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PERSPECTIVE



Were Hominins in California ~130,000 Years Ago?

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ABSTRACT

In a controversial study published in *Nature*, Holen et al. (2017) claim that hominins fractured mastodon bones and teeth with stone cobbles in California ~130,000 years ago. Their claim implies a human colonization of the New World more than 110,000 years earlier than the oldest widely accepted archaeological sites in the Americas. It is also at odds with genetic and fossil evidence for the dispersal of anatomically modern humans (*Homo sapiens*) out of Africa and around the world. Recognizing the incompatibility of their claim with extant knowledge, the authors suggest that the Cerutti Mastodon locality might have been created by an as-yet unidentified archaic hominin, for which no fossil, archaeological, or genomic evidence currently exists in northeast Asia or the Americas. We assess Holen et al.'s (2017) supporting evidence and argue that such extraordinary claims require extraordinary evidence, which their paper and supporting materials fail to provide.

KEYWORDS

Cerutti Mastodon; peopling of the New World; epistemology

In defense of their claim that the Cerutti Mastodon locality (CML) was created by humans, Holen et al. (2017) offer four criteria for recognizing and accepting an early archaeological site: (1) *archaeological evidence is found in a clearly defined and undisturbed geologic context*; (2) *age is determined by reliable radiometric dating*; (3) *multiple lines of evidence from interdisciplinary studies provide consistent results*; and (4) *unquestionable artifacts are found in primary context*. Here, we evaluate the CML in light of their criteria 1, 3, and 4. We do not question the Uranium series age derived from the mastodon bones. It may be valid, but if the material being dated is not modified by humans, the age is archaeologically irrelevant.

A hallmark of archaeological research is establishing stratigraphic context, control, and integrity. The remnants of the CML were excavated 25 years ago during a salvage paleontology project related to highway construction. Context is crucial for evaluating the purported processing of mastodons by humans at the CML, but the data required to fully understand the context of the bones and stones are not presented. Although limited discussion of the site's geographic context, stratigraphy, soils, and taphonomic history is presented, much of

this information is inadequate and lacking a full stratigraphic section and a detailed map showing the relationship of the locality to surrounding landforms. Currently, it is impossible for readers to evaluate whether the cobbles critical to Holen et al.'s (2017) case could have been derived naturally from surrounding landforms or depositional settings.

Holen et al. (2017) claim to present multiple lines of evidence establishing a hominin presence in California ~130 thousand years ago (kya), but their conclusions are based primarily on a series of modern experiments suggesting that humans *could* have fractured mastodon bones and teeth, producing fracture patterns and striations consistent with those identified on bones and cobbles recovered at the CML. They offer no alternative hypotheses that fully assess the role of natural taphonomic processes in producing those same products. Instead, their analysis is a classic illustration of the fallacy of "Affirming the Consequent": because humans *could* have fractured the CML mastodon remains does not mean they *did* fracture them. Holen et al. (2017) fail to demonstrate that *only* hominins could have fractured and modified the CML bones and teeth, nor that the "artifacts" are of cultural origin rather than geofacts.

They also offer no explanation for why or how hominins would deeply impale one tusk more or less vertically into the sediments underlying the bone bed layer.

Archaeologists and paleontologists have spent decades studying breakage patterns and other modification to animal bones, focusing on everything from weathering to animal trampling, burrowing, scavenging, and processing by hominins (Lyman 1994). Taphonomic and modern surface assemblage studies demonstrate that spiral fractures of the sort displayed by the CML mastodon can result from trampling or wallowing by large herbivores, including elephants (Haynes 1988; McComb, Baker, and Moss 2006). With evidence as ambiguous as broken bones/teeth and nondescript broken or battered cobbles, it is not enough to demonstrate the CML mastodon remains could have been broken/modified by humans. Holen et al. (2017) must demonstrate that the bones *could not* have been broken by natural forces. The fact that some bones within the stratum were broken while others were not has little or no value as an indicator of the potential archaeological nature of the locality.

The purported stone tools from the CML could also be readily explained by natural processes. Similar to the bone breakage, Holen et al. (2017) demonstrate that the battering patterns on these stones *could be* from processing mastodon bones, but experimental evidence that separates the action of natural processes from intentional human actions is absent (see Andrefsky 2013). In fluvial settings, for instance, well-rounded cobbles such as those depicted by Holen et al. (2017) can be eroded from higher landforms, roll considerable distances after being dislodged, and end up battered and spalled in sediments more typical of low-energy depositional environments. Striking in their absence are any unambiguous chipped stone tools, although hominins were making clearly recognizable stone tools throughout Africa and Eurasia 130 kya, ranging from formal tools to expedient flakes. There is no shortage of quality tool-stone in the San Diego area, and the absence of clearly modified chipped stone tools at the CML is damning to their case.

Extraordinary claims require extraordinary evidence, which has not been provided for an archaeological origin of the CML. If the antiquity of hominins in the New World is to be extended more than 110,000 years, the archaeological evidence must be unequivocal. Despite extensive research in sediments of Last Interglacial age, including previously debunked claims from southern California (Carter 1980; Leakey, De Ette Simpson, and Clements 1968), scientists have found nothing to indicate hominins were in the New World – or even in far northeast Asia – before ~50 kya (Meltzer 2009). The oldest

widely accepted archaeological site in the Americas, Monte Verde, is only ~14.6 kya, or possibly as early as 16–18 kya (Dillehay et al. 2008, 2015). It has taken archaeologists decades of careful survey, excavation, analysis, and critical debate to break the Clovis barrier and extend the chronology of New World colonization back a few millennia. A late Pleistocene colonization of the New World is further supported by genetic evidence that points to human movement from Asia to the Americas no more than about 25 kya (Raghavan et al. 2015). If hominins were living along the ancient California Coast by 130 kya – an environment rich in terrestrial, riverine, estuarine, and marine resources – what happened to them? It is highly improbable that they simply died out, or that archaeologists have missed evidence of > 100,000 years of human occupation of the New World. The most parsimonious explanation for the CML faunal remains and purported artifacts is that they were created by natural processes, not by human agency. A key step forward will be additional research by independent researchers to further evaluate the CML materials and the claim that they were modified by humans.

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No potential conflict of interest was reported by the authors.

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