

# Oldest Human Fossil Found, Redrawing Family Tree

Discovery pushes back the origin of our genus, Homo, by half a million years.

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This jawbone, shown steps from the place where it was spotted by Arizona State University grad student Chalachew Seyoum, puts the first members of the human genus *Homo* in the Afar region of Ethiopia half a million years earlier than previously thought.

PHOTOGRAPH BY KAYE REED

In a rare congruence of new evidence, two fossil jaws cast a fused beam of light on one of the darkest mysteries in human evolution: the origin of our genus *Homo*. The two lower jaws—one a reconstruction of a pivotal specimen found half a century ago, the other freshly plucked from the badlands of Ethiopia—point to East Africa as the birthplace of our evolutionary lineage.

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The new Ethiopian fossil, announced [online by the journal \*Science\*](#), pushes the arrival of *Homo* on the East African landscape back almost half a million years, to 2.8 million years ago. The date is tantalizingly close to the last known appearance, around three million years ago, of *Australopithecus afarensis*, an upright-walking, small-brained species best known from the [skeleton called Lucy](#), believed by many scientists to be the direct ancestor of our genus. The new jaw, known as LD 350-1, was found in January 2013 just a dozen miles from where Lucy was found in 1974.

"This is exciting stuff," says paleoanthropologist [Donald Johanson](#), who discovered Lucy.

The Afar, part of the East African Rift Valley, has yielded many other prize fossils of hominins—members of the extended human family—including the previous earliest known *Homo* specimen, an upper jaw known as AL 666-1, dated to 2.3 million years ago. (Learn [more about Ardi](#), another human ancestor from the Afar region.)



NG MAPS; ANDREW UMENTUM SOURCE: E. N. DIMAGGIO, ET AL., SCIENCEEXPRESS

Fossils attributed to *Homo* in the period two to three million years ago are exceedingly rare. Bill Kimbel, director of the [Institute of Human Origins](#) at Arizona State University, in Tempe, who co-led the analysis of the new specimen, [once said](#) that "You could put them all into a small shoe box and still have room for a good pair of shoes." (See more about the hunt for fossils of [humans' early ancestors](#).)

Among the features placing the new fossil in that singular shoe box are slim molar teeth; a particular pattern of tooth cusps; and the shape of the bony body of the

mandible—all traits shared with later *Homo*. But the front of the jaw sports more primitive morphology, such as a receding chin line, characteristic of *A. afarensis*.

"This narrows the time period in which we can now focus our search for the emergence of the human lineage," says Kimbel, who found the AL 666-1 jaw in 1994. "It's very much a transitional form, as would be expected at that age. The chin looks backwards in time. But the shape of the teeth looks forward."

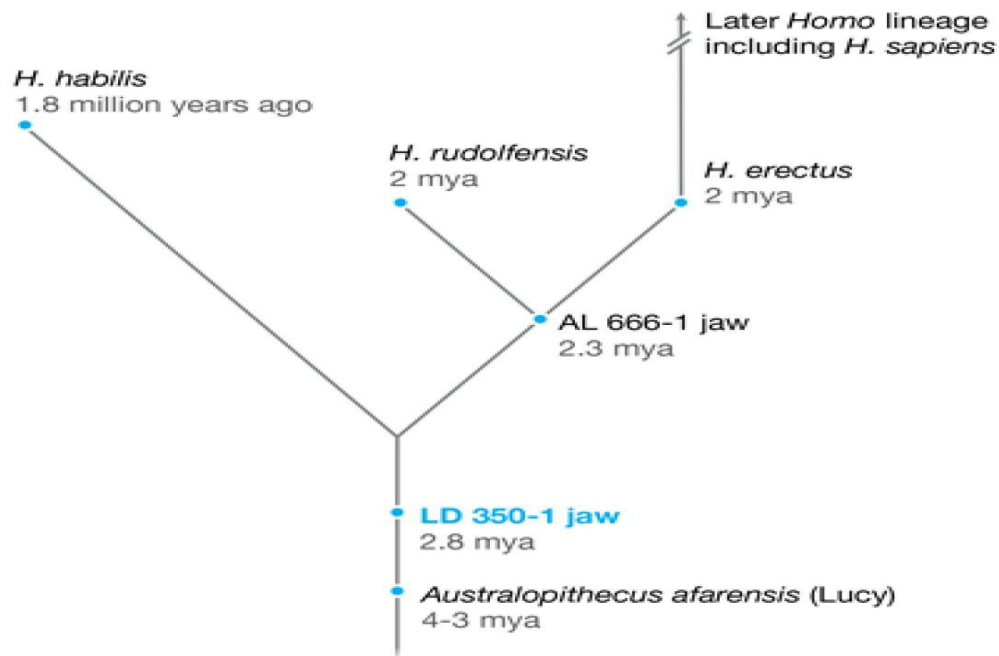
### East Side Story

To the extent that the new jaw underscores an East African origin for the genus *Homo*, it would seem to confound the argument made by other researchers that the best candidate for our genus's immediate ancestor is a South African australopithecine, *Australopithecus sediba*.

