

PALEOANTHROPOLOGY

How the Hobbit Shrugged: Tiny Hominid's Story Takes New Turn

SAN JUAN, PUERTO RICO—The strangest ancient humans may be Indonesia's "hobbits," the 1-meter-tall people who made stone tools and hunted dwarf elephants 18,000 years ago. When announced 2 years ago, the fossils from the island of Flores seemed almost too bizarre for fiction. Now, close-up looks at some of the bones have given the hobbits' saga even more odd twists.

At a recent meeting here,* two anatomists presented analyses suggesting that the original hobbit skeleton may not be female, as first described, and that its shoulders differ from those of modern people and hark back to an ancient human ancestor, *Homo erectus*. That detail and others bolster the notion that an *H. erectus* population on the island evolved into the dwarf form of *H. floresiensis*, anatomist Susan Larson of Stony Brook University in New York said in her talk at the meeting.

Other researchers' opinions about almost every aspect of the hobbits, however, continue to run the gamut. Many are impressed with Larson's analysis. "I support Larson's observations ... [and see] evidence of a faint phylogenetic sig-

nal" connecting the finds with *H. erectus*, says paleoanthropologist Russell Ciochon of the University of Iowa in Iowa City, who calls the skeleton from Flores "a very important link to our past." But a few researchers still find the whole tale too tall to swallow. In a Technical Comment published online this week by *Science*, paleoanthropologist Robert D. Martin of the Field Museum in Chicago, Illinois, and colleagues argue that the single skull is that of a modern human suffering from microcephaly (see sidebar). And even some researchers who are reasonably convinced that the fossils do not represent diseased modern people caution that the



sample size for the shoulder bones is one. "It's always nicer to have more than one individual" to hang a hypothesis on, says Eric Delson of Lehman College, City University of New York.

At the meeting, a packed room listened intently as Larson described her work on the upper arm bone, or humerus, of the original skeleton, labeled LB1 as the first human from Liang Bua cave. The LB1 humerus is peculiar—or, rather, it lacks a peculiarity shared by living people.

In modern humans, the top or head of the humerus is twisted with respect to the elbow joint by about 145 to 165 degrees. As a result, when you stand straight, the insides of your elbows face slightly forward, allowing you to bend your elbows and work with your hands in front of your body.

But in *H. floresiensis*, the humerus appeared only slightly twisted. Last fall, Michael Morwood of the University of New England in Armidale, Australia, co-discoverer of the Flores bones, asked Larson, known for her work on the upper arm, how this could work in a toolmaking ▶

Mini-me. Details of the *Homo floresiensis* skeleton suggest that it may be descended from *H. erectus*.

pathology, including one from a 32-year-old woman reported to have had the body size of a 12-year-old child. "I'm not saying I'm 100% certain it's microcephaly," says Martin. "I'm say-

ing that that brain size is simply too small" to be normal.

Jean-Jacques Hublin of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, who has seen the original specimens, finds the scaling arguments "quite convincing." But Martin's arguments are provoking a sharp response. Falk calls Martin's claims "unsubstantiated assertions" and adds that her team is surveying microcephalics to learn more. And bones from several small individuals have now been recovered from Flores, notes William Jungers of Stony Brook University in New York. He says that Martin's explanation implies that the island was home to "a village of microcephalic idiots." He adds that "there are precious few 'scaling laws' out there" and that examples of unusual scaling are not unexpected.

Paleoanthropologist Ralph Holloway of Columbia University, who is also studying microcephalic brains, says that so far he sees some differences between the Liang Bua skull and what's called primary microcephaly. But he warns that it will take a substantial survey to be sure. "I am coming around to believing that it isn't primary microcephaly," he says. But "I certainly would not rule out pathology just yet."

—E.C.

But Is It Pathological?

Even as some researchers draw inferences about the ancestry of *Homo floresiensis* (see main text), others remain convinced that the bizarre bones from the Indonesian island of Flores are nothing more than diseased modern humans. In a Technical Comment published online by *Science* this week (www.sciencemag.org/cgi/content/full/312/5776/999b), paleoanthropologist Robert D. Martin of the Field Museum of Natural History in Chicago, Illinois, and colleagues make that case.

Martin gathered scaling data on the brains and bodies of other mammals, including data on the proportions of elephants as they evolved into dwarf forms on islands. Using several possible scaling models, he argues that shrinking a *H. erectus* brain to roughly the size of the Liang Bua skull would yield a body size no greater than 11 kilograms—the size of a small monkey.

If the Liang Bua bones aren't a new species of human, what are they? Martin argues that the single tiny skull may be a modern human with microcephaly, or a pathologically small head. A previous *Science* paper by Dean Falk of Florida State University in Tallahassee and her colleagues argued that the Liang Bua skull did not show the extreme pathology seen in a microcephalic brain. But Martin counters that some microcephalic brains exhibit much less

"I'm not saying I'm 100% certain it's microcephaly ... [but the] brain size is simply too small" to be normal.

—R. D. Martin, Field Museum

hominid. “I told him I didn’t know,” says Larson. “It *wouldn’t* work.”

So at the invitation of Morwood and Tony Djubiantono of the Indonesian Centre for Archaeology in Jakarta, Larson flew to Jakarta last fall to study the bones with her Stony Brook colleague William Jungers, who was to work on the lower limbs. The pair are among the handful of researchers who have studied the original specimens.

Larson found that the LB1 humeral head was in fact rotated only about 110 degrees. (No rotation would be expressed as 90 degrees.) Curious, she examined LB1’s broken collarbone plus a shoulder blade from another individual.

