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RESEARCH ARTICLE

Did Modern Humans Originate in the Americas? A Retrospective on the Holloman Gravel Pit in Oklahoma

David Deming

College of Arts and Sciences, University of Oklahoma
ddeming@ou.edu

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Abstract—For decades, the dominance of the Clovis-first paradigm precluded the possibility of acknowledging a human presence in the Western Hemisphere before 11.5 ka. Yet there are a multitude of sites in the Americas with significant evidence for human occupation dating back to 200 ka and older. At two of these sites, Holloman in Oklahoma, and Hueyatlaco in Mexico, stone tools were found that indicate the possible presence of a lithic technology advanced beyond that found contemporaneously in Eurasia. Culturally modern humans may not have originated in Africa as is currently thought, but in America where evolutionary change was facilitated by geographic isolation. *Homo sapiens* could have re-entered Eurasia from America as early as 75 ka and spread rapidly, displacing archaic *Homo* species. The opening and closing of the Bering Land Bridge over the last several hundred thousand years may have functioned as the pacemaker of human evolution.

Keywords: Clovis, Out-of-Africa, evolution, Pleistocene, America

Introduction

In 1926, human artifacts were recovered from a gravel pit near Frederick, Oklahoma (Figure 1). The associated fossil deposits in the gravels were unmistakably of Pleistocene age. Even at this early date, the inference that humans occupied the Americas during Pleistocene time generated heated debate. After a few years, the owner of the gravel pit, A. H. Holloman, became disgusted with the controversy and closed the area in 1932. The site has remained closed since that time and has never been excavated (Branson 1955, Smith & Cifelli 2000).

For decades, archaeological dogma precluded the possibility of early human occupation in the Western Hemisphere. From 1965 through

1997, the predominant theory of human settlement in the Americas was the Clovis-first theory. The name refers to an archaeological site near the town of Clovis, New Mexico. By 1965, remains of stone tools from about six sites in the Great Plains and southwest United States had been carbon-dated to about 11,500 years before present. The narrative that developed and received wide acceptance was that these artifacts represented the first appearance of humans in the New World.

What made the Clovis-first theory so attractive was its parsimony. Clovis culture remains dated to precisely the same period that "for the first time in at least 15,000 years, an ice-free, trans-Canadian corridor opened up" (Haynes 1964:1412). It was a "striking relationship" that seemed to have extraordinary explanatory power (Haynes 1964:1411). The Clovis people were big-game hunters, and they spread rapidly across the continent (Meltzer 2004:539–540). Subsequently, any evidence that people might have occupied the Americas prior to Clovis times was routinely dismissed without serious consideration.

The Clovis-first theory collapsed in the late 1990s due to the accumulation of a weight of evidence documenting earlier occupation of the Americas. Yet the generally accepted date for first human settlement has been barely nudged back from 11.5 ka to 15 ka (Fagan 2005:71–96, Goebel, Waters, & O'Rourke 2008). The archaeological community continues to strongly resist the idea of older human occupation despite significant evidence to the contrary. An important site containing evidence of human presence in the Americas as early as 150 ka is the Holloman gravel pit in Oklahoma (ka is a kilo-annum, or a thousand years before present. Ma is a mega-annum, a million years before present). Although the Holloman site contains human artifacts cemented in situ with a Pleistocene faunal assemblage, the site has never been excavated.

The Holloman Gravel Pit

In the 1920s, A. H. Holloman operated a commercial gravel pit on a ridge approximately a mile (1.6 kilometers) north of the city of Frederick, Oklahoma. In 1926, Mr. Holloman discovered in the gravels what appeared to be human artifacts in the form of stone tools. A resident of Frederick, F. G. Priestly, wrote a letter to the editor of the journal *Scientific American* describing Holloman's finds (Cook 1927a, Branson 1955). The editor passed on this information to Harold J. Cook and J. D. Figgins. Descriptions of the Holloman site were published in 1927 by Cook in *Scientific American* and in separate articles by Cook and Figgins in *Natural History*.

The gravel deposits at the Holloman site were dated by Cook (1927b) and Figgins (1927) as being of Pleistocene age based on a distinctive fossil

