



# MAMMOTH TRUMPET

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Center for the Study of the First Americans  
355 Weniger Hall, Oregon State University  
Corvallis OR 97331-6510

## The Bright Side of Archaeology



Rick Will is a professional archaeologist who hasn't forgotten the thrill of discovery. His company, Archaeological Research Consultants, Inc. of Ellsworth, Maine, provides professional archaeology services for utilities and industry in Maine. It earns him a living. It also gives Dr. Will the resources and capital to educate and inform the public, especially young people. Here he shows youngsters at Moosehead Lake in Maine how early Americans knapped flint into weapons and tools. He has some surprising views about the obligations of an archaeologist and about conserving treasures of our past. Read about him—and a thing or two about his home state you may not be aware of—in our story on **page 4**.

**T**he Center for the Study of the **First Americans** fosters research and public interest in the Peopling of the Americas. The **Center**, an integral part of **Oregon State University**, promotes interdisciplinary scholarly dialogue among physical, biological and social scientists. The **Mammoth Trumpet**, news magazine of the **Center**, seeks to involve you in the late Pleistocene by reporting on developments in all pertinent sciences.

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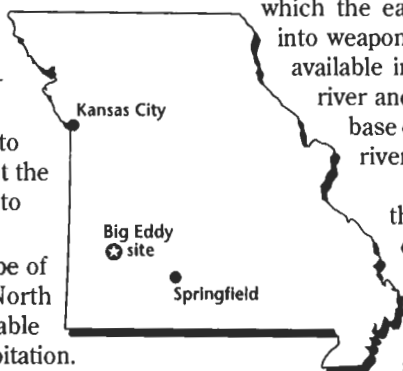
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## FRAGILE HISTORY: THE BIG EDDY SITE

### *First of a 2-part series*

Nestled on the Sac River in southwestern Missouri where the Ozarks meet the Plains, the Big Eddy site has racked up an impressive list of credits since the summer of 1997, when the Center for Archaeological Research (CAR), Southwest Missouri State University, first started excavating:

- it has the largest late-Paleoamerican lithic workshop ever discovered in the western Ozarks;
- it has yielded a continuum of artifacts from the Paleoindian through the Archaic, Woodland, and Mississippian periods;
- it may be the first site to provide evidence about the transition from Clovis to Dalton;
- it offers tantalizing hope of being the first site in North America with indisputable proof of pre-Clovis habitation.



southwest Missouri was spruce-dominated parkland and forests, with some oak and other deciduous species. Early inhabitants would have enjoyed bountiful hunting, for deposits in the nearby Pomme de Terre Valley dating back as far as 13,500 RCYBP have yielded remains of mastodon, tapir, ground sloth, deer, giant beaver, and horse. In the Holocene, when first the prairie expanded and later the forest encroached, the population subsisted principally on white-tailed deer and small game—and on mussels, fish, waterfowl, and aquatic plants supplied by the sluggish Sac River. Chert, which the early Americans knapped into weapons and tools, was readily available in the gravel bars of the river and in talus deposits at the base of a steep bluff across the river from the site.

For thousands of years the Sac River, a tributary of the Missouri, provided a comfortable living for early Americans. Now it is destroying the Big Eddy site. The site was first discovered by professional archaeologists from Kansas City in 1986 when, on a canoe trip, they spotted artifacts eroding out of the bank. Erosion has since accelerated greatly because of Stockton Dam, located about 10 km upstream from the site. Great volumes of water released during peak power generation—up to 5,000 cfs—have increased cutbank retreat from less than 2 ft/yr, the

*continued on page 2*

Unfortunately, the Big Eddy site is being devoured by the Sac River at an alarming rate. CAR will undertake intensive investigations during the next three years to discover its secrets.

### **The river, creator and destroyer**

The site is a beautiful spot today and must have been equally appealing to early Americans. At about 18,000 RCYBP, when the Laurentide ice sheet retreated northward,

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*Kennewick Man is putting folklore and oral traditions under intense scrutiny.*

**New this issue:** we've started using RCYBP. It stands for "radiocarbon date, years before present." We hope it eliminates confusion.

rate first measured over the period 1975–1990, to more than 4 ft/yr, measured over a 14-month period ending October 1998. This means that every year about 16,000 cubic feet of soil is lost *including potential cultural deposits*.

Principal investigators Neal Lopinot and Jack Ray have already recovered abundant material from the site that has increased our knowledge of the environment and the inhabitants of this part of Missouri over the ages. The best may be yet to come—and they only have three years to get it.

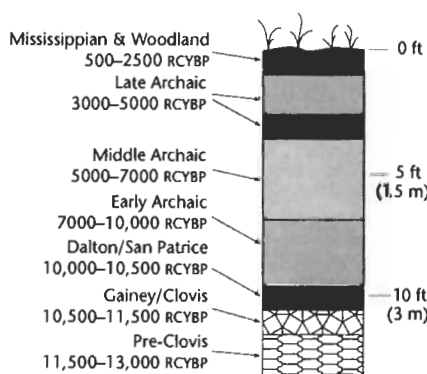
### Not an easy dig, but worth the effort

Smithsonian archaeologist Dennis Stanford, an authority on the Clovis culture, says the Big Eddy site “has the potential of being one of the most important strati-



Principal investigators Jack Ray (left) and Neal Lopinot at the Big Eddy site.

fied Paleoindian sites in the country.” *Stratified* is the key word here. Most Clovis-age artifacts have been isolated finds or mixed with artifacts of other ages with no clear chronological ordering. Big Eddy was revisited by peoples over thousands of years, and each culture deposited its “trash” (the archaeologist’s goal) in a well-defined layer on the river’s edge. Layers containing artifacts from different periods are vertically separated like pages in a book, and CAR archaeologists are carefully turning the pages.



CAR started excavating the site in June 1997. First a road grader stripped the plowzone layer from an area about 47 m by 70 m (154 ft by 230 ft) and the scraped surface was examined for late-prehistoric features. Small features were collected in their entirety as flotation samples; larger ones were also screened through quarter-inch-mesh hardware cloth. Then a trackhoe dug two test trenches about 4 m

The strata at the Big Eddy site are like a yardstick for measuring prehistory. Artifacts that may date to pre-Clovis times, a possible anvilstone and hammerstone, were recovered at a depth of 3.84 and 3.65 m (about 12.6 and 12 ft).

(13 ft) deep, well back from the river’s edge; each bucket load was monitored for artifacts. Finally four excavation blocks were dug by trackhoe in slices 5–10 cm (2–3.9 in) thick to a depth of about 2.5 m (8.2 ft). Subsequent excavations through horizons of early Archaic, late Paleoindian, early to middle Paleoindian, and pre-Clovis age have been done carefully by hand. This is painstaking work because authentication of finds demands recording of every detail.

### Published findings

Two monographs published by CAR con-



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tain enough detail to satisfy the most demanding scientist. They record every aspect of the 1997 and 1999 excavations—research design, field and laboratory methods, analysis of flotation samples and cultural remains—and describe the minutiae of the inhabitants' culture, from the tools and weapons they made, to the kinds of nuts they ate and the wood they burned!

We now know more about the part this region played in the lives of inhabitants over the ages. Some lithic artifacts were made from chert obtained from locations as far away as 400–700 km in Oklahoma and Texas, which suggests that trade may have been more important in late-Paleoamerican times than archaeologists previously thought. Substantial piles of lithic

debris also suggest that knappers of Dalton and San Patrice points may have gathered here (the analog of today's town elders congregating around the woodstove in the general store). Evidence still to come may prove that Big Eddy was a popular rendezvous site, where inhabitants from around the area gathered to visit, strengthen political ties, marry, and exchange goods.

Sometimes conclusions can be drawn in a straightforward manner from excavated material because the science involved is well understood. The climate and vegetation history, for example, can be inferred from stable carbon isotope analysis.

*continued on page 20*

## Smith Symposium II

The Hiscock Site:  
Late Pleistocene and Holocene  
Paleoecology and Archaeology  
of Western New York State

Sunday, October 14 &  
Monday, October 15, 2001  
Buffalo Museum of Science



### Session I: The Setting and Nature of the Hiscock Site Sunday, 8:30 A.M.–noon

1. Regional geology of the Hiscock Site: Ernest H. Muller, Parker E. Calkin, Keith J. Tinkler
2. Late Quaternary vegetation, lake-level, and climate changes in the Northeast: Thompson Webb III, Bryan Shuman, Paige Newby
3. Site structure, stratigraphy and chronology of the Hiscock Site: Richard S. Laub
4. Microstratigraphic and chronometric aspects of the Hiscock Site: Thomas W. Stafford, Jr.
5. Sedimentary analysis of the Hiscock Site: Donald W. Owens
6. Paleoecological studies of marl fen and *Thuja* stand development at the Byron-Bergen Swamp, Genesee Co., New York: Norton G. Miller, Richard P. Futyma

Discussant: Michael R. Waters

### Session II: New Data on the Hiscock Fauna Sunday, 2:00–5:30 P.M.

7. Pleistocene fauna of the Hiscock Site, with emphasis on the mastodon remains: Richard S. Laub
8. Season-of-death and terminal growth histories of Hiscock mastodons: Daniel C. Fisher
9. Were there mastodon die-offs at the Hiscock Site? Gary Haynes
10. Long-term change and continuity in the Holocene bird community of western New York State: David W. Steadman
11. New non-avian, non-*Mammut* remains from the Hiscock Site: Clare Flemming, Carl Mehling, Ross D. E. MacPhee
12. Mid-Holocene canid remains from the Hiscock Site: Stephen Cox Thomas

Discussants: C. S. Churcher, Jeffrey J. Saunders

### Session III: Miscellaneous Studies Monday, 8:30 A.M.–noon

13. *Mammut* hyoid elements from the Hiscock Site: descriptions and implications: Jeheskel Shoshani

14. Hyper-disease at the Hiscock Site: fact and theory: Bruce M. Rothschild
15. Taphonomy of Holocene cervid bones from the Hiscock Site: T. Clegg Madrigal
16. Early Holocene fossil oribatid mite biofacies as paleohabitat proxies at the Hiscock Site, Byron, New York: J. Mark Erickson, R. B. Platt, Jr., D. H. Jennings
17. Plant fossils from the Hiscock Site: environment and chronology: John H. McAndrews
18. The feasibility of preserving an impression in mud: study of soil samples from the Hiscock Site: Judith A. Logan, Malcolm Bilz, Jane Sirois

Discussants: Jim I. Mead, Thomas W. Stafford, Jr.

