

Earliest Ancestor Emerges in Africa

Our ancient kin have taken a big step back in time. An international team working in Ethiopia has found bones and teeth of the earliest known hominid, a member in good standing of humanity's evolutionary family.

The fragmentary remains come from at least five individuals—in the genus *Ardipithecus*—who lived between 5.2 million and 5.8 million years ago, says anthropology graduate student Yohannes Haile-Selassie of the University of California, Berkeley. He describes the finds in the July 12 NATURE.

Until now, the earliest *Ardipithecus* fossils came from a 4.4-million-year-old Ethiopian site. *Australopithecus*, the genus that includes Lucy's famous remains, lived in eastern Africa no more than about 4 million years ago.

DNA studies have suggested that a common ancestor of people and chimpanzees lived in Africa anywhere from 5 million to 7 million years ago.

"*Ardipithecus* was close [in time] to the common ancestor of chimpanzees and humans," Haile-Selassie says. "We don't know what that common ancestor looked like."

Much is also unknown about *Ardipithecus*' looks. The new finds consist of a partial jaw, a few teeth, several hand and foot bones, and pieces of an upper-arm bone and a collarbone. The bones are about the size of those from a modern common chimp. However, *Ardipithecus* displays dental features found in other hominids but not in any fossil or living ape.

Moreover, the new finds include a toe bone shaped like those of Lucy and her kind. This constitutes "subtle but clear evidence" that *Ardipithecus*, like *Australopithecus*, walked on two legs, says anthropologist C. Owen Lovejoy of Kent (Ohio) State University, who independently examined the toe fossil. Ongoing studies of 4.4-million-year-old *Ardipithecus* fossils will further illuminate this hominid's stance, Lovejoy says.

The fossils were unearthed at sites in what is now a desert. When *Ardipithecus* lived there, the region contained a dense forest and had a cool, wet climate, according to studies led by Giday WoldeGabriel of Los Alamos (N.M.) National Laboratory.

That work, reported in the same issue of NATURE, includes chemical analyses of fossil-bearing soil and study of the sites' other animal remains, such as extinct elephants, rats, and monkeys.

The researchers dated layers of volcanic ash above and below the fossils by measuring argon gas trapped in samples of the rock. This gas accumulates at a known rate in rocks and minerals. Age estimates based on orientation shifts in an-

cient Earth's magnetic field at the sites corroborated the argon-based dates.

"This is the best evidence for the earliest hominids," comments anthropologist Laura M. Maclatchy of Boston University.

The new finds raise puzzling questions about why early hominids evolved an upright stance, Maclatchy adds. Researchers have often portrayed a two-legged stride as an adaptation to trekking across hot, grassy savannas. Yet *Ardipithecus* lived in shady forests where a hominid would have less need to stand up to dissipate heat or walk long distances.

Earlier this year, a French team announced the discovery of fossil teeth and limb-bone fragments of a 6-million-year-old hominid in Kenya. The researchers placed

this creature in a new genus, *Orrorin*.

Orrorin's evolutionary status is uncertain, Haile-Selassie holds. Its teeth resemble those of apes far more than those of later hominids, he says. However, *Orrorin*'s leg bones may have supported an upright stance, Haile-Selassie acknowledges. —B. Bower



Ardipithecus finds include jaw fragment (white arrow) and toe bone (yellow arrow). Hand holds a piece of a collarbone.

Antimatter mystery transcends new data

Physicists have finally answered a decades-old question about the difference between matter and antimatter. Yet their finding only deepens the mystery of why the universe contains so much more matter than antimatter.

Last week, researchers at the Stanford (Calif.) Linear Accelerator Center (SLAC) announced they had proved that hefty subatomic particles, known as B mesons and anti-B mesons, decay into lighter particles in slightly different ways.

This disparity, called the charge-parity (CP) violation, first became apparent in 1964 among particles known as K mesons. After that discovery, some theorists proposed that this type of disparity may solve a cosmic mystery: How is it that the universe is almost solely made of matter even though it theoretically burst into being with equal shares of matter and antimatter?

A pathway to an answer opened in the 1970s when theorists predicted that B mesons also would exhibit CP violation. That prediction has since been incorporated into the main theory of particle physics, known as the standard model. But researchers have lacked the technology for actual tests.

Since 1999, physicists working at giant particle accelerators at SLAC and at the KEK High Energy Accelerator Research Or-

ganization in Tsukuba, Japan, have raced to test that prediction (SN: 3/3/01, p. 143). While expecting to find CP violation, they were eager to see whether their measurements would disagree with the amount of CP violation predicted by the standard model. If so, physicists might find an explanation for the missing antimatter.

The SLAC team analyzed the aftermath of 32 million B meson-producing collisions between electrons and their antimatter counterparts, dubbed positrons. From those crashes, the experimenters have calculated a value of 0.59 ± 0.14 for a parameter known as $\sin 2\beta$. $\sin 2\beta$ would have equaled zero if there were no CP violation among B mesons, and the standard model predicts between 0.50 and 0.85.

Since the SLAC figure overlaps the $\sin 2\beta$ of the standard model, a major piece of the model has been confirmed, says SLAC team member A.J. Stewart Smith of Princeton University. The new result has only 0.003 percent chance of being a statistical fluke, the team reports. The KEK team plans to release what physicists expect to be comparable results next week.

Although the standard model has held up so far, Smith says, physicists intend to investigate other types of B mesons and their behavior for clues to the missing antimatter's fate. —P. Weiss