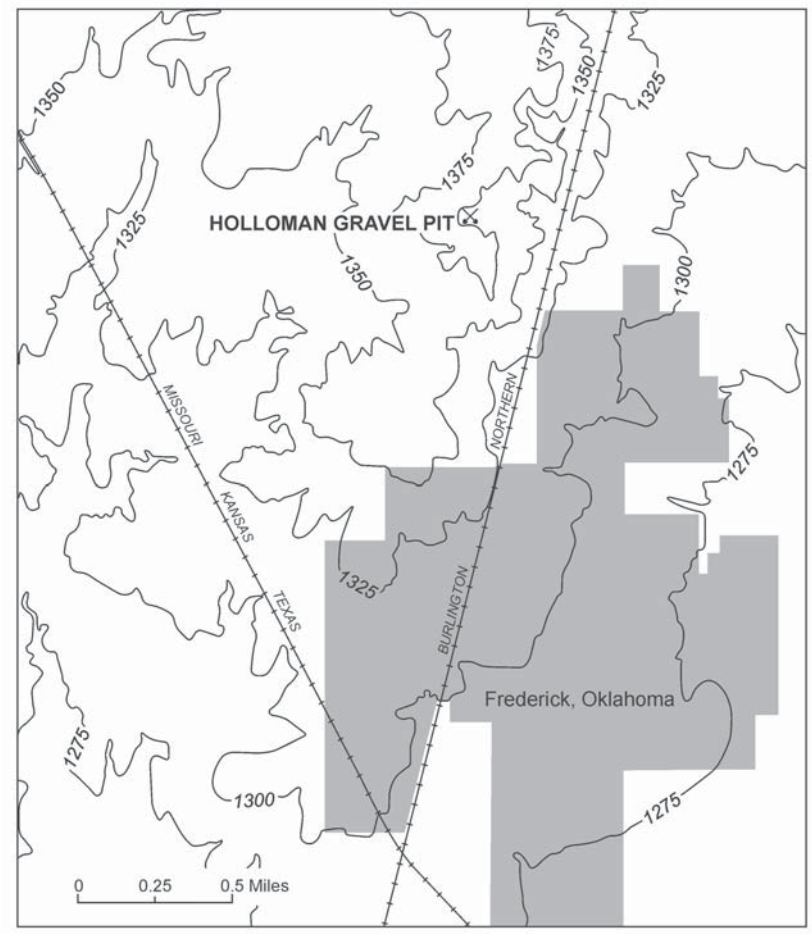

Figure 1. Location of the Holloman Gravel Pit near Frederick, Oklahoma. Contour lines show elevation (in feet) above sea level (1 foot = 0.3048 meters).

assemblage. The lowest member of the Pleistocene gravels was described by Figgins (1927:235) as "solidly cemented." Cook (1927b:247) concurred that the bottom layer was "generally cemented," and wrote that "it is in this bed that fossils are most abundant, and in it one flint spear point was found imbedded." Photographs of artifacts recovered from the Holloman pit were published by Figgins (1927:237–239). Five rounded stones recovered from the site were interpreted to be metates, implements used for food processing. Cook (1927b:247) concluded that the Holloman site provided "evidence of [human] antiquity" that was "clear-cut and conclusive."

Almost immediately, the artifacts and their supposed Pleistocene age became a controversy. Every possible argument, no matter how tenuous or speculative, was raised against the possibility of human occupation in Pleistocene time. Writing in *Science* in February of 1928, anthropologist Leslie Spier suggested that the artifacts described as "arrowheads or blades" had not been recovered in situ from the Pleistocene layers, but washed into the gravel pit from the surface. Spier dismissed the metates as "water-worn boulders" (1928a:160). Spier made these criticisms without either visiting the Holloman site or inspecting the artifacts.

Spier was immediately rebutted by Cook (1928) and Hay (1928). Cook (1928:371) pointed out that Spier had not seen the artifacts in question, while "no one who has seen them has questioned their authenticity as human artifacts." Cook also noted that the finding of metates did not necessarily imply agriculture. The stones could have been used by foragers to grind dried fruits and meat, as well as roots and plants.

Hay (1928:442) rejected Spier's claim that the artifacts had fallen into the pit from the surface, giving credence to Holloman's assertion that he had pried at least one "out of the hard conglomerate on the floor of the pit" using a tool. The debate in the pages of *Science* ended with a concession by Spier (1928b). After inspecting the rounded stones from the Holloman pit, Spier agreed they were "unequivocally metates." But Spier was not willing to concede the antiquity of the objects described as "arrowheads." He concluded these most likely were Holocene-age implements that had fallen or been washed into a pit "gullied by erosion along its margins" (Spier 1928b:184).

Given the controversy, Mr. Holloman was counseled on the necessity of preserving the in situ state of any future artifact he might find (Cook 1928). In September of 1928, Holloman found an artifact in the bottom layer of cemented gravel. The object was photographed in situ and copies of the photos were sent to Charles Gould (1929a, 1929b) at the University of Oklahoma in Norman. Gould and Leslie Spier inspected the site a few days later and satisfied themselves that the object had been recovered from a Pleistocene-age gravel. Oliver Hay described the artifact as an "arrowhead . . . 56 millimeters long and 38 millimeters wide" (1929:94). Spier, the skeptic, was now convinced that the artifact was of the same age as the gravel. He was quoted as conceding

> there can be no doubt that the artifacts occur in the pit near the basal portion, on the same level as the fossil remains . . . as the case stands, it looks very much as though the artifacts are of the same antiquity as the fossil animals. (Hay 1929:94)

Critics now took a new tact. Evans (1930a, 1930b) proposed that the artifacts found in the Holloman gravels were not autochthonous. He argued that the artifacts were found with Pleistocene fossils because both had been eroded, reworked, and redeposited together in Holocene time. According to Evans, at some time in the past the Holloman deposits had been laid down by the ancestor of the north fork of the Red River. Subsequently, the stream had been pirated by a river to the west, forming the present day north fork of the Red River, a tributary located 23 km west of the Holloman site.