### Session IV: The Archaeological Record and Context of the Hiscock Site Monday, 2:00–5:30 P.M.

19. Typology, use and sourcing of the Late Pleistocene lithic artifacts from the Hiscock Site: Christopher J. Ellis, John Tomenchuk, John D. Holland
20. Analysis of Pleistocene bone artifacts from the Hiscock Site: John Tomenchuk
21. Human activities at Hiscock during the Pleistocene based on artifacts, distributions, and physiography: Richard S. Laub
22. Perishable technology from Hiscock: James M. Adovasio, Richard S. Laub, David C. Hyland, John H. McAndrews, Jeffrey S. Illingworth
23. The Hiscock Site and the archaeological record of the upper Spring Creek basin, Genesee County, New York: Kevin P. Smith
24. From text to context: Hiscock in the Paleoindian world: Peter L. Storck, Ronald Williamson, John D. Holland, Kevin P. Smith

Discussants: David G. Anderson, Kenneth B. Tankersley, Henry T. Wright

*Presentations and speakers are subject to change without notice.*

### General information

- Reception Sunday, 8:00–10:00 P.M., at the Buffalo Museum of Science.
- Symposium check-in at Museum: Sunday, 7:00 A.M.–5:30 P.M.; Monday, 7:00–10:00 A.M. Registrants will receive programs and abstracts at check-in.
- The Pillars Hotel (877-633-4667) and the Hyatt Regency Buffalo (800-233-1234) are offering reduced rates to Symposium registrants for a limited number of rooms. Shuttle buses will provide transportation between the Museum and these hotels.
- Registration fee is \$65. Seating is limited. For registration materials and more information contact Michelle Rudnicki (716-898-5200, ext. 312).

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Buffalo, New York 14211

# A Professional Archaeologist



ALL PHOTOS: ARC, INC.

Members of the ARC team survey drawn-down lakes in the late fall in northern Maine.

**A**RCHAEOLOGICAL RESEARCH CONSULTANTS, INC. of Ellsworth, Maine, has a lot in common with its home state. Maine's population of 1.2 million doubles with summer tourists. Rick Will's company likewise swells from a full-time staff of four to a temporary crew for summer field work that may number 40.

You don't dig in Maine in the winter. Maine, after all, has been described as a land of 11 months of winter and one month of lousy sledding. Winter is the time for Dr. Will and his staff to catch up, write reports and work on research projects and craft educational displays for local schools. It's also the time to plan for the next season of the work that funds all the other activities: serving the needs of Maine's utilities and industry for professional archaeology.

It has taken Will 10 years to build ARC. The road to get here wasn't a smooth one—and certainly nothing like a straight line. But now he gets to practice archaeology, what he calls the process of discovery. "It's fun," he confesses. "I've wanted to do this since I was a little kid." For Will, the payoff is in learning new things, meeting new people, and working with school kids.

## Dams, the bread and butter of the trade

Surveys to relicense dams are the principal source of revenue for ARC. Maine has 1,071 dams (a statistic almost as impressive as 5,500 miles, the length of Maine's shoreline). Only a few hundred dams, however, are of a size that requires a license from the Federal Energy Regulation Commission to continue operating. The dam user, typically an electric power producer or a paper mill, must fund a battery of

studies to satisfy state and federal authorities in areas like water quality (does the water meet standards for purity and clarity?); the condition of the dam itself (is the structure sound? does it require maintenance?); and the impact on wildlife (will altering the water flow affect bird and fish populations?).

ARC's services are needed to ascertain that operation will not endanger cultural resources through erosion.

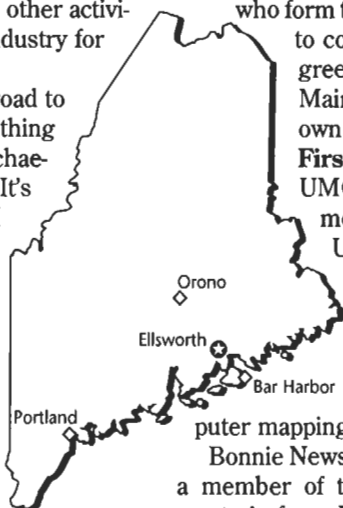
## The right team, like the right tool, for the job

"Cultural resources" takes in an enormous range of objects that might be found above and below the ground, and the members who form the nucleus of ARC's crew are uniquely qualified to cover the range. Karen Mack has a master's degree in Quaternary sciences from the University of Maine at Orono. (Maine is capable of educating its own scientists. **The Center for the Study of the First Americans** was formerly headquartered at UMO, where director Rob Bonnicksen was a faculty member. Rick Will, today an adjunct professor at UMO, studied there through his master's.)

Another UMO graduate and a former student of Bonnicksen's is Jim Clark, who has been with ARC since 1990. He is a general archaeologist whose specialty is computers. Clark applies the latest techniques of computer mapping to solving the problems of archaeology.

Bonnie Newsom qualifies by birth (she is a Native American, a member of the Penobscot tribe) and education (another master's from UMO) as an expert in prehistoric cultural remains.

Historic archaeology, an area that Will's company is required to address when performing a comprehensive survey,





is the forte of John Marron, a transplant from Florida. In the U.S., cultural resource management deals with any culturally significant materials more than 50 years old. "By definition of the National Historic Preservation Act of 1966," Will points out, "a World War II Navy base is a cultural resource." Thus a

realistically, "they probably don't have the funds to pay him for taking a day off work." Fortunately for the school, Will shuns a business-only mentality. Creating educational displays, demonstrating flintknapping to groups of students, molding replicas of stone points in resin so that many schools can share

students who wanted to get involved in archaeology. Some students worked in his lab, others participated in the archaeological dig. "Laws like NAGPRA [Native American Graves Protection and Repatriation Act, which mandates the return of Native American remains to the indigenous tribe] intimidate people," Will admits, "but the more that people from various groups talk to one another, the better the understanding of their respective goals."

Here Will echoes comments made by Rick Pettigrew, himself a professional archaeologist and founder of *The Archaeology Channel* ("A Website That Makes Archaeology Come Alive!" *Mammoth Trumpet* 16-1), who is troubled by the strained relationships between archaeologists and indigenous peoples. "Archaeology," Dr. Pettigrew insists, "can help indigenous people recapture parts of their culture that have been lost or forgotten."

Pettigrew and Will agree on another point, too. Too often field research funded by industry is summarized in a single copy of a report that gets filed and is never seen again, with the result that neither the profession nor the general public benefits from millions of dollars of research. Pettigrew sees the root of the problem in natural human stinginess. "Clients," he says, "understandably want to pay only as much as they are required to." For Will, that's only part of the cause. He notes that most environmental laws have a clause that mandates public education or interpretation, requiring a final infusion of capital by the funding company. Unfortunately, the clause only kicks in at what archaeologists

## ***Rick Will makes a living from the science he loves. And along the way, he does a lot of good.***

steam log hauler abandoned in the North Woods by a logging company 100 years ago may be every bit as culturally significant as a 2,000-year-old Passamaquoddy campsite. Historic archaeologist Marron occupies an important niche that Will feels unsuited to fill by temperament and training.

The ARC team is a carefully chosen group of professionals. The proof is in their safety record. Although there are no poisonous snakes in Maine, the threat of serious injury—and worse—is always present when working with tools in the woods and on stone cliffs. Yet in 10 years, the worst injury suffered is a severe case of poison ivy.

### **An obligation to educate**

Since ARC is a corporation, income remaining at the end of the year after paying salaries and expenses is identified as profit, and profit is what funds educational projects that, to Will, are his responsibility as a professional archaeologist.

Occasionally Will accepts small grants to perform research or promote education, but he doesn't aggressively pursue grants. "The grant market is very competitive," he says, "and grant-funded projects are most effectively pursued in a university environment." Instead, he funds projects out of his company's profits. He fills a need, especially in the low-income hinterlands of Maine. "If a school wants Jim Clark to speak to its students about archaeology," Will notes

scarce artifacts—these are typical uses to which Will applies his company's profits.

Will is eager to develop a strong rela-



**Jim Clark puts finishing touches on casts of a chipped-stone axe.**

tionship with Native Americans through education. Last year he seized an opportunity while surveying for a dam re-licensing. The dam was situated near a large site on a river island owned by the Penobscot nation. Will launched an internship program for Native American

call Phase 3 data recovery, the stage where useful information is obtained that can be interpreted. "But most surveys don't recover artifacts or remains," Will explains. "Their only scientific value is in telling you where people *didn't* live." If a report has no interpretive value, the spon-

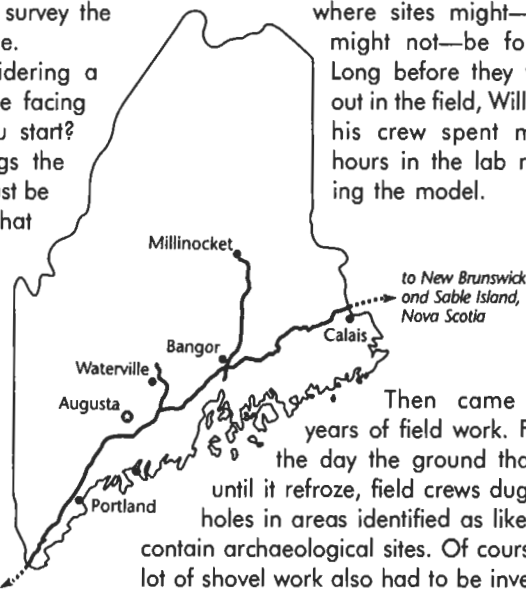
**T**HE NATURAL GAS PIPELINE that was laid across Maine was one of the most ambitious projects ever attempted in New England. The 24-inch-diameter pipe carries gas from the drilling rig on Sable Island off Nova Scotia to its destination in Dracut, Mass., a total distance of 400 miles. Today, scarcely a sign of the subterranean pipeline shows in its passage across Nova Scotia, New Brunswick, Maine, and New Hampshire. Finished in 1999, the job took four years to complete and cost over \$4 billion.

Since the big engineering firms in charge of construction didn't have archaeological capability, studies to insure that construction would not endanger cultural resources were put out for bid. Archaeological Research Consultants, Inc., Rick Will's company, was awarded the subcontract to survey the proposed route across Maine.

It seems natural, considering a task as awesome as the one facing ARC, to ask, Where do you start? Long before a backhoe digs the first bucket of earth, there must be archaeological certification that no cultural resources will be jeopardized by trenching and digging. "The archaeologist doesn't run behind the excavator," Will explains. "Machines follow the archaeologist."

