

Fossil Skeleton From Africa Predates Lucy

By JOHN NOBLE WILFORD, October 2, 2009

Lucy, meet Ardi.

Ardi, short for *Ardipithecus ramidus*, is the newest fossil skeleton out of Africa to take its place in the gallery of human origins. At an age of 4.4 million years, it lived well before and was much more primitive than the famous 3.2-million-year-old Lucy, of the species *Australopithecus afarensis*.

Since finding fragments of the older hominid in 1992, an international team of scientists has been searching for more specimens and on Thursday presented a fairly complete skeleton and their [first full analysis](#). By replacing Lucy as the earliest known skeleton from the human branch of the primate family tree, the scientists said, Ardi opened a window to “the early evolutionary steps that our ancestors took after we diverged from our common ancestor with chimpanzees.”

The older hominid was already so different from chimps that it suggested “no modern ape is a realistic proxy for characterizing early hominid evolution,” they wrote.

The *Ardipithecus* specimen, an adult female, probably stood four feet tall and weighed about 120 pounds, almost a foot taller and twice the weight of Lucy. Its brain was no larger than a modern chimp’s. It retained an agility for tree-climbing but already walked upright on two legs, a transforming innovation in hominids, though not as efficiently as Lucy’s kin.

Ardi’s feet had yet to develop the arch-like structure that came later with Lucy and on to humans. The hands were more like those of extinct apes. And its very long arms and short legs resembled the proportions of extinct apes, or even monkeys.

Tim D. White of the [University of California, Berkeley](#), a leader of the team, said in an interview this week that the genus *Ardipithecus* appeared to resolve many uncertainties about “the initial stage of evolutionary adaptation” after the hominid lineage split from that of the chimpanzees. No fossil trace of the last common ancestor, which lived some time before six million years ago, according to genetic studies, has yet come to light.

The other two significant stages occurred with the rise of *Australopithecus*, which lived from about four million to



A fairly complete skeleton of *Ardipithecus ramidus*, which replaced Lucy as the earliest known skeleton from the human branch of the primate family tree.

one million years ago, and then the emergence of *Homo*, our own genus, before two million years ago. The ancestral relationship of *Ardipithecus* to *Australopithecus* has not been determined, but Lucy's australopithecine kin are generally recognized as the ancestral group from which *Homo* evolved.

Scientists not involved in the new research hailed its importance, placing the Ardi skeleton on a pedestal alongside notable figures of hominid evolution like Lucy and the 1.6-million-year-old Turkana Boy from Kenya, an almost complete specimen of *Homo erectus* with anatomy remarkably similar to modern *Homo sapiens*.

David Pilbeam, a professor of human evolution at [Harvard University](#) who had no role in the discovery, said in an e-mail message that the Ardi skeleton represented “a genus plausibly ancestral to *Australopithecus*” and began “to fill in the temporal and structural ‘space’ between the apelike common ancestor and *Australopithecus*.”

Andrew Hill, a paleoanthropologist at [Yale University](#) who was also not involved in the research, noted that Dr. White had kept “this skeleton in his closet for the last 15 years or so, but I think it has been worth the wait.” In some ways the specimen's features are surprising, Dr. Hill added, “but it makes a very satisfactory animal for understanding the changes that have taken place along the human lineage.”

The first comprehensive reports describing the skeleton and related findings, the result of 17 years of study, are being published Friday in the journal *Science*. Eleven papers by 47 authors from 10 countries describe the analysis of more than 110 *Ardipithecus* specimens from a minimum of 36 different individuals, including Ardi.

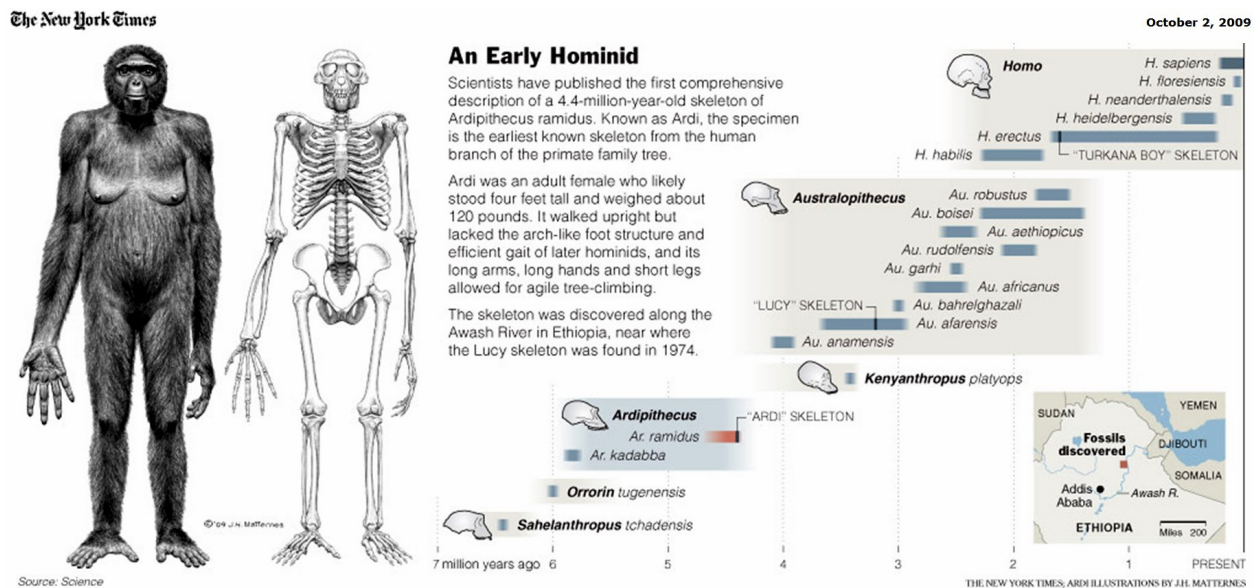
The paleoanthropologists wrote in one of the articles that *Ardipithecus* was “so rife with anatomical surprises that no one could have imagined it without direct fossil evidence.”