Evans (1930a, 1930b) was rebutted by Cook (1931) and Sellards (1932). Cook pointed out that if the Holloman gravels represented a reworking of Holocene artifacts and Pleistocene fossils, they should also contain remains of Holocene animals. Yet "not one single bone found in these deposits . . . is referable to a modern species" (Cook 1931:162).

Cook's second objection was that reworking of the Pleistocene fossils would have destroyed them, yet they were intact. Cook cited especially a *Glyptodon* carapace, concluding "it is utterly impossible that any erosion could move the specimen without scattering the parts of the shell, or losing and destroying them" (Cook 1931:163).

Sellards (1932) also rejected Evans' (1930a, 1930b) claim of reworking. He concluded that the Holloman terrace as well as lower terraces east of the north fork of the Red River were of Pleistocene age. The geology and topography did not support the hypothesis of reworking. Sellards (1932) also reiterated Cook's observation that reworking would have destroyed the Pleistocene fossils, yet they were found intact.

By 1932 Mr. Holloman had closed the site, and he passed away in the 1970s (Smith & Cifelli 2000:7). A 1955 retrospective published by the Oklahoma Geological Survey concluded

> it is a scientific tragedy that the disagreement among observers and scientists caused all to cease collecting and observing the pit. (Branson 1955:100)

Discussion of the Holloman artifacts disappeared from the scientific literature. But there continues to be interest in the Pleistocene fossils. Meade (1953:459) described the fauna as Aftonian in age, "intermediate between the better-known Nebraskan age and Kansas age faunas." Subsequently, the term *Aftonian* was abandoned (Hallberg 1986). Most recently, Dalquest (1977) and Smith and Cifelli (2000) described the Holloman fossils as Irvingtonian age (1.9 to 0.15 Ma). Thus the lower Holloman layer from which human artifacts were recovered appears to be at least 150,000 years old (Bell et al. 2004:273). Age estimates based solely on faunal assemblages are necessarily imprecise. But up to the present time no better estimate has

been published. The Holloman gravel quarry is now abandoned and "filled with slump" (Smith & Cifelli 2000:7). In 2001, I visited the site and found it used only for cattle grazing.

Evidence of Pre-Clovis Occupation in the Americas

The Holloman pit in Oklahoma is not the only site in the Western Hemisphere from which substantive evidence of a human presence in Pleistocene time has been recovered. In the following summary, I list several of the more important sites (see also Goodman 1981:91–119). The list is not intended to be comprehensive, nor is this the place to enter into an extensive discussion of the relative strength or merits of the evidence from each location. The point is that the Holloman site is not unique: The scientific literature contains extensive evidence of a human presence in the Western Hemisphere in pre-Clovis times. Some of these studies have been published in preeminent peer-reviewed journals, including both *Science* and *Nature*.

Monte Verde, Chile: 12.5 to 33 ka

Monte Verde is the site that effectively falsified the Clovis-first paradigm (Dillehay 1986, 2000). For twenty years, lead investigator Tom Dillehay recovered extensive human artifacts at Monte Verde. Multiple carbon dates indicated human occupation at least as early as 12.5 ka. The excavations at Monte Verde were documented exhaustively in an authoritative thousand-page monograph (Dillehay 1997). A team of the world's leading archaeologists visited the site in 1997 and came to the conclusion that Monte Verde was an archaeological site older than 12.5 ka (Meltzer et al. 1997). There is also a lower layer at Monte Verde that dates to 33 ka (Dillehay & Collins 1988).

Alice Boër, Brazil: 14 ka

Carbon dating indicates a human presence in Brazil by 14 ka. Beltrao, Enriquez, Danon, Zuleta, and Poupeau (1986:211) concluded

> there are now at least five sites in Brazil at which evidence exists in favor of the presence of man more than 17 ka years ago.

Saltville, Virginia: 14.5 ka

The oldest horizon contains a bone tool dated at 14.5 ka (Goodyear 2005a).

Buttermilk Creek, Texas: 15.5 ka

At the Debra L. Friedkin site on Buttermilk Creek in Texas, 15,528 artifacts were excavated dating between 13.2 and 15.5 ka (Waters et al. 2011).

Cactus Hill, Virginia: 17 ka

Carbon dating of charcoal associated with artifacts yielded dates between 15 and 17 ka (Goodyear 2005a).

Great Plains, United States: 19 ka

Holen (2006) concluded that spiral fracturing of mammoth bones from sites in Nebraska, Kansas, and Colorado indicated the presence of humans on the Great Plains of North America at 18 to 19 ka.

Meadowcraft Rockshelter, Pennsylvania: 19.6 ka

The Meadowcraft rock shelter in Pennsylvania has been excavated since 1973. The "excavations are widely considered to represent state-of-the-art closed-site excavations" (Adovasio & Pedler 2005:24). Radiocarbon dates associated with artifacts range from 12.8 to 16.2 ka, and there is a single older date of 19.6 ka (Goodyear 2005a).