**Pipeline route across Maine, with major lateral feeders.**

*to New Hampshire and Dracut, Mass.*



ARC's team started by mapping the landscape. With the proposed route of the pipeline in hand, they first checked state records to see if the route crossed sites already identified. Next, they constructed a model to predict where they might expect to find archaeological sites. Will spent an entire year working with maps—geological maps, soils maps, town maps—to get a sense of where sites might—and might not—be found. Long before they went out in the field, Will and his crew spent many hours in the lab refining the model.

Then came two years of field work. From the day the ground thawed until it re froze, field crews dug test holes in areas identified as likely to contain archaeological sites. Of course, a lot of shovel work also had to be invested



in low-priority areas to confirm the accuracy of their model.

Before laying of the pipeline was ever started, thousands of holes had been dug. When a site was found, ARC's crew collected enough evidence—by more digging, of course—to warrant rerouting the pipeline. In its travel across Maine, the pipeline was rerouted 30 times when sites were found and their cultural significance was confirmed. The sites were a mix of cultures and periods: pre-European sites ranging in age from early Holocene to the first contact with settlers in the 17th century; and historic farmsteads, about 20 in all, the newest still working in the 20th century.

This is professional archaeology: a marriage of analytical reasoning, educated guessing, and a fair degree of proficiency with the common shovel.

—JMC

sor is not required to publicize the results of a survey.

Nonetheless, Will is determined to wring all the possible benefit out of every survey. "If the project involves a large open excavation," he says, "the public benefits if school kids come out and see what you're doing." Last fall more than 150 students from three school districts visited a dig ARC made in western Maine while completing a survey for International Paper. A friendly game of oneupmanship developed, ARC and IP each trying to outdo the other in a show of

corporate responsibility. Not only did International Paper pay for the time ARC members spent assembling the kids and explaining what an archaeological dig is all about, the giant paper company is also funding a display at the famous Abbe Museum in Bar Harbor. The museum, a favorite stopping-off spot for visitors to Acadia National Park and points beyond, showcases artifacts of Wabanaki and other Native American cultures. (A part-time employee who divides her time between the museum and her husband's company is Becky Cole-Will, an archae-

ologist in her own right. *Her credentials? You guessed it, a master's—but from University of Alberta instead of UMO.*)

### **Interpreting, the key to educating**

The problem, as Will sees it, in getting the results of a survey to the public and his profession at large is that reports are necessarily written to a standard that presumes a level of knowledge most people simply don't possess. A surgeon who develops a new procedure faces the same problem; to publicize it requires the talent and time of an editor who can make

medical terminology understandable to the general reader. Turning an arcane archaeological report into something generally readable isn't done as often as Will wishes it were. For that he blames the author of the report, not the sponsor. The archaeologist, after all, is uniquely qualified to recast the information and make it available to a wider audience.

Not one to shirk responsibility, Will over the years has extracted useful information from ARC surveys and published it in journals. In digging the Little Ossipee North site in southwestern Maine as part of a dam relicensing survey, for example, Will's crew recovered a collection of calcined (burned) turtle bones, the second-largest assemblage reported in New England. Since reptile bones don't usually preserve well, this was a remarkable find packing a wealth of information on food procurement and preparation by pre-European Native Americans. Will wrote a scientific report on his findings, then condensed it into an article for *Archaeology of Eastern North America*, whose readers include professional and avocational archaeologists. Writing the article took three weeks, time he funded out of ARC profits. And in 1997, while surveying for a proposed development in southern Maine, Will's crew found a Paleo-Indian site, named the Janet Cormier site after a colleague who died that same year. A synopsis of their findings, including a description of chipped-stone artifacts of the Fluted Point tradition, **became** an article in the bulletin of the Maine Archaeological Society. ("It's alive and healthy," says Will of the Society, "with more than 350 members.")

ARC also funds its own independent research. One project, which ultimately found its way into the pages of *American Antiquity* in 1996, helped answer a question that has long puzzled archaeologists: How do water action, sediment transport, and ice movement act on stone artifacts exposed on shoreline fluctuation zones? Rick Will and Jim Clark set out to get answers. They mapped a grid system on a shore as if it were an archaeological site, laid out stone tools and flakes, noting their exact locations, and monitored the site for a full year, recording precisely how wind and water action relocated the objects. Another project Will undertook sought to identify the debitage produced at different stages of flint-knapping in order to understand craftsmen's travel. Would a

knapper perform some of the operations at the quarry site, then finish the tool at a different location? To find out, of course, you have to be able to recognize the kinds of flakes associated with each stage. So Will's team became knappers; they crafted stone tools and studied the flakes they chipped from start to finish.

What Rick Will really wants to do is practice archaeology. When he gets a chance to do it, he's like a school-boy playing hooky.

### **An informed public is the archaeologist's best friend**

What do you do when someone walks in your door carrying a cardboard carton or shopping bag and says, "We were digging at such-and-such-place, and look at the neat things we found"? The standard approach is to inform the offender in the sternest possible terms that he has violated the law and must surrender the artifacts on the spot. Sadly, the standard approach has never worked.

The Rick Will approach, on the other hand, is to say, "Let's sit down and talk about the age and importance of these things you found. But first,

◀ **Ned Moore interprets stratigraphic profiles at his computer.**

▼ **Karen Mack measures and catalogs stone artifacts.**



do you realize that because you removed them from the ground, there's a lot of information we'll never be able to get?" His approach doesn't always work, Will admits, but usually the person realizes digging is wrong and is happy to hand over the material. "It's not their fault," says Will. "It's the archaeologists' fault for not making the public aware of the resources we are here to protect."

He reminds us that all professional archaeology practiced today is the result of the National Preservation Act passed by Nixon in 1966. It is public law, reviewed and renewed by Congress every year. It declares that the public *wants* to preserve

the past. "But if you don't educate the public about what is worth preserving," he warns, "common laws go, simple as that." The more people are informed about the value of the archaeological record, the more people will resist having the law removed from the books.

### **Home, at last**

Rick Will is a ninth-generation Mainer. Wills first settled in the Brunswick area (about 20 miles north of Portland) in the 1750s.



71 Oak Street, Ellsworth, world headquarters of Archaeological Research Consultants, Inc. This magnificent building, built in 1898, was the home of Rick Will's family and business until both outgrew it; now his family lives in a separate residence. A few Victorian houses like this have been lovingly restored and made into offices by Ellsworth businesses. Most, unfortunately, have been replaced by sleek modern structures. Ellsworth, like many New England towns, is having trouble deciding how big it wants to be.



Will earned his master of science in archaeology from UMO, his doctorate from the University of Alberta. (Parallel paths: both Rick Will and Rob Bonnicksen claim Alberta's Alan Bryan as their mentor.) His specialty was Arctic research, specifically, how hunting peoples manage food and resources. He didn't learn it all from books, either; he got practical experience on Banks Island, the westernmost of the Canadian Arctic islands, where he studied how the Inuit people utilize musk oxen.

Archaeology is what he always wanted to do, but at the time it simply wasn't possible to earn a living from it. So Dr. Will turned criminologist. For seven years he studied crime in America and explored alternatives to imprisoning young people and drug offenders. He worked at the national level developing programs to take young offenders out of prison and put them instead into educational settings or work relief. He applied analytical methods to reducing crime in America, seeking answers to such questions as, Are there identifiable traits in young

### A home like no other

Maine has a flavor all its own. Ellsworth sits at the gateway to Mount Desert Island, home to Bar Harbor and the southernmost parcel of Acadia National Park. Tourism is a major industry in Maine, competing with wood products and fishing, but that doesn't mean the citizens have to like tourists. The locals call them summercaters, and "summer complaints" refers equally to the famed blackflies and to the Winnebago crowd. A



◀ Rick Will (left) and Michael Sapiel at the Abbe Museum Fieldschool, Tranquility Farm site, in Gouldsboro, Maine.

▼ Will holds a shard of 1,000-year-old Native American ceramics recovered from the Tranquility Farm site.



people that are accurate predictors of later criminality? How do you determine fair punishment for a range of crimes?

Criminology is intellectually stimulating, he admits. It just isn't archaeology. He returned to Maine through the back door, still practicing criminology but now in Castine, a town about 30 miles from Ellsworth (site of a historic Revolutionary War battle and home of the Maine Maritime Academy, which trains officers for the merchant marine). And he set about earning a living as a professional archaeologist. Only for the past five years has he been able to work full-time at archaeology. It has been a long road, and not the most direct route.

bumper sticker seen on local cars says it all: "Summer people. And some aren't."

It's a place of striking contrasts. David Rockefeller maintains a summer estate in Bar Harbor, just as J. P. Morgan did, yet there are shacks without indoor toilets a short walk from Rockefeller's front door. The local phone book lists Zbigniew Brzezinski, Archibald Cox, and Jane (Mrs. Caspar) Weinberger... and Loaves & Fishes, a food pantry where the needy can get a free bag of canned food.

A sizable part of the population make a living with the muscle in their arms—raking blueberries, fishing for scallops and lobsters, harvesting seaweed, felling trees, working at construction trades (this area of Maine is enjoying substantial economic growth). But there are also scientific minds at work here. At the Jackson Laboratory in Bar Harbor, more than 2,500 strains of genetically defined mice are the test bed for research into complex human diseases; powerful new genetic and molecular techniques are used to identify genes and track

*continued on page 11*



# One-stop Shopping For Radiocarbon Dates

**A**RCHAEOLOGISTS have a new and wonderfully useful tool on the Internet to help in their search for the First Americans—a Website that lists radiocarbon dates from thousands of sites throughout Canada and the Arctic. The Canadian Archaeological Radiocarbon Database (CARD), hosted by the Canadian Archaeological Association, was developed by Richard E. Morlan, curator of Palaeoenvironmental Studies at the Canadian Museum of Civilization in Quebec.

Selected dates in CARD are presented graphically in a related website called "Mapping Ancient History" (MAH). MAH is presented on the Internet by the Geological Survey of Canada as part of its Earth Science Viewer series. Coauthored by R. E. Morlan, A. S. Dyke, and R. McNeely, MAH uses Geographic Information System software to plot dated sites on a series of 15 basemaps, created by Dyke and V. Prest, that depict the changing environment of North America from the last glacial maximum to the present. The result reveals the spread of ancient animals and people across a continent emerging from the grip of the Laurentide and Cordilleran ice sheets. The maps show that people may already have been south of the ice at the last glacial maximum. By 4,500 years ago, people were living throughout North America, even in the High Arctic.

## An eminently usable tool

The MAH Website is a masterful marriage of graphic and tabular media. Choose a time period, click on a site, and you get a thumbnail summary of the radiocarbon dates at the site. Want more information? A link to CARD instantly gives exhaustive

details—location, kind of material dated, provenience, even the name of the person who submitted the material.

