

# Early Man Confirmed in America 40,000 Years Ago

Conclusive evidence that early man was present in North America at least 40,000 years ago—nearly twice the previously accepted estimate of man's entry into the New World—has been confirmed for the first time by carbon-14 dating. The find was made in a deep gully nestled in the barren "badlands" area of California's Santa Rosa Island, off Santa Barbara.

There, last summer, UCLA archaeologist and geophysicist Rainer Berger found what scientists have been combing the island for since the turn of the century: an ice-age "pit barbecue" where some form of human beings roasted and ate dwarf mammoth elephants they had hunted and killed. Berger, a specialist in radiocarbon dating methods, recently completed his analysis of four charcoal samples from the 3-meter-wide, 16-centimeter-deep hearth. He reported his findings at a symposium on archaeometry and archaeological prospection last week at the University of Pennsylvania Museum in Philadelphia.

The discovery is "significant," Berger says, because it "clinches the argument that human presence and evolution [in North America] go back much further than we thought." A relatively new dating technique called amino acid racemization (see related story) has placed some California human fossils as early as 48,000 years old. But that technique, developed by Scripps Institution of Oceanography geochemist Jeffrey L. Bada (SN: 5/18/74, p. 316) is still not fully accepted by the archaeological community.

The Santa Rosa site was found in late 1975 by John Woolley, a member of the family that owns the island, and his fiancé Charlene Haupt. However, the island has been a focal point of archaeological curiosity since the first mammoth dwarf remains were discovered there around 1900. Woolley asked Berger, who had previously dated the oldest human remains in the United States at 24,000 years, to study the newly found fire pit area.

Within the sediment-filled hearth, Berger found not only the huge, hind-leg bone of a mammoth but also what he concluded were crude chopping tools used by the ancient beings to cut up their prey.

In the past, researchers had found dwarf mammoth remains, many with their skulls smashed in, in the area of suspected roasting hearths. "But no one had ever found mammoth remains together at a fire site with either cutting tools or human remains," Berger says. It is unlikely that humans would happen to die at their eating place, Berger reasons—and indeed, no human bones have yet been found anywhere on the island. So, he and others concentrated on searching for the mam-

moth-fire-tools combination.

And upon excavating this latest hearth area—which over the years had been buried by sediment, then slowly uncovered by erosion—he found the remains of stone tools, most of which were hand-sized pieces of basalt and chert (a hard, clay stone). The discovery excited Berger. "We knew from the remnants of villages and cemeteries that Canalino Indians had probably existed there in prehistoric times," he says. "But we never found a definite link between man and mammoth" during the Pleistocene era, when the bull-sized elephants roamed the earth.

The archaeologist collected the tools and bones and dug out four chunks of charcoal from the pit. Laboratory analyses showed the samples had no C-14 left in them. Since it takes 40,000 years for an object to lose all its measurable C-14, Berger's findings mean the site and the people who used it were at least that old.

The hearth itself, Berger suggests, was a giant pressure cooker. After killing the elephant, the hunters placed wooden slabs at the bottom of the pit and set them on fire. Then they wrapped the meat in plant material and place it on top of the smoldering wood. They then placed more wood on top of that, set it on fire and covered the pit with soil. The meat was left to cook for 12 to 24 hours, Berger

speculates, or however long it takes for elephant meat to become tender.

Because the C-14 dating method is useful only to about 40,000 years (which amino acid racemization proponents say gives the advantage to their method), Berger is not sure of the exact age of the Santa Rosa fossils. "It may be only 41,000 years old, or it may be more," he says. The C-14 technique can be "adjusted" to detect age up to 50,000 years, he adds, and that will be one of the next steps in Berger's work. Some archaeologists have speculated that many may have arrived in the new world as long as 70,000 years ago, or earlier.

In any case, the Santa Rosa find appears to shatter the long-held belief that man first entered North America somewhere around 20,000 years ago. The Santa Rosa man would correspond to the middle of the last ice age, when a natural bridge would have connected the island to the mainland, Berger notes. "We don't know what these people looked like—we don't know if they were really Indians," the archaeologist says. Human skulls of that time would probably not have any discernible racial characteristics, he says. And while no actual human remains have been found on Santa Rosa, Berger says his findings indicate that such remains are buried there. □

## Amino acid dating: Now it has teeth

To many archaeologists, dating a fossil by any means other than the carbon-14 method borders on heresy. So, when California geochemist Jeffrey L. Bada reported in 1974 that, through a new dating method, he had placed man in North America 48,000 years ago, he immediately became the Roger Maris of archaeology—in the minds of many researchers, a qualifying asterisk was placed next to his "discovery." Since then, Bada's technique—amino acid racemization—has advanced somewhat in stature, but is still short of being universally accepted, particularly in the United States. "He [Bada] is a very serious scientist, but this is a young method in its childhood stage," says UCLA's Rainer Berger.

Ironically, Berger's announcement last week in Philadelphia that he has dated, with carbon-14, man in North America around the time of Bada's earlier estimate (see preceding story) could lend more credibility to the racemization technique, according to some observers. And at the same archaeological meeting at the University of Pennsylvania, a colleague of Bada's at the Scripps Institution of Oceanography in San Diego reported on

additional findings that she says support the accuracy of racemization in dating fossils.

Biologist Patricia Helfman also reports that by measuring the racemization rate in the teeth of skeletons from a medieval cemetery in Czechoslovakia, she has been able to determine their age at the time of death. That method, if applied to other structural parts of the body, such as skin, tendon and cartilage, as well as teeth, might reveal more about how long proteins are maintained in the body and perhaps about the aging process itself, she suggests.

"The bulk of [aging] research has always been in intracellular functions, but 30 to 40 percent of the body protein is structural protein," she says, and that aspect has been "ignored. If such proteins are undergoing racemization [during life], that could have very serious implications" in understanding aging, she says.

The age of a fossil in the racemization method is determined by measuring how much of its L-isomer—the left-handed amino acid found only in living things—has converted to D-isomer—the right-handed form that begins to accumulate