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Bush tightens science belt

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A NEARly perfect landing


PALEOANTHROPOLOGY

# Scientists Spar Over Claims of Earliest Human Ancestor

**PARIS**—Brigitte Senut took the weathered fossils from her safe and laid them out, one by one, on her desk. To an untutored eye, they might not look like much: broken femurs, bits of lower jaw, several teeth—13 fossils in all. But these relics have caused one of the biggest sensations in the field of human evolution in years. In two papers scheduled for publication in the 28 February issue of the *Comptes Rendus de l'Académie des Sciences*, a team led by Senut, a paleontologist at France's National Museum of Natural History, and geologist Martin Pickford of the Collège de France claims that these 6-million-year-old bones unearthed in Kenya represent our earliest known ancestor.

If that's true, "Millennium Ancestor"—so called because the bones were found last year—would predate other leading candidates by some 2 million years. But Senut and Pickford have a more drastic shake-up in mind for the human family tree. They believe that all australopithecines—hominids which include the famous skeleton Lucy, whose species is thought to be one of our direct ancestors—should be relegated to a side branch in favor of their specimen. Millennium Ancestor appears to have been a bipedal primate—perhaps the first of its kind—at home equally on the ground and in the trees. Because the fossils date to a period when the human and ape lineages are thought to have split, any primate remains from that time could shine a strong light on our murky origins. The findings also enflame an ongoing debate about what constitutes a hominid.

Such dramatic claims require big-time proof, of course. So press conferences in Nairobi in December and Paris earlier this month left most colleagues unmoved until they could see the description in a peer-reviewed journal. On 15 February, the French Academy lifted the embargo on the papers, giving the community its first good look at the riveting bones, which Pickford and Senut have labeled *Orrorin tugenensis* (*Orrorin* means "original man" in the local dialect). In the meantime, some researchers contend that the team collected the fossils illegally, charges that Pickford and Senut have strongly denied (*Science*, 15 December 2000, p. 2065; 9 February, p. 986).

**Bones of contention.** Martin Pickford and Brigitte Senut (*right*) claim that these 6-million-year-old fossils are remains of a bipedal hominid.

The verdict on the significance of the fossils, in a poll of more than a dozen experts, is split. "This discovery is very exciting and very important," says Brian Richmond of the University of Illinois, Urbana-Champaign. He says that Pickford and Senut have "come the closest yet to finding evidence of the base of the human family tree." Milford Wolpoff of the University of Michigan, Ann Arbor, agrees, calling *Orrorin* a "great discovery, one with key information about hominid origins and early evolution."

Others, however, doubt that the bones even belonged to a hominid—a loose classification that currently includes the australopithecines and the genus *Homo*—or even that the species they belonged to walked on two feet. "The case for a hominid is weak," argues Lucy co-discoverer Donald Johanson, director of the Institute of Human Origins at Arizona State University in Tempe. Indeed, says David Begun of the University of Toronto, the fragments cannot reveal whether *Orrorin* was "on the line to humans, on the line to chimps, a common ancestor to both, or just an extinct side branch."

The one thing experts do agree on is the date of the fossils, which were found last fall in lake and river sediments in the Tugen Hills of northwestern Kenya. "The dating might ultimately require some fine-tuning, [but 6 million years] is at least in the ballpark," says John Kingston of Emory University in Atlanta, who has conducted detailed studies of the area's geology. Indeed, the site's potential importance has been recognized since at least 1974, when Pickford discovered a single molar there that he and some others believe belonged to a hominid.

"I have been expecting this discovery for 25 years," says Yves Coppens of the Collège de France, a co-author of one of the *Comptes Rendus* papers. "One tooth was enough to know that hominids were there."

Indeed, the team argues that the teeth found among the remains are key evidence for *Orrorin*'s status as a human ancestor. The molars are thickly enameled, small, and squared—features retained in modern humans. Most australopithecine molars, although also thickly enameled, are much larger. That evidence impresses Wolpoff, who points out that the oldest potential hominid before *Orrorin* was a 4.4-million-year-old australopithecine whose molars—although small like *Orrorin*'s—have unhumanlike thin enamel.

Other researchers are unswayed by the dental evidence. Begun says that because

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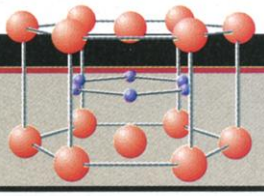





some early *Homo* species had large molars, *Orrorin*'s small molars alone are insufficient to sideline australopithecines: "If big molars exclude *Australopithecus* from a close relationship to *Homo*, they also exclude most of early *Homo*." Others assert that enamel thickness varies so much from one species to another that it may not be a valid measure for evolutionary relationships.

But there are more than teeth for the community to chew on. Pickford and his colleagues also believe that *Orrorin*'s femurs have several features ancestral to later *Homo*. One of the three retains its head, which fits into the pelvis. The team points out that the femoral head—although smaller than that of modern humans—is nevertheless much larger than Lucy's. According to Pickford, this implies that *Orrorin*'s femurs were built to support its upper body in a bipedal stance long before australopithecines arose. He concludes that this makes Lucy—who lived 3 million years ago and had smaller femoral heads—an unlikely human ancestor.