Another side of the CARD Website (it is bilingual, English and French) is a primer that explains fundamentals and technical aspects of carbon-14 dating as part of the Canadian Archaeological Association's commitment to improve the understanding and use of radiocarbon dating.

Although the database is far from complete and may contain scattered errors, Dr. Morlan sees it as a major first step in helping researchers establish the chronological framework required in all archaeological studies. "Yes, I am very satisfied with the results so far," Morlan said in a telephone interview. He believes

*For radiocarbon dates and background  
information, log on to*  
**www.canadianarchaeology.com**



the database, one of the most complete anywhere in the world, gives archaeologists a valuable research tool. "The main thing now," he says, "is to maintain the database and expand it into the U.S. I'm working with state archaeologists, who are happy to have this material available for resource management and for research purposes." The next step is to link the U.S. dates in MAH to detailed records in CARD.

## At last, a central repository for widely scattered data

CARD is a compilation of radiocarbon measurements that document the age of

archaeological and vertebrate paleontological sites in North America. Since radiocarbon dating was invented about 50 years ago, archaeologists and paleontologists have invested heavily in radiocarbon analysis. Unfortunately, tens of thousands of radiocarbon dates have become scattered throughout scores of publications and reports—when they have been published at all. CARD makes the information accessible.

The main purpose of the database, says Morlan, is to rescue from oblivion the expensive radiocarbon analysis we all pay for. It is regrettable, he says, that "many of these radiocarbon dates simply end up languishing in gray literature, and many of them are purchased with public money and should be available to the public." He feels the analyses have inherent value; the more interpretation we can bring to them, the more valuable they become. So he became interested in organizing them so that people could have access to them. Not only are CARD elements accessible; ages are normalized (corrected for isotopic fractionation).

## A great idea that had to wait for technology to catch up

The project idea arose, Morlan recalls, at a 1987 workshop convened by Renee Kra at Yale University to plan the scope and content of an international radiocarbon database. Sadly, that first discussion was ahead of its time because technology, especially computer technology, wasn't sufficiently advanced to compile a database of the scope needed. "It just

never got off the ground," says Morlan of the International Database project. "There were all kinds of good intentions, but we were a little ahead of our time. Remember, in 1987 not everybody had a desktop computer. Laptops hadn't even been invented." Also missing was uniformity in software. "There was no Internet," he reminds us, "and no e-mail." Without them, you can't communicate freely or transmit data easily.

In the mid-1990s, technology finally having evolved to the point where a database was practical, the project slowly came to life. The Canadian Museum of Civilization was the logical hub for the



project, according to Morlan. For one thing, the museum had submitted more than 1,500 radiocarbon dates. Starting from those as a base, Morlan began collecting other data sets by laboriously poring through the journal *Radiocarbon* and by reading page by page through other journals and reports, collecting and tabulating radiocarbon dates. He sent out requests to researchers and institutions to supply data sets. Many of those first data sets arrived as attachments to e-mail messages, the way Morlan now receives most of his data. He makes an effort to trace every radiocarbon date back to its original report—all from his computer. “I haven’t done any traveling for this project yet,” he confesses, “except in cyberspace.”

### Satisfaction comes from seeing it used—and there’s more to come

Morlan is gratified that the database is being heavily used. Some Arctic archaeologists are using it, he says, “as a way to

tease out the degree of overlap between the Dorset and Thule cultures.” Other researchers are using the bibliographic component of the Website to write scientific papers. For one researcher in England, the database is a source of information on carbon-13 ratios of bison bones for a paleoenvironmental study.

Other researchers find the faunal component useful. Although oriented principally toward archaeology and radiocarbon dates, CARD also includes vertebrate data that are being incorporated into the FAUNMAP database established at the Illinois State Museum. FAUNMAP will soon return to the Internet via the Denver Museum of Nature and Science. “FAUNMAP lets us look at the history of any mammal species spanning 40,000 years and spread across the U.S.,” says Morlan. “Now Russ Graham has acquired funding to expand this database into Canada and Alaska. We can also expand it (with a National Science Foundation grant) backward in time, beyond 40,000 years, to the beginning of the Pleistocene. We’re go-

## This Is What the Internet Does Best!

[www.canadianarchaeology.com](http://www.canadianarchaeology.com)—the Website of the Canadian Archaeological Association—is a superb example of human engineering done right. Finding background information on radiocarbon dating and locating radiocarbon dates in Canada, the Arctic, even in parts of the U.S. is an intuitive process for the casual inquirer or serious researcher.

Choose “Mapping Ancient History” to locate a data set in CARD using Geological Survey of Canada maps. Select the time period of interest (1,000 to 14,000 years ago, or 18,000 years ago) for the map showing the location of dated faunal remains and of dated and undated human occupations. This example is the map of 8,000 years ago. (The Website makes effective use of color, which unfortunately we can’t show in our black-and-white publication.) You can show or hide political boundaries. For greater detail, zoom in on an area. Then choose “Identify” and click an icon for a summary of the associated data set. For this example:

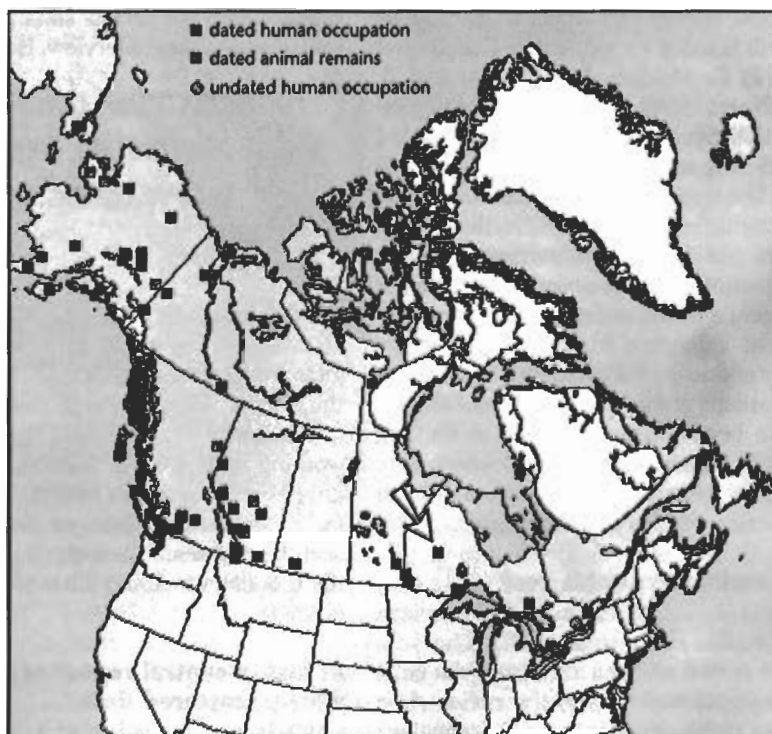
Significance	Archaic
Site Code	EcJs-1
Site Name	Allen
Age Norm	8050 ± 80
Material	charcoal
del C-13	-22.1
Lab Number	Beta 111666
Data Link	CARD

Click the **CARD** link for complete data, including location, provenience, and the submitter’s name.

The maps are only one means of accessing CARD. You can also search the database through information fields: by site code; site name; province, territory, or state; laboratory number; mate-

rial dated; cultural affiliation; a range of dates; or any combination of these fields. A location field contains searchable county names, major drainages, and the islands of the Arctic Archipelago; a taxa field lists the scientific names of vertebrates associated with dates.

Besides CARD and a tutorial on radiocarbon dating, the Website features news and events of the Canadian Archaeological Association. A source this rich in information, instantly accessible from anywhere in the world, was impossible before the Internet.



ing to have a really valuable new tool when this is complete."


There is good reason, according to Morlan, to include vertebrate paleontological sites in the database. For one thing, archaeological and paleobiological studies sometimes overlap; and it isn't always clear whether a paleobiological find or locality also has archaeological significance. By demonstrating that the postglacial environment at a site was suitable to mammals and humans, paleobiological evidence can open the door for further investigation.

Although there are other databases, CARD is widely acclaimed the most complete and extensive. (See, for example, John W. Hoopes's article, "Accessing Proof that the Past is Past: Radiocarbon Databases Online," in the 2001 *SAA Archaeological Record*, Vol. 1, no. 1, pp. 36-38.) Delaware, for example, has a radiocarbon database, but like most databases it is little more than a list of laboratory numbers and ages, with no analysis. Morlan readily concedes that CARD coverage for the U.S. is still inadequate. "For some states, we have hardly any information," he admits. "For others, we have a fairly comprehensive database." CARD will remain a work in progress, with continual updating. Today it is eminently usable, an organized, readily accessible source of radiocarbon dates, something not previously available. "At least everybody is reading off the same page," Morlan notes. Chronologies inevitably benefit from uniform data and analysis.

Hard-core researchers aren't the only ones who benefit from the Website. It also has a wealth of information for casual investigators of the First Americans controversy. You can find answers to such fundamental questions about radiocarbon dat-

ing as, What is radiocarbon? What is radiocarbon dating? What can be dated? How is radiocarbon measured? Why do radiocarbon dates have plus-or-minus signs? What are the age limits of radiocarbon dating? What does "B.P." mean? What is the importance of association? There's also background information for the seasoned and amateur researcher on bone and bone collagen dating, calibrating radiocarbon dates, and laboratory methods of processing samples for radiocarbon dating.

Morlan emphasizes that the success of CARD depends on the archaeologists that use it. Because it is an evolving working document, admittedly incomplete and containing errors, it requires the participation of archaeologists to correct erroneous information and to supply radiocarbon dates to broaden the scope.

"I've tried to load the Website up with a variety of useful features," says Morlan, "to make it an easy-to-use tool for separating useful from non-useful information." Try it, and you'll agree he has succeeded marvelously. 

—George Wisner

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## A Professional Archaeologist


*continued from page 8*

their interactions. (Michele Marron, John's wife, is a geneticist on the staff.) In nearby Salisbury Cove is Mount Desert Island Biological Laboratory, the largest cold-water research facility in the eastern U.S. Its Center for Cell Membrane Toxicity Studies seeks to identify molecular targets and physiological processes that are affected by heavy metals and related environmental pollutants. The Center attracts internationally renowned toxicologists, physiologists, and clinicians who work to solve fundamental problems of human pathologies using marine animal models. It is apparent there is no such thing as a "typical" Mainer.

Maine is a unique setting for the archaeologist. The acidic soil conditions that spawn vast spruce forests and make Maine great potato-farming land decompose organic materials in a very short time, a fact that complicates the archaeologist's job. Most human skeletal remains are found on the coast in shell middens, since sea shells release calcium carbonate as they dissolve and thereby neutralize acidic soil. Human remains that are found, including those that had been curated, are quietly repatriated to the Wabanaki peoples.