Pedra Furada, Brazil: 32 ka

Carbon dating of hearth charcoal associated with quartz and quartzite tools indicates humans were in Brazil by 32 ka (Guidon 1986, Guidon & Delibrias 1986, Guidon & Arnaud 1991).

El Cedral, Mexico: 31.9 to 33.3 ka

A bone tool and a chalcedony scraper were found in situ in layers dating, respectively, 21.96 ka and 33.3 ka. Charcoal from a hearth dated from 31.85 ka (Lorenzo & Mirambell 1986).

Burnham Site, Oklahoma: 35 ka

Fifty-five stone pieces "manifest[ed] attributes of having been flaked" (Wyckoff, Carter, & Theler 2003:296). The artifacts were found in a layer exhibiting minimal "disturbance and mixing," and both their vertical and horizontal distribution were consistent with being autochthonous (Wyckoff, Carter, & Theler 2003:300). Excluding the oldest and youngest dates, eleven ages obtained by various means yielded dates in the range of 22.6 to

46.2 ka. The most probable date for the artifact-bearing deposit was judged by the investigators to be 35 ka (Wyckoff, Carter, & Theler 2003:301–302).

Pendejo Cave, New Mexico: 37 ka

Human fingerprints, including some baked-on clay nodules, were found in layers dating to as old as 37 ka (Chrisman, MacNeish, Mavalwala, & Savage 1996).

China Lake, California: 42.4 ka

A mammoth tooth "in direct contextual association with two sophisticated finishing flakes" yielded a uranium date of 42.35 ka (Davis 1986:82).

Topper, South Carolina: 50 ka

Pre-Clovis excavations began in 1998 and yielded lithic artifacts from layers dating to 16 to 20 ka. Artifacts have also recently been recovered from a lower layer that is older than 50 ka, the limit of radiocarbon dating. Work at the Topper site is in progress, including dating by optically stimulated luminescence (Goodyear 2005a, 2005b, 2009, Waters, Forman, Stafford, & Foss 2009).

San Diego, California: 140 ka

San Diego contains, or contained, "many ancient sites" (Carter 1996:109). Many of these sites have been destroyed by development (Reeves, Pohl, & Smith 1986). The oldest site appears to be Texas Street, where "hearths and artifacts occur widely both laterally and in depth" (Carter 1996:109). The age was estimated by Carter (1957:320) to be "early last interglacial." According to the Devil's Hole chronology, the last interglacial began about 140 ka (Winograd et al. 1992).

Old Crow Basin, Yukon, Canada: 150 ka

Excavations yielded "flaked, polished and cut bones of mammoths and other large mammals" that were interpreted to be autochthonous artifacts dating to 150 ka (Irving, Jopling, & Beebe 1986:49).

Calico Mountains, California: 200 ka

This site, in the Mojave desert of California, has been described as "the best known example of the proposed evidence of very early man in the New World" (Simpson, Patterson, & Singer 1986:90). Among those who

interpreted Calico as evidence of an early human presence in the Americas was Louis Leakey (Goodman 1981:130–140). Critics dismiss the artifacts found at Calico as geofacts, rocks altered by natural processes (Haynes 1973). But when George Carter examined the artifacts, he concluded "I had no doubt that they had been man-made, for they had plural flake scars and no battering, such as occurs in nature" (Carter 1980:210). Uranium-series dating found "that the artifact-bearing deposits are about 200,000 years old" (Bischoff, Shlemon, Simpson, Rosenbauer, & Budinger 1981:576.)

Hueyatlaco, Mexico: circa 250 to 430 ka

The Hueyatlaco archaeological site at Valsequillo, Mexico, contains human artifacts in association with a Pleistocene faunal assemblage (Gonzalez, Huddart, & Bennett 2006). Unlike the Calico site, the artifacts cannot be questioned as geofacts, because they contain advanced forms such as bifacial projectile points. Uranium-series dates on bones from Hueyatlaco yielded dates suggesting an age of 250 ka (Steen-McIntyre, Fryxell, & Malde 1981). Analysis of diatoms indicates that the artifacts are likely autochthonous as "redeposition or reworking of sediments is highly unlikely" (VanLandingham 2010a:134). Diatom analysis established a minimum age of 80 ka for the artifacts (VanLandingham 2010a). A recent review concluded that the evidence of human presence at Hueyatlaco is older than 250 ka (Malde, Steen-McIntyre, Naeser, & VanLandingham 2011).

Toca da Esperanca, Brazil: 204 to 295 ka

The cave La Toca da Esperanca in eastern Brazil contains hearths and quartzite tools. The fact that the nearest quartzite outcrop is ten kilometers from the cave suggests that the tools are human artifacts. Uranium–thorium dating of associated animal bones yielded an age range of 204 to 295 ka (Lynch 1989:185). The site also contains a number of implements fashioned from bone (Beltrao & Danon 1987).

Clovis-First Theory as Paradigm

The Clovis-first theory is a classic example of what Thomas Kuhn termed a paradigm. Kuhn defined a *paradigm* as a "universally recognized scientific achievement that for a time provides model problems and solutions to a community of practitioners" (Kuhn 1996:x). Paradigms are a double-edged sword. They may become obstructive and dogmatic, but the adoption of a paradigm enables scientific activity to be focused, articulated, and defined. Thus "normal science" can function more efficiently for a time.

