PALEOANTHROPOLOGY

Newest member of human family is surprisingly young

Archaic species may have coexisted with our ancestors

By **Ann Gibbons**

Just as a high-profile expedition to retrieve fossils of human ancestors from deep within a cave system in South Africa was getting underway in 2013, two spelunkers pulled aside paleoanthropologist Lee Berger. They had found what looked like an ancient thigh bone in a completely different cave. "Can we go get it?" they asked.

Berger was overseeing a team of 60 people, some of whom were 18 meters below ground gathering fossils. "This was day two. Lives were in danger. This was the beginning of my hair turning really white," says Berger, of the University of the Witwatersrand in Johannesburg, South Africa. "I said 'No, and don't tell anyone. I don't want anyone distracted.'"

But on the last day of the expedition, which retrieved 1500 fossils of a mysterious new species of hominin named *Homo naledi*, Berger gave the spelunkers the go-ahead. They came back with the thigh bone plus photos of a skull poking out of the dirt in a second chamber of the cave system. "I couldn't believe it," Berger says.

He and his team present the nearly complete new cranium plus 131 *H. naledi* fossils from the second cave in a series of papers in *eLife* this week. The new fossils reinforce a picture of a small-brained, small-bodied creature, which makes the dates reported in one paper all the more startling: 236,000 to 335,000 years ago. That means a creature reminiscent of much earlier human ancestors such as *H. habilis* lived at the same time as modern humans were emerging in Africa and Neandertals were evolving in Europe. "This is astonishingly young for a species that still displays primitive characteristics found in fossils about 2 million years old," says paleoanthropologist Chris Stringer of the Natural History Museum in London.

First announced in 2015, *H. naledi* was a puzzle from the start. Fossils from 15 individuals, including fragile parts of the face that are preserved in the new skull, show that the species combines primitive traits such as a small brain, flat midface, and curving fingers with more modern-looking features in its teeth, jaw, thumb, wrist, and foot. Berger's team put it in our genus, *Homo*.

But where it really fit in our family tree "hinged on the date," says paleoanthropologist William Kimbel of Arizona State University in Tempe. Dating cave specimens is notoriously difficult because debris falling from cave walls or ceilings can mix with sediments around a fossil and skew the dates. And these fossils likely were moved over time by rising and falling groundwater, so identifying the sediments where they were originally buried is a challenge, says geologist Paul Dirks of James Cook University in Townsville, Australia. He enlisted 19 other scientists and several labs to independently test samples using several methods. They dated cave formations deposited atop the fossils using a technique called optically stimulated luminescence, which provided a minimum age of 236,000 years for the fossils. The radioactive decay of uranium in three teeth of *H. naledi* provided a maximum age of 335,000 years.

Spelunkers found this ancient skull in a new cave system, giving *Homo naledi* a nearly complete face.

PHOTO: UNIVERSITY OF THE WITWATERSRAND/JOHN HAWKS

Geochronologist Warren Sharp of the Berkeley Geochronology Center in California cautions that the maximum age may be off if the team didn't accurately estimate how much uranium the teeth absorbed from groundwater over time. But Dirks points out that the results from several methods all point to fairly recent dates. "There is a little play in the upper limit, but it certainly isn't going to shift to 1 million years," he says.

National Geographic leaked the dates in a brief Q&A with Berger in April, but without presenting the evidence. Now that he has seen the scientific paper, geochemist Henry Schwarcz of McMaster University in Hamilton, Canada, calls the dating effort "an impressive tour de force."

The recent dates suggest that like the 60,000- to 100,000-year-old fossils of tiny *H. floresiensis* (the "Hobbit") found on an Indonesian island, *H. naledi* was a "twig off the mainstream of *Homo*—some little relic of a relatively archaic population," Kimbel says. It was "a lineage that existed for 1 million years or more and we missed it," says co-author John Hawks, a paleoanthropologist at the University of Wisconsin in Madison.

Researchers remain skeptical, however, of some of Berger's other claims, such as that *H. naledi* might have made Middle Stone Age tools found in the region. That would imply surprising sophistication for such a small-brained hominin. "Yes, that hand could make and use tools," says paleoanthropologist Bill Jungers of the State University of New York in Stony Brook. But he agrees with paleoanthropologist Rick Potts of the National Museum of Natural History in Washington, D.C., who says the idea is a nonstarter because no tools, fire, or other signs of culture have been found in association with any *H. naledi* fossils.

Ditto for the claim that *H. naledi* purposefully buried the bodies of its dead in both caves, or that it might have acquired some of its modern traits by mating with other early members of *Homo*. "It's just sheer speculation," Kimbel says.

Berger says the search for stone tools and other evidence to test whether *H. naledi* was capable of modern symbolic behavior is his top priority. "We're going after all these critical questions—is there fire in there, is there DNA?" he says. His team began new forays into the caves last week. ■

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