Rick Will still calls this home. Besides heading his company,

he serves as adjunct professor at UMO. That means he fills in when a teaching professor takes a sabbatical if the course material falls within his area of expertise; this term he is teaching a course on paleoenvironmental archaeology. He also sits on graduate student committees, where he advises students on how to plan research projects, helps put them into practice, and evaluates them on completion. Moreover, a brand-new opportunity to share archaeology with others has come his way. It's the Acadia Senior College, now being formed on Mount Desert Island under the egis of the University of Maine by a group of retired professionals. The college will offer courses to seniors in subjects they're interested in. Not surprisingly, Rick Will will teach a course in archaeology. "The pay is zero," he confesses with a smile, "but the reward will be working with a bunch of really interested people."

In his spare time, of course, he'll practice archaeology.   
—JMC

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# The Search for Japanese Origins



**W**HEN THE JAPANESE in 1997 determined to discover their origins, they attacked the task with a single-mindedness and intensity that rivals the international Human Genome Project.

Research headed by Takeru Akazawa in 1993 culminated in the publication of *Mongoloid Dispersions*, edited by Akazawa and Emőke Szathmáry, published by Oxford University Press. This project, which builds on Akazawa's research, is known formally as the Interdisciplinary Study on the Origins of Japanese Peoples and Cultures. It was undertaken by the International Research Center for Japanese Studies (*Nichibunken*).

Because it is funded by a research grant from the Ministry of Education, Science and Culture (*Monbusho*), the project has the approval and the backing of the Japanese government. Professor Keiichi Omoto and fellow scholars set a 4-year time frame for the project and assembled a task force of interdisciplinary teams to conduct research in the areas of Natural and Cultural Environments, Biological Anthropology, Archaeology, and Japanese Cultures. Professor Omoto is Principal Investigator of the General Affairs Team, which is responsible for general planning, communications, and reviewing and publicizing research.

## Project goals

The question the project seeks to answer is whether the Japanese people have one root or many. Although the Anthropological Society of Tokyo has been in existence since 1886, early attempts to trace Japanese origins were frustrated by fierce nationalism that decreed a history of a single ethnicity headed by the emperor. The defeat of Japan in 1945 and the new methodology of the biological sciences, abetted by new archaeological discoveries, gave impetus to an objective search for Japanese origins.

The project is an immense undertaking that is further complicated by the very history of the Japanese. Makoto Sahara, Director of the Na-

tional Museum of Japanese History, tells of an incident in 1996, when historian Yoshihiko Amino announced in a TV program on Japanese history that

'Prince Shotoku was not Japanese.' Since Prince Shotoku (574–622) has long been a highly venerated figure in Japanese history, this no doubt came as a surprise to many viewers and Amino later recalled that he received critical telephone calls because of this comment. The name 'Japan' (i.e., *Nihon*) was not used until the end of the 7th century A.D. Before that, Amino argues, there was no Japan and no Japanese and we should therefore use the term 'Japanese Islands' (or 'Japanese archipelago') when referring to events prior to that time.

Agreeing on terminology is only the start of their labors, for long-ingrained customs and rigid social barriers also impede the researchers. The Ainu, indigenous people of the northernmost island of Hokkaido, have suffered discrimination on the same scale as Native Americans in the U.S. Mark Hudson, Foreign Professor of Anthropology at the University of Tsukuba, notes candidly that "being 'Japanese' is not just about geographical space but also about power, nationalism and discrimination."

The teams are focusing their efforts on testing several theories. One is the Dual Structure model of the peopling of the Japanese archipelago, first proposed in 1990 by Kazuro Hanihara, professor emeritus of the University of Tokyo, which explains the intricate relationships among inhabitants of the Japanese main islands, of the Ryukyu Islands (Okinawans), and the Ainu by two waves of migration, one from Southeast Asia in the Paleolithic, and a second from Northeast Asia starting in the Neolithic. (See sidebar.) Also under scrutiny is the Ocean Road hypothesis of Kunio Yanagita, the founder of Japanese folklore. His 30-year-old theory argues that rice and rice-based cultures, which are central to understanding Japanese culture, were introduced from Southeast Asia by way of the Ryukyu Islands. Although final results of the project have not been released, Omoto reports that new data from various fields of research are challenging both theories.

## International Colloquium on the First Americans

The peopling of the Japanese archipelago is inextricably enmeshed with the peopling of the Americas, since both possibly involve the migration of populations from Eurasia. Consequently, in January, Omoto, with co-chair Emőke J. E. Szathmáry of the University of Manitoba in Canada, convened in Kyoto the International Colloquium on the



Emőke Szathmáry and Colloquium participant Takeru Akazawa with a new member of the human family, a Neanderthal child.

ROBSON/JOHNICHSEN

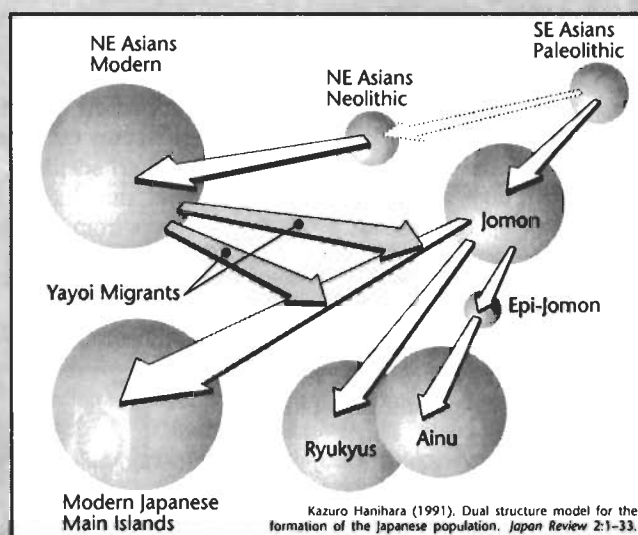


## THE Dual Structure Model

Kazuro Hanihara, Professor Emeritus of the University of Tokyo, first proposed his hypothesis 10 years ago after 20 years' study convinced him that the population history of the Ainu was intimately bound up with that of the non-Ainu Japanese.

The Dual Structure model assumes that the first migration to the Japanese archipelago, from Southeast Asia in the Upper Paleolithic, gave rise to the Jomonese people and the Neolithic Jomon age. The second wave of migration was the Yayoi, from Northeast Asia in and after the Aeneolithic. The Jomon and Yayoi populations gradually intermixed, a process that continues today. According to Hanihara, varying rates of mixing account for regional differences between east and west Japan in physical and cultural characteristics. His model is corroborated by human biological and cultural evidence, even by nonhuman evidence like Japanese dogs and mice. If his model withstands the test of further research, it has the beauty of explaining the population history of the entire archipelago—Ainu, Ryukyans, and Japanese—by a single hypothesis.

A goal of the Interdisciplinary Study on the Origins of Japanese Peoples and Cultures project is to find the routes used by the Jomonese migrants or their ancestral groups. Further study into Hanihara's model may also benefit studies of the First Americans, whose



morphology appears to be different from Northeast Asians and later Native Americans. Hanihara thinks it likely that ancestors of the Jomonese, the Ainu, and the early Americans used the same migration routes by way of Siberia.

Hanihara admits that the Dual Structure model involves issues still to be resolved or revised; he welcomes criticism and advice.

First Americans. Scholars and scientists from Japan and the Americas addressed the group on their areas of expertise: co-chair Szathmáry on ethical and legal issues regarding genetic studies of aboriginal peoples; Smithsonian anthropologist Douglas W. Owsley (coauthor is Richard Jantz), on methods of tracing early populations using osteological data; Hokkaido University Professor Masami Fukuda (coauthor is Nobuyuki Yonekura), on the environment of Arctic Siberia before and after the Last Glacial Maximum, the periods of possible human migration; geneticist Theodore Schurr, on applying mtDNA and Y-chromosome data in exploring relationships among Asian, Siberian, and Native American groups; Smithsonian anthropologist Stephen D. Ousley, on lessons learned from the repatriation program at his institution; Florida State University anthropologist Glen Doran (coauthor is Michael K. Faught), on applying analysis of North American bifaces and skeletal remains to theories about early populations and possible migration routes; CSFA Director Robson Bonnicksen, on new theories proposed about the peopling of the Americas in place of the disproved Clovis-First model.

The Japanese are intent on benefiting from the experience of American archaeologists and anthropologists in the social arena as well as in hard science. Stephen Ousley, in his sobering account of the 10-year history of the Repatriation Office at the Smithsonian National Museum of Natural History, whose activities are mandated by NAGPRA (Native American Graves Protection and Repatriation Act) and NMAIA (National Museum of the American Indian Act), describes the consequences of misidentifying and incorrectly cataloguing human remains—the “Sioux Giant,” revealed by craniometric and osteologic analysis to have been neither Sioux (biologically white instead) nor a giant (6-feet-2 instead of the reputed 8 feet tall); and the

“Kiowa Horse Thief,” who was born white but raised by the Kiowa, probably after being kidnapped. In life he was biologically white but culturally Native American; his remains, like many others, do not fit neatly into any anthropological category. (Analysis further showed he was 17 or so when he died, probably beaten to death.)

In her address, co-chair Szathmáry explores ethical and legal issues that the Japanese must either ignore or accommodate in a responsible manner, principally concerning the rights of indigenous peoples as subjects of scientific research. In her own homeland of Canada, the permission of the aboriginal community and the individual must be obtained before a scientific investigation may be launched. “As a product of human minds,” she emphasizes, “scientific inquiry is a culture-bound activity.”

Unfortunately, there is no precedent in Japan for ceding rights to their indigenous population, the Ainu. “In North America,” Mark Hudson says bluntly, “the question has been how to deal with the ‘Other’ [indigenous population], whereas in modern Japan the very existence of the Other has been denied by the majority mainland Japanese.” Although the Japanese government recognizes the Ainu as an ethnic minority, it still refuses to grant the Ainu the status of an *indigenous* minority, arguing, says Hudson, that “there is no ‘objective definition’ of the term.”

There is hope that the Interdisciplinary Study on the Origins of Japanese Peoples and Cultures project will serve to further exactly that purpose, to trace the origins of the Ainu and other peoples of the Japanese archipelago. In his opening address to Colloquium attendees, Professor Omoto gives us cause to be optimistic:

After retiring . . . in 1994 from the University of Tokyo, and in  
*continued on page 20*

**T**HE SUMMARY of our current knowledge of New World cultural antiquity in the December 2000 issue of *National Geographic* does us all a favor with its renowned graphics and map of early sites, real and alleged (though with some notable exceptions). Michael Parfit does an admirable job as narrator in the space available.