For more than thirty years, the adoption of the Clovis-first theory allowed archaeologists to focus their work on the elaboration of Clovis settlement in North America by addressing questions such as the geographical extent of Clovis culture, its propagation, and the details of Clovis lifestyle. Time and effort were reserved for strata most likely to yield evidence of human occupation. In general, any rock layer known to be older than 11.5 ka was ignored. Holen (2006:34) related that "a geologist informed the archaeologists that the deposits were older than 100,000 years old, at which point they ceased excavation."

The drawback to the adoption of a paradigm is that novelties and anomalies are suppressed because "they are necessarily subversive of [the paradigm's] basic commitments" (Kuhn 1996:5). Because "discovery commences with the awareness of anomaly," the normal scientific activity engendered by a paradigm ultimately runs its course and functions not so much to generate knowledge as to suppress its acquisition (Kuhn 1996:52).

Rarely has a paradigm become so dogmatic and obstructionist as Clovis-first. Any evidence that tended to falsify Clovis-first was questioned. Dogmatism masqueraded as skepticism. If any excuse could be found to dismiss data contradicting the ruling paradigm, they were rejected. There were two standards of evidence. One for evidence consistent with Clovis-first, another for observations that were inconsistent.

Archaeologist David Meltzer related being present in a group of archaeologists shown stone tools from Africa allegedly 2.3 million years old. No one even raised any question as to the authenticity of the objects as genuine human artifacts. Meltzer suddenly realized the contrast. "I'd been in rooms where artifacts on display from the pre-Clovis age sites of Monte Verde, Chile, and Meadowcraft, Pennsylvania, dated to 12.5 to 14.25 ka, respectively, triggered noisy debate" (Meltzer 2009:95). George Carter handed stone tools from the Calico site (200 ka) to archaeologists without telling them where they were from. The response was "that is an artifact . . . no one will deny that" (Carter 1980:35). Yet when the same individuals were handed the same artifacts and told they were from the 200 ka Calico site, the critics invariably insisted the objects they had previously identified as artifacts were geofacts.

Claims of pre-Clovis occupation in the Americas had to be "utterly unimpeachable in all respects" (Meltzer 2009:109). But of course no archaeological evidence is ever "unimpeachable." On the contrary, it is always open to interpretation and analysis of context. Charcoal deposits from hearths were said to result from naturally occurring wildfires. Simple stone tools were dismissed as geofacts. If a tool was sufficiently complex that it could not occur naturally, then it was not autochthonous but reworked. If

all of these arguments failed, then the method of last resort was to claim that artifacts had been fraudulently planted. Anyone who seriously maintained the possibility of pre-Clovis occupation in the Americas was subjected to ridicule and ostracism.

In that nearly everyone agrees humans initially entered the Americas through the Bering Land Bridge, it is surprising that much of the evidence for pre-Clovis occupation comes from South America. The probable reason is that South American archaeologists were not as bound by the Clovis-first paradigm as their North American counterparts. Unaware that pre-Clovis occupation was impossible, they went out and discovered it.

In a 1990 review of the evidence from South America, Thomas Lynch rejected all evidence for pre-Clovis occupation in South America, including Monte Verde. He concluded "there are no indisputable or completely convincing cases of pre-Clovis archaeological remains in South America" (Lynch 1990:27). But nothing in science is ever "indisputable." Science is not a foolproof system of deductive logic. Since Francis Bacon and the members of the Royal Society first elaborated experimental philosophy in the seventeenth century, the sciences have operated inductively (Deming 2012). Science constructs theories through induction based upon the set of observations available at the present time. As our observations increase through time in number, reliability, and precision, our theories change. The history of science is punctuated with the eventual adoption of theories once considered highly improbable. These include heliocentrism, continental drift, and the theory that peptic ulcers are caused by a bacterial infection. Before accepting the reality of pre-Clovis occupation in South America, Lynch demanded evidence that was "incontrovertible" (1990:28). He was oblivious to Karl Popper's warning: "if you insist on strict proof in the empirical sciences, you will never benefit from experience, and never learn from it how wrong you are" (1959:50).

There is a long tradition of denying human antiquity. The most infamous example of a short terrestrial chronology is Anglican bishop James Ussher's book *The Annals of the World Deduced from the Origin of Time* (1658). Ussher stated that the Earth had been created on the night preceding the 23rd of October, 4004 BC. Isaac Newton was also a young-Earth creationist (Deming 2012:234).

Even as nineteenth-century naturalists began to acquire an appreciation for the age of the Earth, they nevertheless insisted on a recent origin for man. Georges Cuvier gathered fossil bones by the thousands from the far corners of the Earth. But in his great four-volume monograph *Ossemens Fossiles* (1812) he concluded, "human bones have never been found as fossils" (Cuvier 1997:232).

