it examines the accumulating evidence from the western shores of the North Atlantic. Excavations from New England to Labrador have yielded the remains of an ancient maritime culture, known recently as the Xarimite Archaic, which flourished along those shores approximately from 6,000 to 3,500 years ago, culminating at about the time Eskimo culture reached Labrador from the northwest.

The harsh conditions of the North Atlantic coast have left few traces of this once thriving culture. But new evidence from recent research has given archaeologists new insights into the lives of the Red Paint People. They have begun to reconstruct the lifeways of a people who built and sailed ocean-going boats and established vast trade networks long before the Vikings, erected monoliths before Stonehenge, and constructed elaborate burial mounds for their dead centuries before Howard Carter's work on Tutankhamen. The film introduces some of the people involved in this fascinating research and takes the viewer to many of the remote sites mentioned, on both sides of the Atlantic.

Mystery of the Lost Red Paint People is beautifully filmed and edited, incorporating archive photographs and clear graphics. The blend of scientific investigation and historical research will appeal to both the general public and professionals with an interest in North American archaeology. It is particularly well suited for classroom use.

NEW REFERENCES AND RESOURCES


OLD BONES IN THE NEW WORLD

(Continued from page 1)

typically required in decay-counting. AMS technology was made available for archaeological dating in the early 1980s, and immediately produced interesting results for physical anthropologists.

To those of us interested in dating human bone, as well as the issue of dating the peopling of the New World, AMS came along at a most opportune time. Taylor and his colleagues used the techniques of measurement on bone and still have enough sample left to obtain a date.

The source of the radiocarbon in our bones can be traced through the food chain and into the galaxy beyond. Cosmic radiation of very high-energy, traveling through space strikes and shatters air molecules in our atmosphere. Particles such as mono- and neutrons are produced during these collisions. When one of these neutrons interacts with nitrogen, the most abundant component of our atmosphere, the result is the production of radiocarbon or C-14. This isotope of carbon quickly combines with oxygen in the atmosphere to produce a molecule of radioactive carbon dioxide. This gas molecule has the same chemical properties as a regular carbon dioxide molecule but it contains an unstable carbon atom that can disintegrate at any time.

Radioactive carbon is thoroughly dispersed across the planet by atmospheric mixing. Chemically indistinguishable from normal CO₂, it enters into plants through photosynthesis. Since humans eat plants, issues contain concentrations of radioactive carbon that are similar to any other participant in the terrestrial food chain. One out of every trillion carbon atoms in your bones is radioactive carbon.

This is the basis of radiocarbon dating. Once an organism dies, it no longer obtains radiocarbon from the atmosphere. The amount of radiocarbon within a bone slowly diminishes as individual C-14 atoms in the bone decay at a constant immutable rate. The age of the once-living object is determined by measuring the amount of carbon that remains, and knowing how long it would take for the radiocarbon to decay from its living level down to the level observed in the sample.

In 1960, Taylor, then a first year graduate student, was hired into the isotope lab of Willard Libby at UCLA. Among other reasons, Taylor was attracted to UCLA by the recent arrival of Libby at the university. This was the year that Libby received the Nobel Prize in Chemistry for the discovery of the radiocarbon method. "It was a very unique experience to watch him in action."

While at the University of Chicago in the late 1940s, Libby and his associates had demonstrated that radiocarbon dating could be used to determine the age of a once-living object without any reference to stylistic comparisons of artifacts or stratigraphic positioning of specimens. Thus, radiocarbon dating could be applied to bone, however, the "Radiocarbon Revolution" had to await the development of extensive pretreatment approaches. Taylor states, "In bone that has been in the ground for any length of time, things happen. It is sometimes called diagenetic effects." Bone is composed of both organic and inorganic substances. Realizing that the inorganic component of a bone could be easily exchanged, and thus, "modern" carbon introduced into samples, labs in the 1960s began working with the organic fraction. In modern bone, most of the organic content is the protein collagen. What is collagen? "If you take a bone from a freshly killed cow and you place it in acid, CO₂ is released and what you have left is glue. This is mostly collagen which is the major fibrous protein of bone," explains Taylor.

Unfortunately, collagen breaks down or denatures (changes structure) due to hydrolysis (chemical reactions with water). This means that the collagen, over the longer a bone is in the ground, the amount of organic it sometimes decreases at a very rapid rate," Taylor comments. "Thus the smallest sample of bone is very ill, very old (and thus having very low levels of C-14), or too valuable to be destroyed in whole, AMS is the only way to proceed.

AMS is sometimes referred to as the "direct counting" approach. While decay-counting determines the amount of C-14 in a sample by looking at the sample's rate of radioactive decay, the AMS method measures the radiocarbon directly.

The basis of the approach is a particulate accelerator, which serves as the "engine" of the AMS process. A small amount of the sample is ionized and charged, and then accelerated down a tube in a high-powered stream of ions. When the stream of ions curves through a magnetic field, it repels the ions out by mass. In the case of carbon, there are three different streams, C-12, C-13 and C-14. Radiocarbon (C-14), swinging wide through the magnetic field because it is the heaviest isotope, enters a measurement chamber through a strategically-placed slit and is measured via its interaction with a gas.