This article distills and discusses recent debates about the origins of Clovis Paleoamerican culture. Then a fairly evident observation tossed into the ring may help to simplify the efforts if you're interested in Clovis origins, and perhaps even Solutrean origins.

### The Solutrean wrinkle

For the last couple of years, two prominent archaeologists, Dennis Stanford and Bruce Bradley, have stressed a strong similarity between the Solutrean and Clovis on technological grounds. G. L. Straus, an expert on Solutrean culture, previously wrote in *American Antiquity* that a direct link to Clovis paleoindian culture is impossible. End of discussion. Most the rest of us are getting used to the shock. After all, if the Solutrean culture were indeed the ancestor of Clovis, taxonomic protocol would compel American archaeologists to relegate Clovis to a branch of the European Upper Paleolithic. There's a lot at stake.

An Asian origin for Clovis is not supported by the evidence, since Clovis-class mastery of bifacial thinning is nowhere to be seen in eastern or northeastern Asia.

From a lithics perspective, we ask, If Solutrean technology and mastery of bifacial thinning moved from west to east across the Bering Straits and was so influential in the New World, why are Siberian Dyuktai points (about 14,000 RCYBP) so much thicker than Solutrean laurel leaves of 18–20,000 years ago? (See "Wider, flatter, thinner" below.)

In his article "Deconstructing the North Atlantic Connection" in the 2000 issue of *Current Research in the Pleistocene*, G. A. Clark, an anthropologist from Arizona State University, argues that similar tool kits and other artifacts common to Solutrean and Clovis assemblages can be explained because both cultures had a large-mammal hunting tradition and used flint or other cryptocrystalline toolstone. His argument, however,

fails to account for the absence of Clovis or proto-Clovis sites in Eastern Asia. Where is the evidence?

### A common root for Clovis and Solutrean cultures?

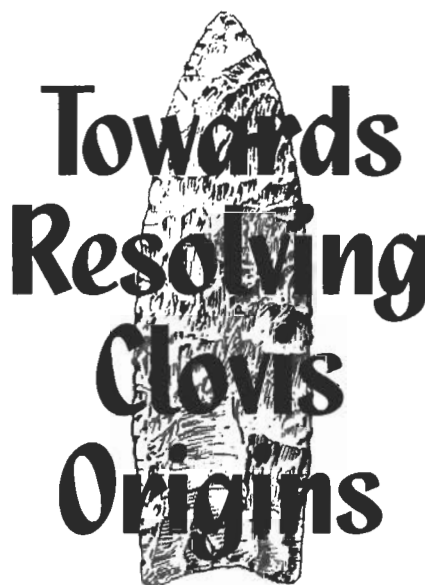
Another scenario, probably more remote, that hasn't been mentioned yet evolves from the idea of a common root. Suppose the Clovis culture is not merely

temporary with, or even prior to, the European Solutreans—must the knappers have their origins in Asia? Could they instead be offsprings of the same culture that became the Solutrean when their common forebears turned up in Europe? For now there is admittedly little evidence to support the idea of a common root for Clovis and Solutrean. It is introduced only to remind us of the present paucity of knowledge about Solutrean origins.

It's unlikely that any direct evidence of New World migrations by way of the Atlantic or Pacific, that is, watercraft, survived the 300- to 400-foot fluctuations in sea level since the last Ice Age. If by chance we discover Pleistocene-age boats along river routes that survived the meltdown of Wisconsin-age ice sheets, they still wouldn't be evidence of open-ocean navigation skills. Evidence of such early navigation will therefore probably have to be circumstantial, as it is for the Australian Paleolithic.

For now, to test the theoretical Solutrean-Clovis connection we are limited to the technological similarities in craftsmanship of other types of artifacts. According to Stanford, "Not everything in Solutrean is found in Clovis, but everything in Clovis is found in Solutrean." Straus cautions, however, that "*one of the great failings of archaeology is a continuous falling back on the notion that if a couple of things resemble one another, they have to have a common source. But these similarities appear and reappear time and again in different places*" [emphasis added].

Of course, Straus is arguing against alleged commonalities and continuities between Solutrean and Clovis technologies, but his position seems to apply to historical and personal dimensions as well. To hear him tell it, Stanford and Bradley are two archaeologists who have stepped out of line by proposing European origins for Clovis. His statement quoted above implies we've got a couple of wackos on our collective hands. It's quite a low blow, considering their impressive credentials. Is he killing the messengers by dismissing them as flaming diffusionists? The passionate scientist, confronted by an idea that threatens to overthrow a comfortable theory or, in this case, that attempts to reconstruct a



by Chris Hardaker

the product of diffusion of the Solutrean culture. Suppose, instead, they share a common parent culture and separated prior to the appearance of the Solutrean in Europe. I haven't read anything that charts where the Solutrean came from prior to their Iberian and European settlements. Like Clovis, they just seem to pop up in the archaeological record. There's no strong evidence to suggest that the Solutrean "evolved" from the late Aurignacian, that is, no evidence of in situ development of Solutrean traits, including their bifacial thinning expertise. If we hypothesize a Solutrean origin for Clovis, then it seems important to know where and how the Solutrean originated. Was it in Africa? The Mediterranean Basin? And if thin bifaces that precede Clovis are found in the New World, perhaps the idea of a common source of culture or tradition becomes less remote.

If we find that thin pre-Clovis bifaces existed in the New World around 20–25,000 years ago—that is, roughly con-

time-honored hypothesis, too often resorts to a myopic and reactionary defense; in this case, a Solutrean connection is called impossible, no ifs, ands, or buts. End of discussion. Kuhn, in his treatise on scientific revolutions, discusses this ploy at length. Most sciences have been forced to sail uncharted waters when enough evidence has accumulated to invalidate a long-held theory or interpretation; consider the history of plate tectonic theory, for example, or the recent discoveries of solar systems very unlike our own. Admittedly, if any scientists, regardless of their eminence in the field, had seriously proposed the Solutrean-Clovis connection just a decade ago, their credibility would have been seriously questioned. Now, given

the absence of evidence for Clovis origins in Eastern Asia, the credibility of the Solutrean diffusion thesis has been once again lifted out of obscurity and put on the same table as the Clovis-First/independent-invention thesis.

### Wider, flatter, thinner

These characteristics of bifaces are one of the reasons Stanford and Bradley propose a Solutrean source for Clovis origins. The use of atlatl throwers and *outré passé* (overshot) bifacial thinning flakes are another reason. Atlatls, after all, are not unique to Europe but appear to have been used in Australia early on. Bruce Bradley puts special emphasis on the significance of the

**Clovis-First** In 1933 previously unseen bifacially flaked points bearing distinctive flutes were unearthed in Colorado; the label "Clovis" was applied when the same beautiful points were later found at Clovis, N.M. In the decades following, the Clovis-First theory dominated the Late-Entry school of archaeology about how the Americas were peopled. Advocates proposed that the first migrants from Northeast Asia crossed the frozen Bering Land Bridge, colonizing the Hemisphere in their north-to-south travel from the Arctic to the tip of South America. The proposed migration was supported when expertly crafted fluted points and bifaces suddenly appeared across North America at sites radiocarbon dated between 10,800 and 11,500 years ago.

Archaeologists like a good argument. Early-Entry proponents (Alan Bryan and Ruth Gruhn are notable examples) have long maintained that the first migrants, possibly seafarers, arrived in the New World much earlier than Clovis times, perhaps 50,000 years ago. Other experts have proposed still other routes at different times in prehistory.

Clovis-First boosters had to leap many hurdles in their path. Beringia was a forbidding place during the Ice Age, hostile to humans and animals. Assuming a band of migrants made the crossing, in order to reach the temperate regions of North America they would have depended on an Ice-free Corridor between the Cordilleran and Laurentide ice sheets—a theoretical avenue that geological research indicates was closed between 28,000 and 13,000 years ago.

The final hurdle was just too tall to be leaped. In 1997 a group of experts convened in Chile. After investigating the evidence firsthand, they agreed that the radiocarbon record of the Monte Verde site was accurate. Monte Verde, 10,000 km south of Colorado and New Mexico, is 1,000 years older than Clovis. The theory that the New World was colonized from Beringia southward didn't square with the prediction that Clovis was ancestral to Monte Verde. These developments have led specialists to rethink how the Americans were peopled.

The Clovis-First model wedded to the Beringian passage is,

according to CSFA Director Rob Bonnicksen, "not only dead, but ready for burial!" But the Clovis culture still figures prominently in theories about the original peopling of the Americas.

## Clovis and Solutrean: Is There a Common Thread?

**Solutrean and Clovis Connection** At the Clovis and Beyond Conference in Santa Fe in 1999, Smithsonian archaeologist Dennis Stanford and colleague Bruce Bradley, a respected lithic specialist, rocked the archaeological community with their theory that the Americas were peopled by migrants from Europe. Stanford, for decades a faithful disciple of the Clovis-First doctrine, became persuaded by the extraordinary similarity of the lithic techniques of the Clovis and Solutrean cultures. (Although Solutrean takes its name from the village of Solutré

in southwest France, Clovis-like stone tools and weapons are found in an area extending into Spain and Portugal.) Solutrean knappers, Stanford points out, not only created the same kinds of weapons and tools as Clovis knappers, they used identical techniques—pressure flaking, overshot (*outré passé*) flaking, heat treating, basal grinding. And Solutrean sites are thousands of years older than

Clovis sites.

The Solutrean migration theory carries with it a new set of questions begging answers. Chief among them is, How did they get here?

The Clovis-First and Solutrean migration theories by no means exhaust the hypotheses that archaeologists and anthropologists today propose about how the Americas were peopled.

South American scientists, freed of the dominant Clovis-First model, are

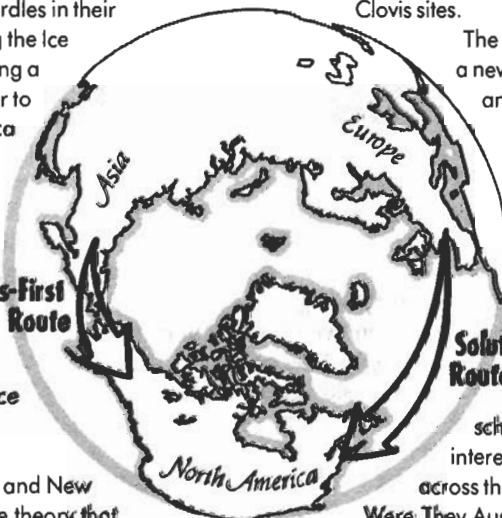
investigating evidence of early Americans in the Southern Cone with renewed energy. Argentinian

scholar Augusto Cardich is looking with interest at a possible migration by Australians

across the South Atlantic! ("The First Americans: Were They Australians?" *Mammoth Trumpet* 16-2.)

