

Rethinking the Hobbits of Indonesia

New analyses reveal the mini human species to be even stranger than previously thought and hint that major tenets of human evolution need revision

BY KATE WONG

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KEY CONCEPTS

- In 2004 researchers working on the island of Flores in Indonesia found bones of a miniature human species—formally named *Homo floresiensis* and nicknamed the hobbit—that lived as recently as 17,000 years ago.
- Scientists initially postulated that *H. floresiensis* descended from *H. erectus*, a human ancestor with body proportions similar to our own.
- New investigations show that the hobbits were more primitive than researchers thought, however—a finding that could overturn key assumptions about human evolution.

—The Editors

In 2004 a team of Australian and Indonesian scientists who had been excavating a cave called Liang Bua on the Indonesian island of Flores announced that they had unearthed something extraordinary: a partial skeleton of an adult human female who would have stood just over a meter tall and who had a brain a third as large as our own. The specimen, known to scientists as LB1, quickly received a fanciful nickname—the hobbit, after writer J.R.R. Tolkien’s fictional creatures. The team proposed that LB1 and the other fragmentary remains they recovered represent a previously unknown human species, *Homo floresiensis*. Their best guess was that *H. floresiensis* was a descendant of *H. erectus*—the first species known to have colonized outside of Africa. The creature evolved its small size, they surmised, as a response to the limited resources available on its island home—a phenomenon that had previously been docu-

mented in other mammals, but never humans.

The finding jolted the paleoanthropological community. Not only was *H. floresiensis* being held up as the first example of a human following the so-called island rule, but it also seemed to reverse a trend toward ever larger brain size over the course of human evolution. Furthermore, the same deposits in which the small-bodied, small-brained individuals were found also yielded stone tools for hunting and butchering animals, as well as remainders of fires for cooking them—rather advanced behaviors for a creature with a brain the size of a chimpanzee’s. And astonishingly, LB1 lived just 18,000 years ago—thousands of years after our other late-surviving relatives, the Neandertals and *H. erectus*, disappeared [see “The Littlest Human,” by Kate Wong; *SCIENTIFIC AMERICAN*, February 2005].

Skeptics were quick to dismiss LB1 as nothing more than a modern human with a disease that



stunted her growth. And since the announcement of the discovery, they have proposed a number of possible conditions to explain the specimen's peculiar features, from cretinism to Laron syndrome, a genetic disease that causes insensitivity to growth hormone. Their arguments have failed to convince the hobbit proponents, however, who have countered each diagnosis with evidence to the contrary.

A Perplexing Pastiche

Nevertheless, new analyses are causing even the proponents to rethink important aspects of the original interpretation of the discovery. The recent findings are also forcing paleoanthropologists to reconsider established views of such watershed moments in human evolution as the initial migration out of Africa by hominins (the group that includes all the creatures in the human line since it branched away from chimps).

Perhaps the most startling realization to emerge from the latest studies is how very primitive LB1's body is in many respects. (To date, excavators have recovered the bones of an estimated 14 individuals from the site, but LB1 remains the most complete specimen by far.) From the outset, the specimen has invited comparisons to the 3.2-million-year-old Lucy—the best-known representative of a human ancestor called *Australopithecus afarensis*—because they were about the same height and had similarly small brains. But it turns out LB1 has much more than size in common with Lucy and other pre-*erectus* hominins. And a number of her features are downright apelike.

A particularly striking example of the bizarre morphology of the hobbits surfaced this past May, when researchers led by William L. Jungers of Stony Brook University published their analysis of LB1's foot. The foot has a few modern fea-

STRANGE SKELETON from Flores, Indonesia, calls into question which human ancestor was the first to leave Africa—and when. Archaeologist Thomas Sutikna (*left*) is one of the leaders of the excavation of the cave that yielded the skeleton.

