

An ancient mastodon ignited a debate over humans' arrival in North America

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"Oh my God," Richard Cerutti said to himself. He bent down to pick up a sharp, splintered bone fragment. Its thickness and weight told him that it belonged to an animal, a very big animal. His mind started to race.

He was standing at the foot of a slope being groomed by the California Department of Transportation for a road-widening project through the Sweetwater Valley near National City.

Earthmoving equipment had already uncovered other fossils from elsewhere on the site, mostly rodents, birds and lizards. But this bone was from no ordinary animal. The operator wanted to keep digging, but Cerutti raised a fist to stop him. He felt a tightening knot of anger.

The contractors had worked over the weekend without contacting him, and he could see the damage they had done. He sprinted up the slope to a construction trailer and picked up a telephone.

"Tom," he said. "I think I have a mammoth out here on State Route 54. Can you send some help?"

Back on site, Cerutti persuaded the operator to move the excavator out of the way. He grabbed a few tools from his truck: an ice pick, an old paintbrush and his prized table knife lifted from a Black Angus restaurant.

Kneeling among broken bones, he dusted away loose soil and began probing the sediment. His adrenaline surged as the outline of a tusk slowly emerged. Inches from the tusk, he found a stone. One edge was smooth, almost rounded. The other was sharp as a razor.

Cerutti had made stone tools before, and he knew how rocks fracture and break. Nothing about the shape of this rock was natural; something had struck and broken it with great force.

What the hell had he stumbled upon?

Cerutti hardly suspected that on this day, Nov. 16, 1992, he was standing atop a discovery that could rewrite the opening chapter in the history of the New World.

Now retired, Richard Cerutti, 76, lived for these moments.

The fascination began when he was a boy eyeing a friend's collection of ancient shark teeth, and it led to paleontology, the study of Earth's history through its fossil record.

In 1980, Cerutti found his dream job as a construction-site monitor for the San Diego Natural History Museum. With a quick eye and an easy temperament, he could spot bones in tumbled debris and talk down construction crews with schedules to keep. Sucking diesel fumes was a small price for the privilege of stepping back in time.

Tom Demere, who answered Cerutti's phone call, was the museum's curator of paleontology. Demere was better versed in the evolution of ancient whales and pinnipeds than mammoths, but he knew Cerutti was not one to raise false alarms.

The two men first met after Cerutti wrote to ask if the museum might be interested in some fossils he had found. Such offers from the public were not unusual, but claims of their significance were often overblown.

But when Cerutti opened the trunk of his Rambler, Demere gasped. Overnight, Cerutti's bones, wrapped in linen and old T-shirts, doubled the museum's collection of vertebrate fossils.

Demere moved quickly; a mammoth would be rare but not surprising.

Construction projects in the San Diego area had uncovered a wealth of fossils, including a previously unknown species of walrus, nearly 3 million years old, and a never-before-discovered armored dinosaur from the Cretaceous Period about 75 million years ago.

Demere visited the site the next day. He found Cerutti and his team of field paleontologists standing at the foot of the slope.

They had swept the site clean of the loose sediment and collected the broken bones, the pieces of tusks and the stones damaged by the excavator. A few molar fragments told them that the mammoth was a mastodon, a shorter and stockier relative.

With foot-long galvanized nails and rebar, string and flags, the team divided the site into 1 meter squares. They washed and screened sediment, borrowing water and electricity from a homeowner whose backyard overlooked the dig.

Most surprising was how smashed up the specimens were. "Mastodon leg bones are like pier pilings," Cerutti said, "and these were broken to hell."

What could have caused this?

They dug into the slope, primarily following a stratum of silty sandstone no more than a foot thick, sediment laid down—by their estimates—nearly 120,000 years ago, by a meandering river, pushed back by rising seas.

Could these bones be that old?

Late on the afternoon of Dec. 11, the paleontologists began sculpting dirt from around a second tusk. It was jammed almost straight down.

They worked into the dying light. They did not want to leave it overnight; the ivory would tempt vandals. When they finally extracted the tusk, they marveled at its beauty and wondered what could have pushed it, tip-first, into the ground.

By now, though, they were accustomed to

unanswered questions.

Mastodon leg bones are like pier pilings, and these were broken to hell.

Demere brought in two experts from Northern Arizona University—Larry Agenbroad and Jim Mead—who spent more than a week at the site. They helped excavate two of the most remarkable squares, where the assortment of fossils was especially dense: ribs, long fragments of femurs with spiral fractures, two molars, vertebrae and a cobblestone.

At the center of this collection were two femur heads, detached from their shafts and nearly touching, one hemisphere facing up, the other facing down.