The authors of the Science paper point out that the only known specimens of *A. sediba* are almost a million years younger than the new *Homo* jaw from Ethiopia that they would have had to have given rise to.

[Fred Grine](#) of New York's Stony Brook University, however, counters that there may well have been other populations of *A. sediba*, or something like it, far older. (Learn more about [how \*A. sediba\* shook up the human family tree](#).)

"The idea that [the new jaw] makes anything else unlikely to be an ancestor is ludicrous," says Grine. "That would pretend that the fossil record is complete. And we know it can't be, since they just discovered something that wasn't there before."



EMILY M. ENG, NG STAFF SOURCE: SCIENCE

The site where the jaw was found, called Ledi-Geraru, was a mix of grasslands and a few shrubs 2.8 million years ago, similar to the Serengeti today, according to an [accompanying paper](#) by [Erin DiMaggio](#) of Penn State University and colleagues. The animal species present at the same time indicate a shift to a more open, arid habitat,

supporting a hypothesis that global climate change at the time may have triggered evolutionary changes in many animal lineages.

"We can see the 2.8-million-year-old aridity signal in the Ledi-Geraru faunal community," says [Kaye Reed](#), director of the Ledi-Geraru project at the Institute of Human Origins. "But it's still too soon to say that this means climate change is responsible for the origin of *Homo*."

### A Specimen Reborn

The Ethiopian jaw is enough on its own to cause a surge of excitement among paleoanthropologists. But its significance is magnified by the reconstruction of a *Homo* fossil a million years younger, published Wednesday in the journal [Nature](#).

The jaw belongs to the original, or type, specimen of *Homo habilis*, or "Handy Man," so-called by its discoverers [Louis and Mary Leakey](#) in 1964 because it was found in Olduvai Gorge in Tanzania in sediments that also contained the oldest stone tools known at the time. (Much older tools, dating to at least 2.6 million years ago, have since been uncovered in Ethiopia.)

Louis Leakey and his colleagues maintained that *H. habilis* was the most likely ancestor of all later *Homo*, including our own species *Homo sapiens*. *H. habilis* has clung unsteadily to that exalted perch in the family tree ever since, its precariousness caused

in part by the fragmentary nature of the type specimen. It consists of a heavily distorted jawbone, a collection of many small skull fragments, and pieces of a hand.

Using computed tomography (CT) and state-of-the-art 3-D imaging technology, a team led by [Fred Spoor](#) of the University College, London and the Max Planck Institute for Evolutionary Anthropology, in Germany, has now digitally reconstructed what the mandible would have looked like in life. Its narrow shape, with tooth rows parallel to each other, is more like that of an australopithecine, the group of human ancestors that predates the *Homo* genus.





A new reconstruction of this fossil *Homo habilis* skull, called Olduvai Hominid 7, finds a mix of primitive and more modern traits, including a larger brain than previously thought, suggesting a big-brained common ancestor in the *Homo* lineage.

PHOTOGRAPH BY JOHN READER

Though younger by half a million years than the AL 666-1 upper jaw from the Afar, the reconstructed jawbone from Olduvai Gorge is clearly more primitive. This suggests that an even more primitive "ghost lineage" of *Homo* must have existed well before 2.3 million years ago, which split and gave rise to both lineages.

And lo and behold: the new Ethiopian jaw neatly fits the bill.

"The Ledi-Geraru jaw has turned up as if 'on request,' suggesting a plausible evolutionary link between *Australopithecus afarensis* and *Homo habilis*," says Spoor.

In another plot twist, Spoor and his colleagues digitally reconstructed the braincase of the original *H. habilis* specimen, which had previously been estimated to hold about 700 cubic centimeters of actual brain—more than a typical australopithecine, but less than later humans. Their new version upped the volume to 800 cubic centimeters, advancing *habilis* into the same cerebral class as two other *Homo* species gadding about the East African savanna by two million years ago—*Homo rudolfensis* and early forms of *Homo erectus*.

"What we have is a beast with a very primitive snout, but with big brains," Spoor said, when he first discussed the reconstruction at a meeting at the Turkana Basin Institute in Kenya last August.

Since it is unlikely that the three contemporaneous species *Homo habilis*, *H. rudolfensis*, and *H. erectus* evolved large brains independently, it follows that their common ancestor had already set the course toward an enlarged brain, much earlier than previously thought. This could reestablish the link between the appearance of larger brains in the hominin lineage and the first stone tools.

So perhaps *H. habilis*—depending on how far back that species lived—was a bona fide Handy Man after all.

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