In *Vindiciae Geologicae* (1820), William Buckland affirmed "the declaration of Scripture is positive and decisive . . . in asserting the low antiquity of the human race" (p. 23). When people began to find human fossils in association with extinct Pleistocene animals, Charles Lyell advocated a double standard of evidence. In the second volume of *Principles of Geology* (1833), Lyell preached "more than ordinary caution is required in reasoning on the occurrence of human remains" (p. 232). Among those who excavated human fossils in British caves was the clergyman John MacEnery. Years of field work convinced MacEnery that humans had been contemporaneous with extinct Pleistocene fauna. Yet MacEnery, the amateur, was convinced by Buckland, the professional, that he must be mistaken (Lyon 1970). If human bones were found in association with Pleistocene fossils, they could not be autochthonous (MacEnery 1859:50–51).

Geologists were unwilling to accept evidence of human antiquity until the theoretical framework changed. The publication of Darwin's *Origin of Species* in 1859 legitimized human antiquity. Subsequently, in 1863, Lyell published *The Antiquity of Man* wherein he confessed to having previously held an "extreme reluctance" to "accept the validity of evidence" for human antiquity (pp. 1–2). Once it became respectable to admit human antiquity, geologists suddenly "discovered" evidence that they had been summarily dismissing for the previous fifty years. Eldredge and Gould (1972:83) explained

> the expectations of theory color perception to such a degree that new notions seldom arise from facts collected under the influence of old pictures of the world.

Out of America?

The acceptance of Monte Verde as an authentic archaeological site dated to pre-Clovis time has pushed back the date of human entrance into the Americas to about 15 ka (Fagan 2005, Goebel, Waters, & O'Rourke 2008). But there is no logical or evidentiary reason to limit entry to this late date. Falsification of the Clovis-first theory opened a Pandora's Box of possibilities, and archaeologists have yet to come to terms with the implications. The Bering Land Bridge opened and closed repeatedly during the Pleistocene. It is entirely probable that humans migrated from Asia into the Americas not once, but several times during the Pleistocene (Meltzer 2009:199). Nor is there any reason for migrations to have been one-way (Goodman 1981).

One of the arguments invoked against the antiquity of artifacts from the Holloman site was that they appeared to be relatively modern. Spier

(1928a:160) noted that some of the artifacts resembled "modern Indian forms." Because the age of the cemented gravel in which these artifacts were recovered has been dated to the neighborhood of 150 ka, this suggests that the artifacts were not autochthonous. On the other side of the argument, we have the statement by Gould (1929a, 1929b) that he and others were satisfied that the artifacts had been recovered in situ from a cemented formation. Evans (1930a, 1930b) brought up the possibility of reworking, but this was rebutted strongly by arguments from Cook (1931) and Sellards (1932).

It is difficult to discern precisely how "advanced" the Holloman artifacts described as "arrow-heads" were. Implements recovered from Holloman have been scattered. Whether they are incompatible with stone tools typical of the Middle Paleolithic in Eurasia is undetermined. Stone technology may have been more advanced than has been previously recognized. Stone points that apparently functioned as spear tips were recently recovered from a site in Africa dating to 500 ka (Wilkins, Schoville, Brown, & Chazan 2012).

There is another possibility. Stone-working techniques in the Americas could have been more advanced than those of the same age in Eurasia. Holloman is not the only site in the Americas from which apparently advanced forms of great age have been recovered. At the Hueyatlaco site near Valsequillo, Mexico, artifacts were recovered that composed "a typological sequence ranging from edge-trimmed flake tools in the lower levels to well-made bifacial tools in the upper levels." The strata at Hueyatlaco are apparently older than 250 ka (Malde, Steen-McIntyre, Naeser, & VanLandingham 2011). Steen-McIntyre, Fryxell, & Malde (1981:15) concluded

> [We] are painfully aware that so great an age poses an archeological dilemma . . . if the geological dating is correct, sophisticated stone tools were used at Valsequillo long before analogous tools are thought to have been developed in Europe and Asia.

The presence of advanced stone tools in the Americas dating to circa 200 ka may have implications for our understanding of human evolution. The currently accepted view is that the genus *Homo* evolved from *Australopithecus* in Africa. The first human species appears to have been *Homo habilis* (circa 2.5–1.4 Ma). *Homo habilis* was followed by a succession of human species or subspecies whose categorization is necessarily somewhat subjective and overlapping. These include *Homo erectus*, *Homo ergaster*, *Homo heidelbergensis*, and *Homo neanderthalis*. All of these earlier species were eventually replaced by *Homo sapiens*. Archaic forms

of *Homo sapiens* first appeared circa 500 ka, with anatomically modern humans (AMH) in Africa circa 200 ka (Klein 2009, Tattersall & Schwartz 2009, Brauer 2008).

Homo is a highly mobile genus. Hominids were in the Republic of Georgia by 1.8 Ma and on the island of Java by 1.5 Ma. The oldest evidence of *Homo* in Europe is a jaw fragment from Spain dated to 1.2–1.4 Ma (Tattersall & Schwartz 2009:75–76). Hominids lived in China no later than 1.1 Ma (Klein 2009:351). An assemblage of flint tools recovered from the Happisburgh site on the east coast of Britain shows that humans were cold-adapted and living in northern Europe by 780 ka (Parfitt et al. 2010).

