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PERSPECTIVE

The Cerutti Mastodon

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ABSTRACT

A claim that an assemblage of broken mastodon bones and associated cobbles provides evidence of human behavior in North America dated 130 ka is not adequately supported. The article appeared in the journal *Nature*, which means that it will be widely read and cited. Before the claim can be accepted, we must have a much clearer description of the stratigraphy, and especially of the possible effects that heavy earth-moving equipment might have had on the bones. Bone-breakage by construction activity has been documented in at least one fossil proboscidean site and is probable at others. The dating by ^{230}Th/U radiometric analysis has a possible problem in that no strictly local source of uranium uptake in the bones was available to sample. Another problem is the absence of reputable archaeological traces of such a long-distance dispersal into North America by unknown hominins from Asia.

KEYWORDS

Cerutti Mastodon; earliest peopling of the Americas; taphonomy; skepticism

The Cerutti Mastodon site was announced as the "oldest *in situ*, well-documented archaeological site in North America" (Holen et al. 2017, 479), with a date of 130.7 ± 9.4 ka (MIS 5) given as the "minimum estimate of the burial age" (Holen et al. 2017, Supplementary Information, 51). On the same day as the paper appeared in the journal *Nature*, reporters from print and digital media published first reactions from a sample of professional archeologists. The range of comments included: the paper is astonishingly bad (D. Grayson in Vergano 2017), the site is not credible (J. Erlandson in Wade 2017), the evidence is insufficient (J. Shea in Wade 2017) and ambiguous (D. Meltzer in Rincon 2017), along with a couple of opinions that the claim is plausible (R. Mandel and B. Shapiro in Zimmer 2017). A testimonial essay also appeared in the same issue of *Nature*, written by one of the paper's peer reviewers (Hovers 2017). Such an extraordinary claim must face tough skepticism.

The claim that this site preserves "evidence that is incontrovertible" about an extremely early human activity in the New World (R. Fullagar, quoted in Bower 2017) is especially noteworthy because it was published in one of the world's most widely read and respected peer-reviewed scientific journals, which means every paper written for years to come about the peopling of the Americas will feel the need to cite it, thus ramping up the journal's Impact Factor.

Claims about extremely old traces of humans in the Americas are not uncommon, and southern California has provided other memorable examples. Louis Leakey popped over from East Africa in the 1960s to lobby for the acceptance of 100,000–200,000-year-old broken rocks as artifacts in the Calico Hills conglomerates, and George Carter similarly insisted that 100,000-year-old broken rocks from the San Diego coastal region were artifacts. A more distant claim for such early human presence came from the Old Crow region in the Yukon, where broken bones of different chronometric ages eroding out of river bluffs were deemed by a few archeologists to be human handiwork going back to MIS 5 or beyond.

The Cerutti Mastodon materials were originally recovered in the early 1990s when earth-moving activities started exposing them along a state highway in southern California. The *Nature* paper's authors dismiss the possibility that earth-moving construction equipment could have affected the buried bones and stones (Holen et al. 2017, 484). In their words, after some material was first uncovered in one part of the site, the rest of the stratum containing many other bones and stones "remained intact and buried […] deeply by overlying strata." The potential thickness of overlying sediment is what the authors believe would have insulated the bones and stones from any crushing by earth-moving equipment driving over them.

The overburden was excavated by hand after earth-moving was halted, removing 3 m of sediment, according to the paper. The stratum called Bed F overlying the mastodon bones was 20 cm thick, and the bone-bearing Bed E was 20–30 cm thick; an underlying Bed D was much thicker (as illustrated in Holen et al. 2017, Extended

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Data, Figure 1). But the information about stratigraphy and the depths of the bones is inadequate to evaluate the possibility that the weight of earth-moving equipment may have crushed the buried bones and cobbles. A photograph of the site after excavations were completed (in Zimmer 2017) seems to indicate that the land surface had been previously leveled by grading for housing construction just a few meters away, and that later earth-moving activities piled up sediment above the land surface in which the bones were still buried, to construct an earthen sound-dampening berm between the houses and a state highway. The thickness of the sound-berm's graded fill may account for most of the 3 m that was excavated by hand down to and through the bonebed; it would not have been present when the original land grading was done for highway and housing construction. We are left to wonder how deep was the bone level when the grading for the highway and housing was completed, and before construction began on the sound-dampening berm. The bonebed may have been only half a meter below the surface when the berm was being created. On page 31 of the *Nature* paper's Supplementary Information file is a statement that highway construction destroyed a "probably significant part of the bonebed." The issue of bonebed depth definitely needs clarification. Maps and sections of the site strata are needed for a detailed evaluation of the possibility that heavy equipment could have impacted the bones and stones before they were under the berm. The *Nature* paper and supplementary file do not provide necessary data. Readers cannot guess at how much the bones and stones were insulated from massive compression.