Taylor works with Libby, and his colleagues approached a long-standing gray area in American archaeology—the question of the timing of the peopling of the New World. It has been determined that before about 12,000 years ago, the presence of great continental glaciers had lowered the sea level and created a land bridge between Siberia and Alaska. It is generally accepted that this was the means by which the initial human populations reached the New World. During the 1970s, several human skeletons were assigned ages in the 50,000 to 70,000 years BP range by the new dating method, amino acid racemization (AAR).

This method measures the percentage of amino acids that have spontaneously changed over to a different form. Many amino acids can have two forms, labelled L, or levo, and D, or dextro, that are mirror images of each other. Living matter generally only contains the L form of amino acids. However, over a period of time, a number of these L-forms will spontaneously switch to the D form. One of the more celebrated skeletons dated by the AAR method was the Sunnyside skeleton. This is a complete female skeleton excavated near San Francisco. Its AAR-assigned age was 70,000 years B.P.

In 1968, Taylor and other researchers from Stanford University and the University of Arizona published a report in Science which reported an AMS date for the Sunnyside skeleton at about 5000 years B.P. In 1985, a well-known list of AMS dates was published in American Antiquity that significantly reduced the ages of most of the supposedly Pleistocene age skeletons in the New World to less than 11,000 years. "That article probably has the largest number of co-authors of any appearing in American Antiquity," Dr. Taylor joked. "It represented the combined work of my lab group at Stanford and Arizona and Oxford.

In these instances, AMS technology was used to obtain C-14 ages on bone in situations where it would have been very difficult or, in some cases, impossible to obtain the C-14 age by the older methods. Although these redating efforts do not categorically disprove human habitation of the New World before 11,000 years B.P., the implied maximum limit of 11,000 years does fit with other evidence.

Currently, the C-14 AMS maximum age range is about 40,000 years B.P., a range similar to that of conventional dating. This limitation for AMS is not due to limitations in the measurement technique itself, but to the difficulties in removing modern contamination from sample preparation. The problem is particularly difficult in the C-14 dating of bone. "The main problem with bone is C-14 dating," Taylor remarks, "is extracting an indigenous component of the bone for analysis. The method by which you can critically ascertain that the organic fraction is actually indigenous to the bone."

That has been the goal of all bone analysis ever since the beginning. The advantage of AMS analysis is that, since you can work with much smaller amounts of organic, you can be much more exacting and rigorous in the way that you can use to extract a given fraction. Unfortunately, the older a bone gets, the greater the chance that you're looking at contamination.

However, with improvements in lab techniques, there is the expectation that eventually the C-14 dating range can be extended to as much as 80,000 to 90,000 years B.P. using AMS technology. "This will be of much interest to archaeologists" says Taylor. "We need a physical dating method that can routinely and accurately cover this time period at the present time," Taylor states.

According to Taylor, now that AMS technology is available, the issue in bone dating is "What is the appropriate way to look at bones from a geoarchaeological perspective?" How do you manage your time?" Taylor asks. "We are going to get an accurate estimate of age from an analysis of the C-14 content of a given organic extract? Taylor's view is that "Each bone should be looked at as a potentially unique sample. One examines a number of fractions in a bone—particularly with critical bones. It is often said that one date by itself means little in archaeological situations. It is necessary to obtain concurrent age estimates to be able to speak of the age of a bone sample with confidence. If you find that you pull out three or four fractions and they are roughly the same age, the chances that all three were contaminated equally from an external source in the same manner is significantly decreased."

What's next for Taylor and his colleagues? "What we'd like to do in conjunction with Dr. Bonnichsen and the Center is to look at the remaining suite of bones from the West World that have been suggested to be of Pleistocene age." These samples, from such places as Florida, California, Nebraska, and Argentina, have been obtained from various museums and repositories across the country. "Some of these samples, that some years ago, were thought to be human bones of possibly Pleistocene age. We are very interested in working on the ones Rob has collected."

"I would suspect it will take us a good six to seven months once we get the samples to evaluate the bio-geographical problems. It's going to take some time because this type of work-up is very time consuming. Especially if you see each bone as a unique geoarchae- system. Those will be done very carefully, because these samples are one-of-a-kind. Another reason for the caution, he emphasizes, is "The fact that the first number will be the number people remember, so you want to make sure it's right."

...—Jon Bonnichsen

SUGGESTED READINGS

On Old Bones in the New World.


On the Lehner Ranch Site


On a Bridge Over Time

Hedges, J.D. 1967 A Summary Prehistory and History of the Sierra Picaso, Sonora, American Antiquity 33:335-54.


PRIVATE HANDS HOLD PUBLIC TRUST

Above, Rob Bonnichsen, Director of the Center for the Study of Early Man, demonstrates the art of flint knapping to an interested group assembled at the Cremer Ranches' annual archaeology round-up. Below, Larry Lahren of An-thro Research in Billings, Montana demonstrates the effectiveness of the stone tools Bonnichsen made as he butchers an antelope for the evening's barbecue.