The team wondered how this could be. Mastodon femurs—those pier pilings—are almost 3 feet long and up to 8 inches in diameter. What could have detached these heads from their shafts and positioned them side by side? Next to them was a large boulder that somehow seemed implicated.

They tried not to speculate but kept returning to the possibility that humans might have been here, broken these bones and walked away. That meant the evidence they left behind—all this debris—was almost the same age as the sediments that eventually buried the site.

It was heresy, maybe even lunacy.

For nearly half a century, schoolchildren have been taught that the first human visitors to the New World belonged to the Clovis culture, known for chipped-stone spear points first discovered in New Mexico.

Archaeologists say these people crossed the Bering Land Bridge from Asia about 12,000 years ago.

To dispute Clovis-first by a few thousand years was controversial. Some archaeologists had won begrudging acceptance with a few scattered excavations.

But to propose a site more than 100,000 years older was professional suicide. It would undermine the research and reputations of most archaeologists studying the New World.

"If you claim something is that old, you get blasted," Cerutti said, "which is why some archaeologists stopped working on sites like this. They didn't want to get blasted."

The paleontologists tried to find an alternative theory.

Could these bones have been broken by construction equipment or by other animals? Perhaps another mastodon? If so, then why were more fragile bones, like ribs, still intact?

Could a mudflow have swept in the large cobblestones? Maybe, but wouldn't a mudflow have also swept away, even destroyed, the smaller skeletons of birds and lizards they'd also found at the site?

And what about the cobblestones? There were five of them, ranging from 9 to 30 pounds, caught in this sedimentary layer of fine-grained sand. Why weren't there more?

For that matter, why hadn't they found more of the mastodon's skeleton, especially the large pieces like the skull, the pelvis, and the scapulas?

Agenbroad, who had made his reputation at the famed mammoth graveyard in South Dakota, was flummoxed. He could not accept the presence of man on the North American continent so long ago.

"'Anomaly' is the key word for this site as far as I'm concerned," he said. "There are anomalous fragments of rocks, anomalous fragments of tooth enamel scattered throughout the site that—and here he paused between words for effect—just ... don't ... make ... sense in a natural depositional environment.

"If I didn't call this Highway 54 Mastodon, I would call it the Anomalous Mastodon Site."

The lack of consensus frustrated Cerutti. He knew

that the San Diego museum supported the work, but he had also heard that some of his colleagues were saying he had been "out in the sun too long."

So who were the first Americans? The answer, he feared, would have less to do with science than blood sport.

By the time the site played out after five months, 50 squares had been excavated. Nearly 400 specimens had been trucked to the museum. Cerutti and the team cleaned, preserved and cataloged them.

Demere sent samples to a laboratory in Miami for radiocarbon dating, the gold standard for determining the age of archaeological sites.

A report came back: There was not enough organic carbon—collagen—in the samples to allow them to date the critical isotope, C-14. But because organic carbon decomposes over time, the isotope's absence suggested that these specimens were probably older than Clovis culture.

Corroboration came from a University of Southern California professor, Richard Ku, who had been dating other sites in Southern California using a new, if rudimentary, technique that measured changes in the uranium and thorium content of organic materials as they aged.

Ku worked with a portion of a tusk and a piece of the calcium carbonate, a hardened rind of minerals that had encrusted the specimens over the thousands of centuries underground.

After a few months, Ku wrote back: The average age of the tusk and the rind was 191,000 years. As exciting as this was, it also seemed too old and felt like a setback. Had the team gotten something wrong?

In his final report completed in 1995, Demere hedged. He wrote that the spiral fractures in the femurs could have been produced "by human activity" or by simple "torsion caused by twisting," what a panicked animal might do if its foot were sunk in mud.

In the years that followed, Demere invited other researchers to study the collection. But no one stepped forward.

Robson Bonnicksen, an anthropologist at Oregon State University and the founder of the Center for the Study of Early Man, said, "Your site may well be a candidate for one of the oldest archaeological sites ever found in the New World."

But he added: "From my own bitter experience, I know that research that contributes to First American Studies is a game of hardball."

George Jefferson, former associate curator of the Page Museum in Los Angeles and district paleontologist for the California State Parks, was blunt: The archaeological community was not ready for such an unsettling claim of antiquity.

"Keep it under wraps," he said. "No one will believe you."

The director of the San Diego museum asked Demere: "When are you going to publish?"

"I didn't know what to do," Demere said.

Months went by. Then years.

Cerutti stopped going near State Route 54. In 2000, he and his wife moved to a new home in the mountains east of San Diego. Three years later, a wildfire swept through the community. Their home was spared, but they eventually had to walk away.