To some experts, *Orrorin*'s femurs push back the earliest evidence for bipedalism by almost 2 million years. "Upright walking goes way back in prehistory," says Ron Clarke of the University of Witwatersrand in Johannesburg. Johanson notes that other features of *Orrorin*'s femurs, including grooves where muscles and ligaments needed for walking on two feet might have attached, could be evidence for bipedalism.

But the femur argument has gotten a lukewarm reception from others. They point out that many male specimens of Lucy's species—*Australopithecus afarensis*—have much larger femoral heads than Lucy's. (Few researchers agree with Senut's contention that these larger specimens belong to another species.) And Alan Walker of Pennsylvania State University, University Park, argues that the lower femur—not found among *Orrorin*'s remains—would be more likely to make the bipedalism case by revealing the structure of the knee.

These conflicting views reflect the fact that experts lack a clear definition of a hominid, says Jeffrey Schwartz of the University of Pittsburgh. But that only means researchers seeking to penetrate our shadowy origins will be debating Pickford and Senut's find for years. Says Leslie Aiello of University College London: "If half of what they are claiming is true, it's fantastic."

–MICHAEL BALTER

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JAPAN

## Fusion Scientists Urge Closer Look at ITER

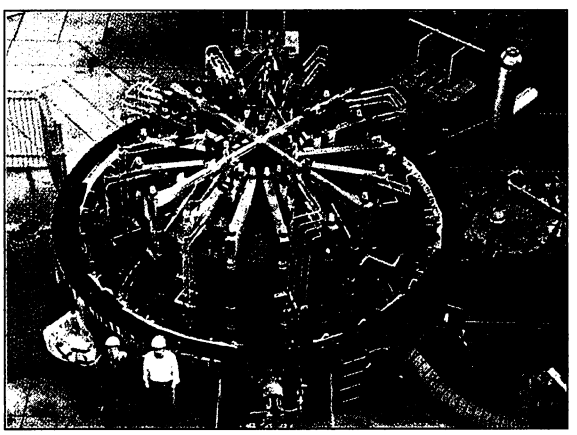
**TOKYO**—Japan's scientific community has always appeared to be four-square behind the $5 billion International Thermonuclear Experimental Reactor (ITER). But last week, the first cracks in that unified front appeared as the country's leading fusion researchers gathered to discuss the megaprojects's potential impact on the country's fusion research efforts, with some urging a fresh look at other options. "We really should have gotten more involved sooner," says Osamu Motojima, one of the fusion scientists raising concerns about ITER. Scientists are worried that the recent merger of Japan's two major science agencies will put other projects more directly in competition with ITER for funding.

The debate comes as the major ITER partners—Japan, Europe, and Russia—prepare to select by next year a site and budget for the giant machine, which has a troubled history. When researchers first proposed the project in the early 1980s, there was substantial support in the United States and elsewhere for the idea of harnessing nuclear fusion, the process that fuels the sun and stars, to produce energy on Earth. Some government budgetmakers were shaken, however, after scientists estimated that it would cost $10 billion to build a tokamak—a doughnut-shaped device in which a magnetic field contains a superheated ionized gas, or plasma—capable of containing the violent reaction. Despite efforts to cut costs by scaling back the device, the U.S. Congress abandoned ITER in 1998, leaving the three remaining partners to complete the project on their own.

They have since finished basic design work on the slimmer version, flippantly called ITER Lite. Each is now preparing to propose a candidate site for the reactor, with a final decision on the location and funding to come by the end of 2002. Completion is not expected before 2013.

Many Japanese scientists—including a solid majority of the 300 who stayed to the end of the meeting—would like to see the device built in their nation. "I think virtually everyone is convinced of [ITER's] scientific and engineering feasibility," says Kenro Miyamoto, a plasma physicist and professor emeritus of the University of Tokyo. There is also widespread agreement that the next big step for fusion research will be a facility to study an actual burning plasma.

But there is scattered opposition to ITER. And some scientists wonder if it is the best bet for plasma studies. "ITER is one candidate, ... [but] we need to investigate other alternatives," says Motojima, director of research at Japan's National Institute for Fusion Science (NIFS). The institute operates the Large Helical Device, a $650 million facility that confines plasma in a magnetic field created by spiraling coils instead of the plain rings of a tokamak (*Science*, 20 March 1998, p. 1846). Although such helical devices "are a decade or two" behind ITER's tokamak technology, Miyamoto says the government should still fund research into alternatives. And more than a quarter of those at the meeting felt that ITER's scientific details need to be vetted more carefully before the partners move ahead.



**Charged up.** Japanese scientists have begun to question ITER, shown with a model superconducting coil from the latest design.

Their concerns are fueled, in part, by the January merger of the Science and Technology Agency (STA) and Monbusho, the Ministry of Education, Science, Sports, and Culture. STA traditionally funded big science projects, including ITER, while Monbusho handled virtually all other fusion work at universities and other institutions. The former STA's budget currently provides $139 million for ITER R&D and other projects, while Monbusho spends $108 million on NIFS