

Fossil lower jaw sheds light on early Homo

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Close up view of the mandible just steps from where it was sighted by Chalachew Seyoum, ASU graduate student, who is from Ethiopia. Credit: Brian Villmoare

A fossil lower jaw found in the Ledi-Geraru research area, Afar Regional State, Ethiopia, pushes back evidence for the human genus—*Homo*—to 2.8 million years ago, according to a pair of reports published March 4 in the online version of the journal *Science*. The jaw

predates the previously known fossils of the *Homo* lineage by approximately 400,000 years. It was discovered in 2013 by an international team led by Arizona State University scientists Kaye E. Reed, Christopher J. Campisano and J Ramón Arrowsmith, and Brian A. Villmoare of the University of Nevada, Las Vegas.

For decades, scientists have been searching for African fossils documenting the earliest phases of the *Homo* lineage, but specimens recovered from the critical time interval between 3 and 2.5 million years ago have been frustratingly few and often poorly preserved. As a result, there has been little agreement on the time of origin of the lineage that ultimately gave rise to modern humans. At 2.8 million years, the new Ledi-Geraru fossil provides clues to changes in the jaw and teeth in *Homo* only 200,000 years after the last known occurrence of *Australopithecus afarensis* ("Lucy") from the nearby Ethiopian site of Hadar.

Found by team member and ASU graduate student Chalachew Seyoum, the Ledi-Geraru fossil preserves the left side of the lower jaw, or mandible, along with five teeth. The fossil analysis, led by Villmoare and William H. Kimbel, director of ASU's Institute of Human Origins, revealed advanced features, for example, slim molars, symmetrical premolars and an evenly proportioned jaw, that distinguish early species on the *Homo* lineage, such as *Homo habilis* at 2 million years ago, from the more apelike early *Australopithecus*. But the primitive, sloping chin links the Ledi-Geraru jaw to a Lucy-like ancestor.

"In spite of a lot of searching, fossils on the *Homo* lineage older than 2 million years ago are very rare," says Villmoare. "To have a glimpse of the very earliest phase of our lineage's evolution is particularly exciting."

In a report in the journal *Nature*, Fred Spoor and colleagues present a new reconstruction of the deformed mandible belonging to the 1.8

million-year-old iconic type-specimen of *Homo habilis* ("Handy Man") from Olduvai Gorge, Tanzania. The reconstruction presents an unexpectedly primitive portrait of the *H. habilis* jaw and makes a good link back to the Ledi fossil.

"The Ledi jaw helps narrow the evolutionary gap between *Australopithecus* and early *Homo*," says Kimbel. "It's an excellent case of a transitional fossil in a critical time period in human evolution."

Global climate change that led to increased African aridity after about 2.8 million years ago is often hypothesized to have stimulated species appearances and extinctions, including the origin of *Homo*. In the companion paper on the geological and environmental contexts of the Ledi-Geraru jaw, Erin N. DiMaggio, of Pennsylvania State University, and colleagues found the fossil mammal assemblage contemporary with this jaw to be dominated by species that lived in more open habitats—grasslands and low shrubs—than those common at older *Australopithecus*-bearing sites, such as Hadar, where Lucy's species is found.

"We can see the 2.8 million year aridity signal in the Ledi-Geraru faunal community," says research team co-leader Kaye Reed, "but it's still too soon to say that this means climate change is responsible for the origin of *Homo*. We need a larger sample of hominin fossils, and that's why we continue to come to the Ledi-Geraru area to search."

More information: "Early *Homo* at 2.8 Ma from Ledi-Geraru, Afar, Ethiopia," *Science*, www.sciencemag.org/lookup/doi/10.1126/science.aaa1343

"Late Pliocene Fossiliferous Sedimentary Record and the Environmental Context of early *Homo* from Afar, Ethiopia," *Science*, www.sciencemag.org/lookup/doi/10.1126/science.aaa1415

Nature, [DOI: 10.1038/nature14224](https://doi.org/10.1038/nature14224)

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