Although AMH appeared in Africa circa 200 ka, their behavior and culture did not differ from archaic forms of *Homo sapiens* or other species such as *Homo neanderthalis*. Culturally modern humans (CMH) first appeared circa 50 ka and rapidly spread throughout Eurasia. The sudden appearance of CMH has been described as "the most fundamental change in human behavior that the archaeological record may ever reveal" (Klein 2009:659). Yet it remains an event with no discernible cause. The genus *Homo* evolved slowly in Eurasia over hundreds of thousands of years. Whence discontinuity?

The currently popular theory that explains the sudden appearance of CMH at about 50 ka is called "Out-of-Africa." Out-of-Africa postulates that modern humans originated in Africa circa 60–50 ka and from there rapidly spread throughout the world, replacing other *Homo* species (Stringer & Andrews 1988, Higham et al. 2011). There seem to be two apparent reasons for selecting Africa as the origin of fully modern humans. The first is that the fragmentary fossil evidence indicates that by 500 ka the primary species in Africa, Europe, and Asia, respectively, were *Homo sapiens*, *Homo neanderthalis*, and *Homo erectus* (Klein 2009:739). The second reason is that Africa itself contains the highest degree of genetic diversity, and genetic differentiation increases with increasing geographic distance from Africa (Ramachandran, Deshpande, Roseman, Rosenberg, Feldman, & Cavalli-Sforza 2005). Out-of-Africa is regarded as the dominant, if not the only, acceptable theory that explains the origin of CMH. Ongoing research is mostly concerned with an elaboration of the theory, not a consideration of alternatives (Beyin 2011).

But there are several problems with the Out-of-Africa hypothesis. The evidence for the emergence of AMH in Africa is sketchy.

> [It] is truly remarkable . . . that if we look at the African record we find rather little that clearly foreshadows the distinctive morphology . . . [of] *Homo sapiens* today. (Tattersall & Schwartz 2009:82)

It is true that there is more fossil evidence for *Homo sapiens* in Africa than elsewhere, but this may well be because Africa is by far the place most people look for human fossils. What is not sought cannot be found.

Another problem with Out-of-Africa is that the sudden appearance of modern human behavior at 50 ka implies a significant evolutionary advance in neurological capacity. There is no evidence for any precursor in Africa. In other words, there is no discernible cause for the effect.

> The people who inhabited Africa between 100 and 60–50 ka may have been physically modern or near-modern, but they were behaviorally very similar to the Neanderthals and other non-modern humans. (Klein 2009:741)

A third objection to Out-of-Africa is that evolutionary changes in Africa would have likely been suppressed by gene flow. It is believed that evolutionary change results from the geographic isolation of a subset of a population. People in Africa were not isolated, and any putative evolutionary change would have been muted by gene flow, a process that "exerts a homogenizing influence" (Eldredge & Gould 1972:112). If there were not significant gene flow between Europe, Africa, and Western Asia in Middle Stone Age time (circa 250–50 ka), it would be difficult to explain why Mousterian stone technology was "remarkably uniform over vast areas" (Klein 2009:538).

> It is hard to imagine how this apparent cultural uniformity could have persisted without high levels of movement and mate exchange between groups. (Harpending, Sherry, Rogers, & Stoneking 1993:495)

A fourth problem with Out-of-Africa is that it implies that a species which evolved in tropical Africa rapidly displaced cold-adapted Neanderthals in northern Europe during the coldest part of the last Ice Age. For about 150,000 years, Neanderthals prospered in Europe while subjected to varying climatic extremes of glacial and interglacial conditions. CMH entered Europe at about 43–42 ka (Higham et al. 2011). Within a few thousand years of the appearance of CMH in Europe, Neanderthals became extinct (Pinhasi, Higham, Golovanova, & Doronichev 2011). Thus it seems that CMH "were better equipped technologically and culturally to deal with . . . severe glacial conditions" (Mellars 2006:934). Not all of Africa lies in the tropics, but nevertheless nearly all of the land area lies within 30 degrees latitude of the equator.

Finally, there is evidence that CMH colonized southeast Asia and Australia circa 60 ka, well before their entry into Europe circa 43 ka (Macaulay et al. 2005, Beyin 2011:3). It is bizarre that CMH migrating out of Africa would have entered Australia before Europe.

The presence of advanced stone tools at Holloman and Hueyatlaco suggests the possibility that CMH may not have evolved in Africa, but in the Americas (Goodman 1981). This theory has the advantage of providing a much higher degree of allopatry, the geographic isolation thought necessary for significant evolutionary change.

The Bering Land Bridge opens when sea level is about 50 meters below the present-day level (Elias, Short, Nelson, & Birks 1996). Reconstructions of global sea level over the past 470 ka suggest it was possible to walk from Asia to Alaska from 370–337 ka, 283–240 ka, 189–130 ka, and 75–11 ka (Siddall et al. 2003). Altogether, the Bering Land Bridge was likely open for about 200,000 of the last 500,000 years. Yet we are supposed to believe that *Homo sapiens* entered the Americas only 15,000 years ago, even though *Homo erectus* was in east Asia as early as 1.5 Ma. I suggest it is more likely that hominids moved back and forth over the Bering Land Bridge repeatedly.