(PHOTO BY ROY A. GALLANT)

The place is Cremer Ranches near Melville, Montana. Every year a group of people interested in archaeology meet here for a two-day event of barbecuing, dancing, flint knapping demonstrations, field trips to archaeological sites, and, best of all, talking archaeology. They may not all be degree archaeologists, but one look at the faces of the people gathered to watch a flint knapping demonstration assures one that they are all archaeologists at heart. This summer, in addition to hosting the gathering, the Cremers opened their home to the annual board meeting of the Center for the Study of Early Man.

The Cremer event was originated 11 years ago by George Cremer, Dr. Bobbe Bonnichsen, and Dr. Larry Lahren. Upon seeing the interest that Cremer and other ranchers had in Montana archaeology, Bonnichsen and Lahren decided to organize a gathering which would provide an informal atmosphere for people to learn about American prehistory. What started out as a small party of five to ten people now attracts as many as 150, all by word of mouth. The annual barbecue provides an opportunity for people interested in archaeology to meet with professional archaeologists, ask questions, and, most importantly, to break down the barriers that often exist between professionals and the public.

As a result, the interest in archaeology in the Swegrass region of Montana has grown tremendously. Lahren states that he has received a number of calls at his Livingston office from regional ranchers who have discovered sites on their land.

This interest stems, in part, from their attendance at the Cremer Ranch festivities. The overall atmosphere of the two day event is often enough to get people interested in archaeology. Demonstrations are given on flint knapping and butchering, and material from the private collections is identified by the "in-house" archaeologists. On occasion visiting professionals will sign out artifacts for the weekend from his or her home museum, so that people can gain a better understanding of different types of artifacts.

Most of the people that attend Cremer's event don't belong to amateur archaeology societies; they are ranchers and farmers interested in learning about the past.

There is no age limit to loving archaeology. Ranchers, young secretaries and children watched in awe as Bonnichsen created tools from stone. With equal fascination, people gathered around Lahren as he butchered their dinner (an antelope acquired through the Fish and Wildlife division), with the stone tools. At the flint knapping demonstration, one bright child asked if the tools could be tied to wooden handles and used more like modern knives. With pleasure, Bonnichsen answered "yes" and went on to explain how stone knives and scrapers could be bound to bone, wood and antler for use in preparing skins and cutting meat. The child and his friends then went off to try their hand at cutting meat with stone.

Adults gathered around Bonnichsen after the demonstration wanting to know how they could become involved in archaeology. The answer to this is a multi-faceted one. Many communities have local archaeological societies which distribute information, offer short courses, and are involved in on-going excavations. Volunteer organizations (such as Earthwatch) also exist which permit interested individuals to assist at sites almost anywhere in the world. Professionals are often willing to speak at schools. Lahren, in addition to talks at the local elementary school, offers a short night course for adults, which many Swegrass ranchers attend. And of course, the Center for the Study of Early Man provides up-to-date information on the peopling of the American. But one of the best ways to become involved in archaeology is to keep an eye open for potential archaeological sites and/or artifacts, and to ask questions. A striking example of public involvement is illustrated by Cremer's chance discovery of a potentially important site a few days before the barbecue.

Cremer was flying over a neighbor's ranch when he noticed terraces surrounding a dried up lake basin. Realizing the possible significance of this observation (such terraces frequently contain very old human occupation sites), Cremer contacted Norman Starr, the owner of the property, and the two ranchers drove out to look at the basin. After discovering a number of small weathered stones which appeared to be flaked, Cremer and Starr collected a small sample.

When Bonnichsen was shown the weathered stone he agreed that, at some time in the distant past, the material had been worked by human hands. The following day, a reconnaissance party consisting of archaeologists, the Center's Advisory Board and the two ranchers visited the site. Once at the site area, the crew split up to look for artifacts along the lake terraces. A number of weathered (weathered by wind) artifacts were found clustered along these terraces. Members of the crew agreed that Cremer and Starr had indeed found an important Paleoindian site, and plans for surveying and preservation were initiated.

Although George Cremer lacks a formal education in archaeology, he has perhaps done more towards educating the public on the importance of archaeology than have many professionals. Since finding his first arrowhead at the age of ten, Cremer has pursued a lifelong interest in archaeology. (Rose Hynman, an amateurarchaeologist and rancher from Livingston, Montana receives special mention for her contribution in fostering and developing Cremer's knowledge of Montana archaeology). Today, in addition to acting as host for the annual barbecue, Cremer can be frequently found talking to friends and neighbors about the importance of artifacts, buffalo jumps, and sites that exist on their land. It was in this way that Norman Starr became interested in archaeology, interested to the extent that he wants to become actively involved in the preservation of prehistoric sites on his land.

We, as archaeologists are fortunate that people do have an interest in our subject of human prehistory. Every year members of the public bring sites to the attention of State Preservation Societies and universities. Each newly reported site enhances the potential for reconstructing and preserving prehistory.

Archaeology needs the George Cremers and the Norman Starrs of the world. Much of this nation's archaeological resources occur on private land. It is only with the assistance and cooperation of private land owners that we will be in a position to help preserve sites for future generations. Neither professional nor amateur archaeologists can be everywhere at once; an interested public can.

—Diane Douglas