And researchers of the stature of Marta Lehr and Walter Neves note that early Native Americans share certain similarities with South Pacific populations.

These are exciting times to be an archaeologist.



—JMC

*outré passé* flake, seen in Clovis and Solutrean flintknapping. The *outré passé* flake, when it occurs during bifacial reduction, runs all the way across the surface and removes a section of the other edge of the biface. This "dent" along the edge destroys symmetry and makes extra work for the knapper, who has to resharpen the edge at the cost of the original width of the biface. The *outré passé* flake may have started out as a mistake that ultimately led to a deliberate knapping technique. These and other features that may link the Solutrean to the Clovis are described in Stanford's presentation of the North Atlantic Hypothesis at the 1999 Clovis and Beyond Conference (**Mammoth Trumpet** 15-2). Still, I argue that it is the quality of thinning that is central to the diffusion argument: wider, flatter, thinner.

The *National Geographic* article illustrates "thinness" with six points and their cross sections. The Dyuktai (Siberia) and Mesa (Alaska) points are contemporaries of Clovis points but much thicker. The Clovis specimen is paired with a Cactus Hill (Virginia) point (about 15,000 RCYBP) and the Solutrean laurel leaf (about 20,000 RCYBP). To some, this thinner quality may not seem like such a big thing. To a flintknapper, the two groups are light-years apart.

The comparison of thick paleo points with thin ones is a strong argument for a Solutrean landfall along the Eastern seaboard. The thick points have a width:thickness ratio that varies from roughly 5:1 to 3:1. The thin points, on the other hand, have a width:thickness ratio roughly 8:1 or greater. To produce such thin points takes advanced knowledge of fracture mechanics and the dexterity to apply this awareness—knowing the correct kind of platform to use and where to position it along the lineal edge, knowing precisely how hard to strike it and at what angle. Width:thickness ratios cannot be whimsically manipulated in the same way as length:width ratios. The thinner the point, the more liable it is to break during production and therefore the greater the skill required of the craftsman. Shapes and styles of very thin bifaces are completely secondary characteristics.

### Knapping the Clovis point: Technique is everything

To make the Clovis point requires the ability to remove thinning flakes in such a way as to create just the right bifacial contours to allow for removing the double flute. This skill goes way beyond knocking off flakes to thin the base, a common technique used to haft points. The removal of flutes, or channel flakes, is made possible by initially making a biface that will also function as a specialized blade core. The flute, however signatory it is of Clovis and Folsom points, is a secondary trait; it is simply an innovation made possible by first understanding, obeying, and mastering the laws of fracture mechanics that produce the bifaces from which these channel flakes are struck.

For the out-of-Asia/independent-invention hypothesis to

work, there must be material evidence that charts the transition from the Dyuktai-type thicker points to the thinner Clovis points, regardless of whether the extreme thinning tradition was invented independently by early Asians or diffused by Solutreans walking east. So far, evidence of a tradition of intermediate-thickness points just isn't part of the archaeological record. Nor can we just pretend that this masterful thinning is some kind of whimsical event that just happens in the course of "evolution." The flintknapper who today successfully replicates a Clovis point knows the art was developed through a lot of knowledge, hard work, and skill. Straus, or anyone, who thinks the quality of superb thinness implicit in Clovis bifacial technology is a weak and superficial argument for a Solutrean connection can't just say so and think the point has been made (pun intended). It isn't enough to say, "Just

because." Clark's argument falls short, too; it isn't enough to cite inevitable parallel development when the necessary evidence to support such a position is absent from the record. Such a view is the basis for a hypothesis, not a conclusion.

The archaeologist ready to live by the scientific sword had better be ready to die by it, because fracture mechanics isn't something that can be molded to our theories. Archaeologists have been looking for independent evidence for extreme thinning (and its in situ development) in Asia and America going on 50 years now, and it still evades us. It is nowhere to be found. If it turns up in the future, we can all breathe a sigh of relief. In the meantime, however, it doesn't hurt to examine other possibilities, especially on the other side of the Atlantic where evidence of such mastery

has been known all along.

Although direct evidence of Pleistocene navigation of the Atlantic may forever evade us, width:thickness ratios can be tracked anywhere that bifacial reduction traditions are part of the archaeological record. It shouldn't be difficult to begin compiling a worldwide database of the length, width, and thickness of Pleistocene bifaces. We would then have a way to track width:thickness traits where and when they turn up in the record. From this quantitative foundation it may then be possible to figure out where, when, and hopefully how extreme thinning practices came to be developed. 🐾

### Mammoth Trumpet Statement of Our Policy

Many years may pass between the time an important discovery is made and the acceptance of research results by the scientific community. To facilitate communication among all parties interested in staying abreast of breaking news in First Americans studies, the **Mammoth Trumpet**, a science news magazine, provides a forum for reporting and discussing new and potentially controversial information important to understanding the peopling of the Americas. We encourage submission of articles to the Managing Editor and letters to the Editor. Views published in the **Mammoth Trumpet** are the views of contributors, and do not reflect the views of the editor or **Center** personnel.

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(Bipolar Reduction: Variability or Chaos?)



**T**HE Native American Graves Protection and Repatriation Act (NAGPRA), which mandates the transfer of Native American remains to an "affiliated" indigenous tribe, allows the use of several lines of evidence in establishing cultural affiliation. One of them is "folkloric and oral traditional evidence." This is entirely appropriate, given the nature of the problem and the fact that oral traditions, if appropriately weighed and carefully evaluated, can sometimes prove valuable in retrieving historical facts. But it is not only reasonable, it is *imperative* that any program for implementing NAGPRA specify protocols governing the rules of evidence pertaining to oral traditions.

This is by no means virgin territory, for scholars have long grappled with the problem of extracting historical fact from oral traditions. Historian and folklorist Richard Dorson tells of a contract he received in 1961 from the Indian Land Claims Commission of the Department of Justice to determine how much credence the government should place in arguments made by Indian claimants based entirely on oral tradition. In the course of his research, Dorson found that "a host of scholarly disciplines had fought bitter interdisciplinary battles" over the issue of the historical validity in oral traditions. Besides folklorists and mythologists, they included "archaeologists, anthropologists, classicists, geologists, historians of every hue, students of religions, Africanists, the medievalists, the Celticist."

Especially concerned with this issue are historians of Africa, who deal with a paucity of written sources from African societies but an abundance of oral traditions. Moreover, scholars in various fields have long been interested in how memory produces tradition and in how tradition is changed by oral transmission and by the nature of oral cultures.

It isn't possible here to summarize such a rich and vast literature, nor can we apply it to specific questions raised by

cultural affiliation under NAGPRA. Instead, we will try to illustrate what this body of scholarship has to offer, suggest some rules of evidence that might emerge from it, and conclude with Ken-

NAGPRA, usually refers to oral folklore, also described as oral literature, and is divided into genres defined by different forms and functions. *Epics, ballads, and lyrics* appear in verse and are usually sung. The epic relates great events of the past and the action of great personages. The ballad, shorter and more prosaic, tells a story. The lyric evokes a mood or a feeling. Prose narrative in oral literature is divided into *tales, legends, and myth*. Tales are highly structured, purely fictional narratives exemplified in European tradition by such stories as Snow White and the Seven Dwarfs and Cinderella. Leg-

ends, on the other hand, are often told in less tightly structured narratives whose themes may also appear in other genres such as the ballad and the epic.

Unlike folktales, legends may bear some relationship to the truth; that is, they are believed to be true accounts of historical fact by at least some of those who relate them. Tales are the short stories of oral societies; legends are their history. Myths, on the other hand, are sacred narratives, believed to be true by those who relate them, that deal with the broader meaning of life, the cosmos and human morality. Every culture has its own classification of oral traditions; however, all cultures distinguish between those stories that are fiction and those that are true, roughly in the way defined by folklore scholars.

Scholars have been intrigued by strikingly similar themes, patterns, and narrative elements that recur in the folklore of unrelated societies around the world. Vladimir Propp and Levi-Strauss, among others, describe basic structures of folk narratives. Recurring narrative elements called motifs have been catalogued; useful in analyzing folktales, they are especially valuable in determining the historical validity of oral traditions.

Different kinds of evidence can be retrieved from different genres of oral traditions. Even folktales, regarded as pure fiction, can sometimes reveal information about past cultural or social aspects.



## ORAL TRADITIONS AND RULES OF EVIDENCE

by Glynn Custred

newick Man as a case study to show why such rules are sorely needed.

### Folklore and oral traditions

Perhaps the best place to start is by defining "folklore and oral tradition." Jan Brunwald defines folklore as "those materials in culture that circulate traditionally among members of any group in different versions, whether in oral form

### *Kennewick Man underscores the importance of separating historical fact from narrative embroidery in oral traditions*

or by means of customary example, as well as the process of traditional performance and communication." *Oral*, as opposed to written material, and *tradition*, knowledge and skills handed down over the generations, are central to every definition of folklore. Note, however, the difference between oral *tradition* and oral *history*. *Oral history* refers to knowledge from experience or living memory that is transcribed and becomes part of the written record. *Oral tradition* is those narratives that are passed down by word of mouth from one generation to the next and therefore become transformed over time.

*Oral tradition*, as the term is used in



Their reach into the past, however, is probably not much earlier than the latter part of the nineteenth century. The most fertile sources of retrievable historical facts, however, are narratives about the historical past, epics and legends, that people believe are true.

### The process of oral transmission

Knowledge transmitted solely by word of mouth undergoes substantial changes in the course of a few generations because, as Marcel Detienne points out, each person "selects 'facts' and produces an account in terms of the way in which his social sphere organizes spoken memory." Memory, selection, and the cultural context of a body of oral tradition alter accounts of events over time. Moreover, a storyteller often embellishes and redacts for purely narrative purposes; thus aesthetic and dramatic motives also alter content.

To illustrate how oral transmission shapes content, we will examine three processes: omission, and thus the loss of information; addition through diffusion; and fusion of elements within a narrative, also called telescoping.

**Omission** of events or personages from a body of oral traditions can lead to loss of information from folk memory. Robert Lowie illustrates this point in the case of the Assiniboines of the Canadian Plains, who adopted the horse in the eighteenth century, only a century and a half before Lowie's study. Although the horse profoundly changed their way of life, their oral traditions do not mention its introduction. Nez Perce traditions, on the other hand, retain in folk memory the first appearance of the horse. Differing instances like these lead Lowie to object to the use of oral traditions in history. Jan Vansina, however, says that omissions of this kind can be explained by the cultural context of the oral traditions. The horse may not have appeared significant to the Assiniboine when it was introduced; therefore the event itself was not remembered. But after three generations they couldn't imagine a time without the horse, and they accounted for its origin not in legend but in a myth of Creation. The horse had a less transforming affect on the Nez Perce, which is why Vansina believes they retained its introduction in historical time.