There are many possibilities. Setting aside, for the moment, the question of earlier migrations, consider only the last 200 ka. Analysis of mitochondrial DNA suggests that AMH originated about 200 ka (Cann, Stoneking, & Wilson 1987). Because what scant fossil evidence is available places archaic *Homo sapiens* in Africa, it is believed that the woman who contributed this mtDNA lived in Africa. Suppose the conventional view is true, and that AMH originated in Africa—*this doesn't mean they necessarily remained there*. Estimates from DNA studies are imprecise, but they indicate that the indigenous people of southern Africa split from the rest of *Homo sapiens* anywhere from 90 to 157 ka (Behar et al. 2008, Gronau, Hubisz, Gulko, Danko, & Siepel 2011). The Bering Land Bridge was open from about 189–130 ka. For tens of thousands of years, it would have been possible for AMH to migrate out of Africa to eastern Asia and onward to the Western Hemisphere.

The critical period was the last interglacial. Temperatures were higher than during the Holocene (Andersen et al. 2004), and the Bering Land Bridge was closed for about 55,000 years due to flooding. Geographically isolated in the Western Hemisphere, humans would have had the opportunity to evolve into CMH without the muting influence of gene exchange with people in Eurasia. Once the Bering Land Bridge opened again circa 75 ka, a relatively small group or groups of CMH could have crossed back into Asia and spread southward into Australia and west to Africa and Europe. This would explain why CMH went through a population bottleneck in late Pleistocene time (Ambrose 1998). Thus the sudden appearance of CMH in Africa was due to a migratory influx, just as was the case for Europe.

Consider, by way of contrast, how implausible the standard Out-

of-Africa theory seems when viewed critically. AMH lived next door to Neanderthals in Europe for 150,000 years, sharing the same Mousterian technology. Then, deus ex machina, they changed suddenly into CMH and rapidly displaced Neanderthals in Europe. It is more plausible that CMH originated elsewhere and entered, as it were, as an invasive species.

There is nothing in this scenario that contradicts the possibility that present-day American Indians derived largely from an ancestral population living in Mongolia that entered the Americas during the last 20,000 years. The Bering Land Bridge was open from approximately 75–11 ka. There likely were multiple migrations of different groups of people back and forth. By "multiple migrations," I mean it is entirely plausible that there were as many as ten or twenty migrations in each direction. Five thousand years is a long time. Analysis of DNA indicates only degree of relatedness; it cannot discern migration directions or the number of migrations. People who enter at later times may displace people present at earlier times. Just because modern humans living in Europe have little common ancestry with Neanderthals does not indicate that *neanderthalensis* did not occupy Europe before *sapiens*.

Conclusion

An objection to the Out-of-America theory is that no early human remains have been found in the Americas. But in fact they have. Two "primitive looking" human skulls were recovered from Valsequillo, Mexico. Both were subsequently lost (Gonzalez, Huddart, & Bennett 2006:612, Lyons 2009, VanLandingham, 2010b). Despite this, no one looks for early human fossils in the Americas because their theoretical framework informs them that these do not exist. Human fossils are rare. Even in Africa, nearly a hundred years of searching have turned up only a handful of examples.

Our understanding of human evolution has been obstructed by some epistemological biases.

(1) There is a tendency to jump to premature conclusions on the basis of fragmentary evidence. Clovis-first is exemplary of this tendency. For decades, important evidence was ignored because it was inconsistent with a false theory. This debacle could have been avoided by adopting Chamberlin's method of multiple working hypotheses (1890).

(2) There is a failure to understand that the human archaeological and fossil record has not been assembled objectively, but partly reflects theoretical conceptions. An absence of evidence has been interpreted as evidence of absence. Yet an absence of human artifacts or fossils is surely biased by collecting strategies. Human fossils are found in Africa in part because this is where people look for them. The bias toward Africa dates

back to Darwin's observation that because Africa was home to chimpanzees and gorillas, "it is somewhat more probable that our early progenitors lived on the African continent than elsewhere" (1871:199). Yes, it seems likely that hominids originated in Africa. But with *Homo erectus* in eastern Asia by 1.5 Ma, subsequent human evolution must be considered on the stage of the entire world, including the Western Hemisphere.

As I write, what could be one of the world's most important archaeological sites sits abandoned and ignored. The Holloman site should be excavated. The Holloman site itself may constitute only a minuscule fraction of the area's potential. The site is located on a ridge about 800 meters wide that extends 12 to 16 kilometers to the north (Gould 1929a). This ridge likely exists because of the presence of Pleistocene gravels and cemented stream deposits that have proven relatively resistant to Holocene erosion. Thus the entire ridge may be underlain by Pleistocene deposits and represents a vast potential for discovery.

Excavation of Holloman and other American sites has the potential to illuminate our understandings of human origins. But if we do not look, we shall not find.

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