Worse, Cerutti had been diagnosed with non-Hodgkin's lymphoma, and for two years he underwent chemotherapy. He began losing friends from the excavation, one from a suicide that he still cannot shake.

He felt hopeful when Steve Holen came to San Diego in 2008 with his wife and collaborator, Kathleen, at Demere's invitation.

As the curator of archaeology at the Denver Museum of Nature and Science, Holen had heard about the Cerutti Mastodon Site, and upon retirement, he and Kathleen decided to look into the

claims more carefully.

The couple set themselves up in Demere's research laboratory. Over two days, tray after tray of bones and rocks and cobblestones were brought to them, along with photographs, maps and videos from the site. Holen couldn't believe what he saw. It was just as Cerutti had thought: Someone had hit these bones with a tremendous force.

Here were the signature signs of the impact: the small craters produced when a solid object strikes another, creating cone-shaped divots, like a BB does when it hits a pane of glass.

He also studied the calcium carbonate that covered the broken bones, shielding and preserving the original fractures—essentially locking them in time—more than 100,000 years ago.

"I was staring out into space with my mouth open," he said. "I couldn't get my head around this. It goes against everything I was taught and all that I knew."

He discussed it with Demere, who realized that he had found his co-author. "Finally, someone with the ... experience."

Together they prepared for battle.

Demere and Holen assembled a team of paleontologists, archaeologists, geoarchaeologists, mastodon specialists, Paleo-Indian specialists, sedimentologists, geomorphologists, geochronologists and lithic fabrication specialists.

Each scientist took an element of the site and applied their proficiency.

One concluded that there had been no raging torrents that might have crashed the stones and bones together in a seasonal fury.

Another focused on the fragments scattered around the site. The few pieces of bone that they found fit into the smooth spiral fractures, and the more plentiful stone fragments matched with the ragged edges of the cobblestones.

Still another re-dated the site.

More than 20 years after Ku's work, the technology for uranium-thorium dating had improved, and there was a better understanding of the behavior of uranium in bone samples.

Jim Paces, a geochronologist at the U.S. Geological Survey in Denver, took dozens of slices from a rib and two femurs. Each slice, no wider than a millimeter, was dissolved in nitric acid.

The resulting solution contained trace amounts of uranium and thorium, which Paces extracted. After measuring those concentrates in a mass spectrometer, Paces concluded that the bones were 130,700 years old, plus or minus 9,400 years. The specificity was stunning.

"How could this be wrong?" Paces asked himself.

Holen and Demere sent three of the cobblestones to Richard Fulagar, an archaeologist at the University of Wollongong in Australia. With a variety of microscopes, Fulagar documented the topography of the stones, their abrasions, scratches, scars, polish and pitting.

There was no mistaking it in Fulagar's view: They had been used as hammers and anvils.

George Jefferson, who had advised Demere to "keep it under wraps," was invited for his experience in taphonomy, the science of what happens to an animal from the time it dies to the time it is dug up.

"Each new test," he said, "supported the claim."

The conclusion seemed clear: Hominids, wandering through Southern California, had found a mastodon carcass and gone to work. They hauled cobblestones to the site and pounded the bones, cut out the marrow for food and broke off splinters for tools.

It was, Demere says, "a Pleistocene MacGyver moment," making things out of common objects.

To signify the spot, Demere speculates, the hominids may have driven that tusk into the ground as a landmark.

Kathleen Holen wrote the first draft of their findings, and then fielded comments from the 10 co-authors through 35 versions.

Steve Holen and Demere decided to submit their findings to the scientific journal *Nature*. They thought that the London-based publication would be more open to their interpretation of the site than a journal in the United States. Conclusions such as theirs were more easily accepted in Europe, where sites like this were more common.

The group decided to honor Cerutti, who had stopped the excavator that Monday morning in 1992 and made, to their reckoning, one of the most important discoveries in American archaeology.

They called the excavation the Cerutti Mastodon Site.

After three rounds of review by four "referees—three archaeologists and one geochronologist—over a course of a year, *Nature* accepted the article: 1,700 words, 24 site drawings, eight videos and 71 pages of supplemental material.

The article was published in April 2017 and went viral. Its findings landed on the front pages of newspapers and led many websites.

Dissent from some of the world's most distinguished archaeologists was immediate.

Briana Pobiner damned the work with faint praise. She told *Smithsonian* magazine, "I think the combination of evidence is on the way to being convincing."

Others didn't hold back.

Donald Grayson to *BuzzFeed News*: "I was astonished, not because it is so good but because it is so bad."

David Meltzer to the *Guardian*: "I'm not buying what's being sold."