The potential impacts of multi-ton earth-moving equipment is not a far-fetched possibility to be considered. We already know that buried bones can be broken by the weight of earth-moving equipment to produce midshaft helical fractures, such as at the Orleton Farms mastodon site in Ohio (Thomas 1952, 3, figure 3), and spiral fractures with notched edges and impact/anvil marks, as at the Inglewood mammoth site in Maryland (Haynes forthcoming). The *Nature* paper's authors apparently were not aware of this possibility. The authors also neglect to consider other possibilities that could explain different features in the site assemblage. For example, one notch on a mastodon bone fragment's fracture edge is thought to be too large for any Pleistocene carnivore to have produced, and therefore the paper's authors attribute it to hammerstone impact – but another possible cause is point compression along the edge by sediment crushing. Another example of the shortsighted reasoning: A vertically oriented tusk exposed by a backhoe is said to have been purposefully placed that way by hominins, but the paper's authors ignore the possible effect the backhoe may have had. The much smaller bones of horse, deer, and dire wolf were not fractured like the mastodon bones; the authors did not think to consider whether the very sandy Bed D containing these bones below the mastodon-bearing Bed E may have reacted to compression differently from Bed E, which was richer in silt and clay. A more inclusive awareness of alternative explanations needed to be demonstrated for the breakage and distribution of Bed E materials. Without this awareness, the paper's claims are thus based on an argument from ignorance: the authors knew of no processes other than hammerstone impact that can break proboscidean bones as seen at the site, and it led them to conclude prematurely that hominins alone were responsible.

Possibly an even larger choking point for skeptics is that the site lacks deliberately shaped lithic tools and cultural features such as hearths. The finds consist only of hundreds of pieces of broken mastodon bones and cobbles spread over 50 m^2. Some of the broken cobbles had abrasive smoothing and other features said to be consistent with damage to hammerstones that had missed a bone target and struck a postulated supporting anvil stone – although a simpler explanation is that the stones were crushed against other stones and bones by sediment compression.

Is this set of materials enough to dramatically upend current views of the peopling of the Americas? Certainly not. Sites of comparable age worldwide contain broken proboscidean bone interpreted as fragmented by hominins, some dating >1 Ma, but the least ambiguous of these sites also contain other evidence such as knapped lithic artifacts and cut marks, neither of which kind of evidence is present at the Cerutti Mastodon site. Sites with no cutmarks or lithics have been claimed for North America, such as La Sena in Nebraska (Holen 2006) and Lamb Spring in Colorado (Stanford, Wedel, and Scott 1981; Rancier, Haynes, and Stanford 1982), but they are much younger than the Cerutti Mastodon and are not universally accepted as archaeological.

One more problem some readers might have is the 130 ka dating by ^{230}Th/U radiometric analysis. The dating analysis was conscientiously done, according to archaeometry specialists A. Pike of the University of Southampton (quoted in Wade 2017, 361) and A. Millard of Durham University (Millard 2017), although Millard wonders why OSL ages of samples from the site are so different from the ^{230}Th/U ages, and why two other dates noted in the site's 1995 final report (Deméré, Cerutti, and Majors 1995) are not mentioned in the *Nature* paper. Millard also comments that a strictly local groundwater source of uranium would have provided a more solid basis for modeling uranium uptake in the bones, rather than a "nearby" shallow groundwater source which had to be used.

The authors of the *Nature* paper try to add plausibility by citing the discovery that some South American native people have a possible very distant genetic relationship to Australasians, implying perhaps an origin in Asia much farther back in time than is the case for the rest of the New World's Native Americans (Skoglund et al. 2015; Skoglund and Reich 2016). I acknowledge that the authors of the *Nature* paper have succeeded in making the claims minimally plausible, but this is far from making them probable. Yes, humans wielding hammerstones can break modern elephant bones to produce shapes and marks that are similar to the features seen on the Cerutti mastodon bones (Haynes and Krasinski 2010; Krasinski 2010), but would late Quaternary hominins leave such near-cryptic sites with no other signs of their behavior? And we still do not have any real evidence that there were hominin dispersals from Asia into North America more than 130,000 years ago, on a land connection exposed by lowered sea level – which would be the same route and timing for bison dispersal from Asia. The paper's supplementary file puts forward a number of archeological sites as evidence that hominins present in Asia around MIS 5 or MIS 6 (either late *Homo erectus*, Neandertals, Denisovans, or archaic *Homo sapiens*) could have been the source of the bone-breakers at the Cerutti site. But the huge stretch of the earth that separates these sites from the Cerutti Mastodon is without the structured archaeological traces routinely left by hominins of MIS 5 and 6.

If the claims for such an extended antiquity are true, rather than just plausible, there must have been some sort of hominin in the Americas more than 115,000 years before the time when current mainstream thinking has modern *Homo sapiens* entering the continent. On the other hand, if the claims are *not* true, it indicates that archeologists have clearly not been trained to be more aware of how noncultural processes affect fossil bones. Either way, we might have a lot to learn.

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Gary Haynes is Foundation Professor of Anthropology, Emeritus. His interests include the peopling of the Americas, the Stone Age prehistory of Zimbabwe, and actualistic studies in taphonomy, all of which he has published widely on. Among his publications are the books *Mammoths, Mastodonts, and Elephants*, *The Early Settlement of North America: The Clovis Era*, and *American Megafaunal Extinctions at the End of the Pleistocene*. He is currently writing a book about late Quaternary proboscidean taphonomy.

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