Larson concluded that the upper arm and shoulder were oriented slightly differently in *H. floresiensis* than in living people. The shoulder blade was shrugged slightly forward, changing its articulation with the humerus and allowing the small humans to bend their elbows and work with their hands as we do. This slightly hunched posture would not have hampered the little people, except when it came to

making long overhand throws: They would have been bad baseball pitchers, says Larson.

When Larson looked at other human fossils for comparison, she found another surprise: The only *H. erectus* skeleton known, the 1.55-million-year-old “Nariokotome boy” from Kenya, also has a relatively untwisted humerus, a feature not previously noted. Larson concluded that the evolution of the modern shoulder was a two-stage process and that *H. erectus* and *H. floresiensis* preserved the first step.

H. erectus expert G. Philip Rightmire of Binghamton University in New York, who works on fossils from Dmanisi, Georgia, supports this view. Larson’s and Jungers’s analyses “make it clearer and clearer that *Homo floresiensis* is not some sort of dwarf modern human. This is a different species from us,” he says.

In a separate talk, Jungers reported more unexpected findings. He was able to reconstruct the pelvis, which had been broken when the bones were moved to a competing lab in Indonesia (*Science*, 25 March 2005, p. 1848).

Although previous publications had described the pelvis as similar to those of the much more primitive australopithecines, Jungers found that the orientation of the pelvic blades is modern. The observation adds weight to the notion that hobbits had *H. erectus*, rather than australopithecine, ancestry.

The skeleton was first described as female, although the competing Indonesian-Australian team described it as male in press accounts. Now Jungers says he is “agnostic” about its sex. He notes that limb bones from other individuals from Liang Bua are even smaller—“they make LB1 look like the Hulk,” he says—raising the possibility that males and females differed in size, with LB1 in the role of big male.

More surprises are still to come. Jungers said in his talk that LB1 includes an essentially complete foot, something not identified previously, and hinted that the foot is extremely large. Indonesia’s hobbits, like J. R. R. Tolkien’s fictional creatures, may have trekked about on big hairy feet.

—ELIZABETH CULOTTA

GENETIC TESTING

U.K. Embryos May Be Screened for Cancer Risk

CAMBRIDGE, U.K.—In vitro fertilization patients will be able to use genetic testing to avoid having children with mutations in genes such as *BRCA1* and *BRCA2* that raise cancer risks, the U.K. Human Fertilisation and Embryology Authority (HFEA) ruled

tion genetic diagnosis (PGD), in which one or two cells are removed from the embryo at the eight-cell stage and tested for lethal genetic conditions such as cystic fibrosis or Huntington’s disease. HFEA chair Suzi Leather said on 10 May in a prepared state-

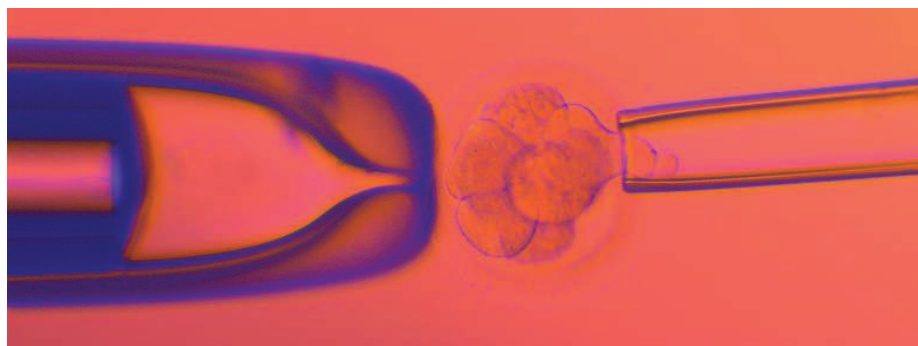
CARE Nottingham, a U.K. clinic licensed to perform PGD, described the decision as “ethically sound.” He predicts that only a very small proportion of clients will elect to use the tests. Cost will also limit take-up: Depending on how much the government contributes, patients could be left with a bill of \$10,000.

But for some, the U.K. decision raises troubling questions. “I’m not entirely comfortable because of the concerns about the whole spectrum, from very severe diseases to what are essentially traits,” says Francis Collins, director of the U.S. National Human Genome Research Institute in Bethesda, Maryland. “There is no bright line along that spectrum.” What is most worrying, he says, is that embryo screening is not regulated in the United States, and no one is sure how widespread testing is.

Some U.K. lobby groups and disability campaigners oppose the policy outright, however, saying it smacks of eugenics. “We are concerned that people are eliminating embryos, whether they have cancer or not,” says Josephine Quintavalle of the U.K. lobby group Comment on Reproductive Ethics. Quintavalle argues that research efforts should be concentrated on cancer cures, not destroying affected embryos. “We are concerned that people will view PGD as a cure for cancer,” she says.

—LAURA BLACKBURN

With reporting by Jocelyn Kaiser in Washington, D.C.



New frontier. Fertility clinics will be allowed to sample embryos before implantation for mutations in genes such as *BRCA1* and *BRCA2* and reject them.

last week. The decision, which follows a public consultation, breaks new ground because it permits screening for genes that are worrisome but not necessarily lethal or likely to produce trauma in childhood. The medical community is generally supportive, but critics are concerned that the decision could lead to screening for less risky traits in the future.

Ten clinics in the United Kingdom are currently licensed to carry out preimplanta-

ment that the authority’s decision is “not about opening the door to wholesale genetic testing.” Rather, genetic tests would be available to the minority of people with a clear history of cancer in the family. HFEA will consider applications for testing on a case-by-case basis, she says, considering factors such as family medical history and whether the condition is treatable.

Like many others in the medical community, Simon Fishel, managing director of