National Geographic pronounced its skepticism in an article titled "Humans in California 130,000 Years Ago? Get the Facts."

The article drew scathing opinions by Tom Dillehay and Jim Adovasio. They had been the lead archaeologists on sites in the New World—Dillehay in Chile and Adovasio in Pennsylvania—that after years of controversy had earned acceptance for their own pre-Clovis claims.

The research at the Cerutti site, Dillehay said, doesn't rule out the possibility that a debris or mudflow carried the cobblestones to the scene, nor does it take into account that patterns on the stones might have been caused by the rocks bumping against one another in a fast-flowing river.

"When you put the total package together," he said, "there's certainly more evidence to reject than accept it."

Adovasio said: "They make a statement that the (evidence at Cerutti) is consistent with many other sites.... Well, I'm sorry, it's not—that just isn't simply true."

In a response co-written with nine colleagues and drafted as a rebuttal for publication in Nature, Todd Braje, a professor of archaeology at San Diego State University, said Holen, Demere and their dream team did not go far enough to rule out other possible causes for the spiral fractures and [broken bones](#).

"Because humans could have fractured the CML mastodon remains does not mean they did fracture them," they wrote.

Braje and his co-authors said the bones might have been trampled, for example by other large animals. He also found it suspicious that there were no "unambiguous chipped-stone tools."

Even though Nature declined to publish Braje's letter, he found a place for it in another journal, which had already accepted two other commentaries, including one by Gary Haynes, emeritus professor of anthropology at the University of Nevada, Reno.

The bones could have been damaged and the cobblestones scattered by earthmoving equipment used by the Transportation Department in 1992, or

by the developer who created the adjacent subdivision in 1971, Haynes said.

Even while saying the claim was "minimally plausible," he called it "an argument from ignorance," and wrote that the "archaeologists have clearly not been trained."

"It was like getting lined up and shot with machine guns," Cerutti said.

Haynes was also critical of Nature, accusing the journal of committing "an editorial lapse in judgment" by accepting the Holen-Demere package.

A Nature spokeswoman said the journal does not comment on its editorial or review process, and that dissenting opinions are published only after the arguments have been peer-reviewed.

Demere and Holen maintain that their article does address the alternative theories, and accuse skeptics of being more rhetorical than constructive by requiring them to rule out explanations that no one articulated.

"A spaceship smashing into the site?" Demere said.

The challenge facing the Cerutti team is not just the site itself but all the questions that it raises about man's migration out of Africa, said John McNabb, a senior lecturer in Paleolithic Archaeology at the University of Southampton, who was invited by Nature to review the letter before publication.

Who were these people breaking these bones? At least three species of hominids populated Earth at that time: Homo sapiens, Neanderthals and Denisovans.

And how did they get to North America? What was the condition of the land bridge between Siberia and Alaska that long ago? What were the sea levels like? How cold might it have been?

Or did they come by watercraft?

And what became of them?

McNabb understands why archaeologists are eager to dismiss the claims of the Cerutti Mastodon Site. But attributing their objections entirely to ego is too easy and only perpetuates the personal rivalries that have dogged this topic for decades.

"Entrenched views are hard to shift for researchers who have built a reputation on them," he said.

Though skeptical of the Cerutti team's findings, McNabb argues that the burden is now on archaeologists to visit the collection, study the data and arrive at their own conclusions.

"It is these folks who should now be looking at the site and remains—independent researchers, outside the arguments, who could bring skill and expertise to bear on these questions," he said.

Demere and Holen have invited researchers to examine their data and the specimens. But no one has done so, as if to study their work would be to dignify it.

Until then, said Kathleen Holen, "we intend to continue to search for similar sites and hope our findings will inspire future archaeologists to do the same."

Today, Richard Cerutti and his wife live in an apartment in Imperial Beach. His living room is a museum to a lifetime spent as a field paleontologist: a bookshelf covered with rocks that he has knapped, boxes of folders and books—and 33 buckets filled with artifacts.

"We're scientists," he said, "and we want to know our own history. Who were the first Americans? When did they get here? How did they get here?"

Thirteen miles away, a [mastodon](#) bearing his name resides in Room 359 of the San Diego Natural History Museum, locked in cabinets kept at 67 degrees. It is the great puzzle of Cerutti's lifetime—and of the New World.

Thomas Kuhn, the scientist-philosopher who wrote "The Structure of Scientific Revolutions," said "normal science" dominates discourse until anomalies arise that normal science can no longer

address. The result is a shift in thinking that ushers in a new era of understanding.

Demere and Holen think the study of early man in the New World has reached this point.

Richard Cerutti is betting on it.

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