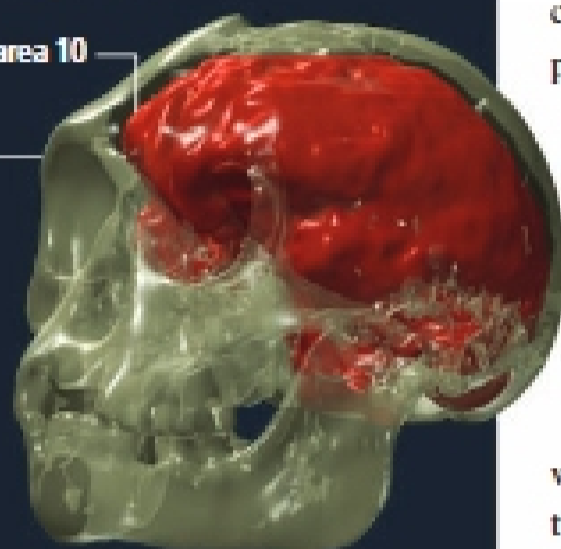
[THE EVIDENCE]

A Mysterious Mosaic

To date, excavators have recovered the remains of about 14 individuals from Liang Bua, a cave site on Flores. The most complete specimen is a nearly complete skeleton called LB1 that dates to 18,000 years ago. Some of its characteristics call to mind those of apes and of australopithecines such as the 3.2-million-year-old Lucy. Other traits, however, are in keeping with those of our own genus, *Homo*. This mélange of primitive features (yellow) and modern ones (blue) has made it difficult to figure out where on the human family tree the hobbits belong.



Brodmann area 10



BRAIN is the size of a chimpanzee's. But a virtual reconstruction—generated from CT scans of the interior of the braincase—indicates that despite its small size, the organ had a number of advanced features, including an enlarged Brodmann area 10, a part of the brain that has been theorized to play a role in complex cognitive activities. Such features may help explain how a creature with a brain the size of a chimp's was able to make stone tools.

WRIST resembles that of an African ape. Of particular interest is a bone called the trapezoid (shown), which has a pyramidal form. Modern humans, in contrast, have a trapezoid shaped like a boot, which facilitates tool manufacture and use by better distributing forces across the hand.



FOOT is exceptionally long compared with the short leg. This relative foot length is comparable to that seen in bonobos, and it suggests the hobbits were inefficient runners. Other apelike traits include long, curved toes and the absence of an arch. Yet the big toe aligns with the rest of the toes, among other modern characteristics.



tures—for instance, the big toe is aligned with the other toes, as opposed to splaying out to the side as it does in apes and australopithecines. But by and large, it is old-fashioned. Measuring around 20 centimeters in length, LB1's foot is 70 percent as long as her short thighbone, a ratio unheard of for a member of the human family. The foot of a modern human, in contrast, is on average 55 percent as long as the femur. The closest match to LB1 in this regard, aside from, perhaps, the large-footed hobbits of Tolkien's imagination, is a bonobo. Furthermore, LB1's big toe is short, her other toes are long and slightly curved, and her foot lacks a proper arch—all primitive traits.

"A foot like this one has never been seen before in the human fossil record," Jungers declared in a statement released to the press. It would not have made running easy. Characteristics of the pelvis, leg and foot make clear that the hobbits walked upright. But with their short legs and relatively long feet, they would have had to use a high-stepping gait to avoid dragging their toes on the ground. Thus, although they could probably sprint short distances—say, to avoid becoming dinner for one of the Komodo dragons that patrolled Flores—they would not have won any marathons.

If the foot were the only part of the hobbit to exhibit such primitive traits, scientists might have an easier time upholding the idea that *H. floresiensis* is a dwarfed descendant of *H. erectus* and just chalking the foot morphology up to an evolutionary reversal that occurred as a consequence of dwarfing. But the fact is that archaic features are found throughout the entire skeleton of LB1. A bone in the wrist called the trapezoid, which in our own species is shaped like a boot, is instead shaped like a pyramid, as it is in apes; the clavicle is short and quite curved, in contrast to the longer, straighter clavicle that occurs in hominins of modern body form; the pelvis is basin-shaped, as in australopithecines, rather than funnel-shaped, as in *H. erectus* and other later *Homo* species. The list goes on.

Indeed, from the neck down LB1 looks more like Lucy and the other australopithecines than *Homo*. But then there is the complicated matter of her skull. Although it encased a grapefruit-size brain measuring just 417 cubic centimeters—a volume within the range of chimpanzees and australopithecines—other cranial features, such as the narrow nose and prominent brow arches over each eye socket, mark LB1 as a member of our genus, *Homo*.

WILLIAM L. JUNGERS (Skull); THOMAS W. SMITH (Wrist); ALAN THORNTON (Foot); COURTESY OF KIRK E. SMITH (Brain); UNIVERSITY OF WASHINGTON (Clavicle); UNIVERSITY OF WASHINGTON (Pelvis)