A bounty of animal and plant material — “every seed, every piece of fossil wood, every scrap of bone,” Dr. White said — was gathered to set the scene of the cooler, more humid woodland habitat in which these hominids had lived.

This was one of the first surprises, said Giday WoldeGabriel, a geologist at [Los Alamos National Laboratory](#), because it upset the hypothesis that upright walking had evolved as an adaptation to life on grassy savanna.

The discovery site, on what is now an arid floodplain along the middle stretch of the Awash River in Ethiopia, is 140 miles northeast of Addis Ababa and 45 miles south of Hadar, where Lucy was found in 1974 by Donald Johanson, with whom Dr. White collaborated in analyzing those fossils.

Gen Suwa, a paleoanthropologist now at the University of Tokyo, made the first discovery in 1992: a single upper molar. Yohannes Haile-Selassie, an Ethiopian curator of anthropology at the Cleveland Museum of Natural History, uncovered the first skeletal bones. A preliminary report on the new species was published in 1994.



But the fossils, which are housed at the anthropology museum in Addis Ababa, were so plentiful, fragmentary and potentially significant that Dr. White held back from further public discussion of the research, even while discoveries of older fossils were being made.

One discovery was of an earlier species of *Ardipithecus* from elsewhere in Ethiopia. Other finds, perhaps from more than six million years ago and given other species names, were excavated in Chad and Kenya. Their bones indicate that they also walked upright, scientists say, but the fossils are too few to draw any definitive conclusions.

Ardi's skull, Dr. Pilbeam said, appears to be more similar to the older Chad hominid than to younger australopithecines. This indicates that the fossils from Chad and Ethiopia possibly represent species of the *Ardipithecus* genus, or closely related genera.

From the new research, scientists inferred that Ardi was female, based on its small and lightly built skull and its canine teeth, which are small compared with other individuals at the site.

Dr. Suwa, a specialist in fossil teeth, said the more than 145 teeth collected at the site were of the size and shape and had wear patterns showing that the individuals were omnivorous eaters of plants and nuts, as well as small mammals, but were not as big consumers of fruits as are living chimps and gorillas. Ardi probably fed in trees and on the ground.

Dr. Suwa also noted that males had stubby canine teeth, more like those of modern humans, in contrast to the projecting tusklike upper canines of chimps and gorillas, suggesting that *Ardipithecus* teeth no longer functioned as weapons or displays in male-male or male-female conflicts. In fact, the male and female upper canines are similar.

This was seen as further evidence that the species had already evolved a distinctive trait of early prehumans. C. Owen Lovejoy, an anatomist at [Kent State University](#) and lead author of two of the journal reports, speculated that these hominids had a social system that involved less competition among males and that this suggested the beginning of pair bonding between males and females.

Dr. Pilbeam disputed this conjecture, saying, "This is a restatement of Owen Lovejoy's ideas going back almost three decades, which I found unpersuasive then and still do."

In his articles and an interview, Dr. Lovejoy described the five years he spent analyzing the *Ardipithecus* pelvis, which appeared to be in transition between a structure originally suited for life in trees and one modified for early upright walking. By contrast, the pelvis of the Lucy species had already evolved nearly all of the adaptations for bipedality.

Asked at a news conference in Washington what Lucy might have said to her new-found "sister," Dr. Lovejoy replied, "She would have challenged her to a race, and Lucy would have won handily." Although the lower pelvis is still primitive, Dr. Lovejoy found, changes in the upper pelvis enabled the species to walk on two legs with a straightened hip, "but probably with less speed and efficiency than humans." A few scientists think this walking evidence to be only circumstantial. The lower part of the pelvis, "still almost entirely apelike," indicates retention of powerful hamstring muscles for climbing.

Dr. White, Berhane Asfaw of the Rift Valley Research Service in Ethiopia and other team members concluded that "despite the genetic similarities of living humans and chimpanzees, the ancestor we last shared probably differed substantially from any extant African ape."

As Dr. Hill of Yale said, "It is always new specimens, particularly those from little known time periods or geographic areas, that provoke the greatest changes in our ideas."

Looking ahead, Dr. White lamented that there were so few sites in Africa known to have fossil deposits six million to seven million years old. "We are getting so close to that common ancestor of hominids and chimps, and we'd love to find an earlier skeleton," he said.