Vansina gives another example of omission, in this case how a great event was lost while a minor one was retained. The oral traditions of the Kuba of the Congo retain the memory of the first white man to appear among them, but there is no mention of the *second* white man, who wrought vast changes in life in the Congo. The first white man, a merchant, was a novelty and thus retained in tradition. The ultimate importance of the second, however, was unknown at the time; thus he didn't become a part of folk memory. The consensus of the community about what is important or interesting therefore determines what will be retained or lost. It may be possible to account for the absence of an important historical fact in oral tradition without calling into question retained information that may truly reflect past events.

**Diffusion** of motifs or themes from one tradition to another, sometimes over long distances and across linguistic barriers, is another feature of oral tradition that may alter or distort the memory of past events. This process was explored in detail by earlier scholars. The way new elements are borrowed and absorbed depends on the influence of the source tradition, on

the interests of the borrowers, and on the part the borrowed elements play in the preexisting tradition. For example, an image expressed in a motif may reinforce a theme in the borrowing culture, thus making it more concrete. Or an innovation may fill out an earlier traditional account, as in the case Vansina relates of the Kuba, who say their ancestors came to their present homeland by river. When traders, whom they

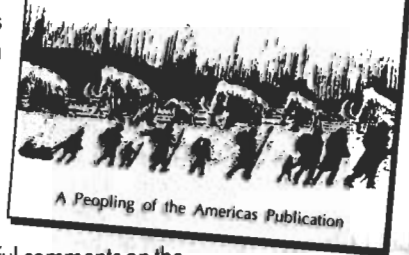
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It's the 17th yearbook in the series that summarizes discoveries in archaeology, physical anthropology, paleoenvironments, and lithic studies—and you can order it now! The 2000 edition of *Current Research in the Pleistocene* has reports from scientists exploring the width and depth of our Hemisphere, from Patagonia to Alaska—and Siberia and the Russian Far East besides. Editor Brad Lepper gives his insightful comments on the "Clovis and Beyond" Conference in this 180-page volume. Use the form inside the front cover of this *Mammoth Trumpet* to order your copy.

### CURRENT RESEARCH IN THE PLEISTOCENE

Volume 17

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encountered from the eighteenth century on, told them about the marvels of the sea, "it fleshed out the image of their points of origin" and was thus incorporated into their body of oral traditions.

**Fusion** of different elements into a single unit is another shaping process in oral tradition whereby multiple historical figures may be fused into a single hero, several battles fused into one battle, historic events fused with mythic themes. Omission, borrowing, and fusion regularly occur in oral tradition and can be taken into account if the researcher understands the cultural and historical context of transmission. Researchers can discard elements that do not reflect historical fact and earmark elements of questionable historic accuracy. Final validation, however, requires corroborating external evidence like written documents and archaeological and other kinds of data.

Oral traditions can actually be more credible than written accounts when contradictions occur in written records. Vansina cites as an example the Abenaki in Maine, whose oral traditions tell about events in 1759 during the French and Indian War. When their oral history was written down over a hundred years later and compared with French and English written versions of the same event, the oral tradition not only confirmed both

written versions, it also resolved a contradiction between them.

But we can't expect to find the same degree of validity in myths as in legends, since the function of mythic lore is very different from that of other kinds of oral traditions.

Archaic myth, as it is sometimes called, is the living myth of oral societies such as those found in America at the time of European contact. This kind of myth deals not with historic time but with the distant past. It addresses the questions of how things became accomplished, how they came to be. Mythic narratives frequently include bizarre elements—monsters, figures that are both animal and human at the same time, shape-shifters, magical transformations, and incestuous relationships. Nonetheless, they are believed to be true accounts by those who relate them, "a reality of a wholly different order from nature," as Mircea Elide puts it. Myth often has a moral dimension; it explains in moral terms why things happened, how the landscape was configured, why plants and animals are the way they are. *The significance of myth lies in the cultural and psychological realm, not in historical fact.*

Since myths, like all folk narratives, reflect the experiences and societies of those who tell them, such great events as migrations and invasions may be telescoped in time in the shift from the historic to the mythic past. Borrowing may occur when ideas spread from one religion to another, filling in or reinforcing earlier narratives or introducing new elements into the mythic narrative. The most striking change comes about when a myth is created to reinforce a new religious movement. The Ghost Dance is an example of a revitalization movement that originated in one North American tribe and spread in various forms to other tribes. Although the roots of a myth may lie in the distant past, some of its elements may be of more recent origin.

### Rules of evidence and oral traditions

All oral traditions have their limitations, says Vansina, meaning they have varying degrees of reliability. Before attempting to retrieve historical information from an oral tradition, we must first define rules of historical evidence, a task to which Vansina applied himself in the two books he wrote on history and oral traditions. "The rules of evidence form a body, a logical train of thought," he cautions. "One cannot apply some and neglect others. They are of a single whole."

Rules of historical evidence must perform as a minimum these functions:

- Validate sources. This involves ascertaining the relationship of the collector to his informants and the collector's competence and knowledge of the native culture.
- Define the kinds of shaping processes at work in oral transmission and how they can be identified.
- Examine all variations of the tradition within the relevant geographic area and within the folk community.
- Identify widespread themes and motifs (to detect fusion of historical fact with recurrent folk patterns) and cultural contacts and revitalization movements (to identify new myths or diffused elements that may be of more recent origin).

These are only a few of the standards we must demand of protocols for determining cultural affiliation under the provisions of NAGPRA. The need for rigorous standards is evident in the government's handling of the case of Kennewick Man.


### The case of Kennewick Man

The Department of Interior has attempted to establish the cultural affiliation of the 9,300-year-old remains of Kennewick Man with a coalition of local tribes. Since there are gaps in the archaeological and mortuary records, affiliation cannot be established by physical evidence. The government has based their case on the geographic proximity of contemporary tribes and the site where the ancient remains were discovered, and on linguistic evidence and oral tradition.

The linguistic evidence is thin and inconclusive and based in part on controversial assumptions.

The evidence from oral traditions is equally unconvincing. Recorded myths were examined in search of ancestors of the contemporary tribes that lived in the area 9,000 to 10,000 years ago. Although there are no migration motifs in the body of myth, there are references to earlier inhabitants, the "Stick People," and to invaders. Note that absence of a migration motif does *not* disallow the possibility that extant tribes migrated into the region they now inhabit; moreover, the mention of outsiders and former inhabitants suggests pre-contact population movement in that area. Oral traditions, like the physical evidence, fail to establish probable continuity.

The entire Plateau, like many other native regions, was the scene of revitalization movements in the nineteenth century, some associated with the Ghost Dance. Christian ideas and later Christian missionaries also played an important part in shaping the cultural changes taking place at that time. In evaluating myth for its possible antiquity, the historical context should be taken into account when sifting folk narrative for elements that may be of more recent origin. This wasn't done in the case of Kennewick Man. The mention in the mythic narratives of natural catastrophes such as floods and volcanic eruptions, *especially periods of cold weather*, was emphasized. The conclusion was drawn that references to extreme cold verified the presence of living people in the Plateau at the time of the Ice Age. But the geology of the region yields prima facie proof that great temperature fluctuations have occurred since then. Concluding that a population inhabited a region in antiquity merely because their oral traditions mention cold weather is pure speculation. This aspect of their oral traditions should be ruled inadmissible as evidence.

Legitimate rules of evidence reveal that oral traditions give no verifiable proof whatever about when the Plateau tribes first inhabited the area. In order to eliminate faulty evidence in future NAGPRA litigation, scholars and jurists must define incontestable protocols for evaluating oral traditions. 


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## The Search for Japanese Origins

*continued from page 13*

1999 from International Research Center for Japanese Studies, I am teaching now in St. Andrew's University, a private university in Osaka with emphasis on human rights as reflected in teaching. There, I started an interdisciplinary research project on 'The Indigenous Peoples and Human Rights,' and carry our seminars with scholars from different disciplines such as international law, ethnology, history, and so on. I teach in my class the history of the Ainu people, compared with that of the native

Americans. My intention is to establish a curriculum in which I can show that the ultimate goal of anthropology is the study of human rights. 

-JMC

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## The Big Eddy Site

*continued from page 3*

Soil samples, 37 in all spanning the interval from 9525 to 12,800 RCYBP, were analyzed in the Paul H. Nelson Isotope Laboratory at the University of Iowa. After fairly elaborate preparation, carbon dioxide from the samples was analyzed in a mass spectrometer. Carbon isotope fractionation discloses the relative contribution of C<sub>3</sub> plants (trees, shrubs, and cool-season grasses) and C<sub>4</sub> plants (plants common to grasslands, savannas, deserts, and salt marshes) to buried organic matter and thus indicates vegetation dynamics and climatic variation.

The results show that after the cool and moist late glacial period, about 11,200 RCYBP was the start of a period of increasing warmth or dryness, or both, that lasted until shortly after 10,400 RCYBP. C<sub>4</sub> vegetation reached its peak about 5200 RCYBP, marking the middle-Holocene dry period, then decreased dramatically between 4500 and 4100 RCYBP with the influx of moist Gulf air into the mid-continent. These analyses yield benefits beyond the Big Eddy site. Because individual stratigraphic horizons in the test excavation are accurately documented—the

virtue of stratification once again!—this is an ideal test case for improving our understanding of how variations in vegetation translate into variations in buried soil organic carbon. The paleotopography of past landscapes can be sampled and analyzed to see how local topographic (edaphic) conditions influence carbon isotopic composition; once local variation and variability are better understood, stable carbon isotope profiles may be used to correlate the vegetation dynamics of different localities and to evaluate the relative time span represented by stratigraphic sections. 

-JMC

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Big Eddy Websites:

1997 Abstract: www.smsu.edu/car/ab\_eddy.html  
Summary: www.smsu.edu/car/bigeddy.html  
Update: www.smsu.edu/car/bigeddygen.html  
1999 Abstract: www.smsu.edu/car/ab\_eddy 1999.html



Hand excavation was done in quadrants and subquadrants within units measuring 2 x 2 m (right) in vertical increments of 5 cm. Although the CAR team placed the excavation blocks well back from the river's edge, at periods of high water hydrostatic pressure creates troublesome seepage (above).



BOTH: CENTER FOR ARCHAEOLOGICAL RESEARCH