

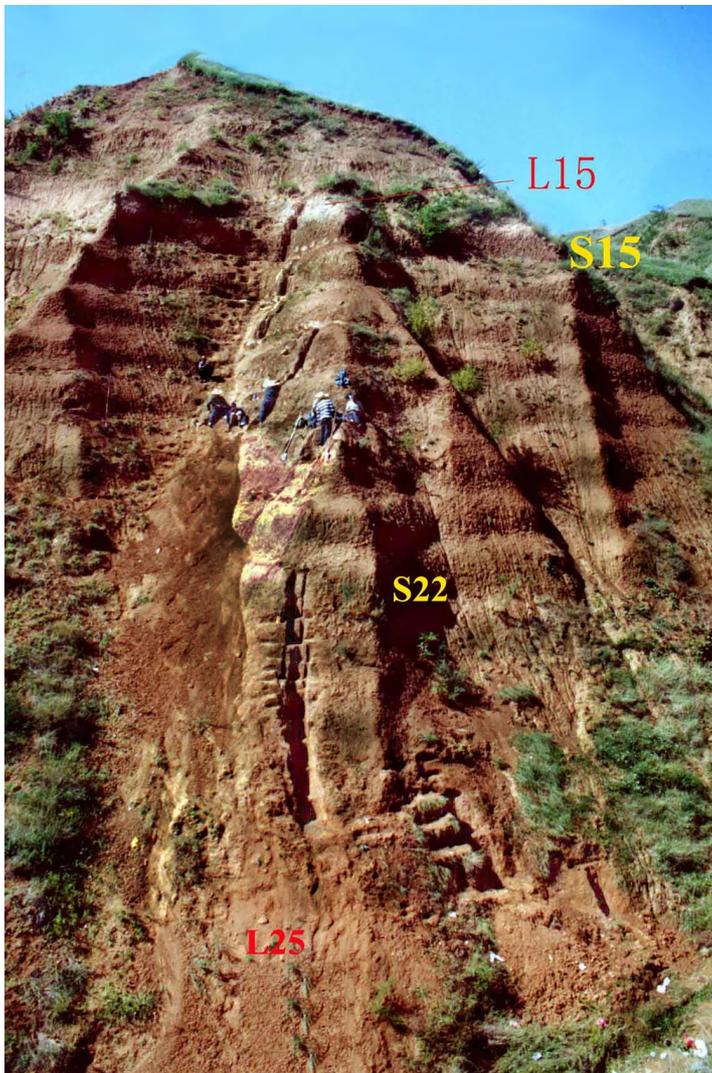
MATTER

Archaeologists in China Discover the Oldest Stone Tools Outside Africa

Chipped rocks found in western China indicate that human ancestors ventured from Africa earlier than previously believed.

By **Carl Zimmer**

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One of the 2.1 million-year-old artifacts, right, recovered from a gully in western China, left, suggest that hominins may have left Africa far earlier than previously believed. Zhaoyu Zhu

The oldest stone tools outside Africa have been discovered in western China, scientists reported on Wednesday. Made by ancient members of the human lineage, called hominins, the chipped rocks are estimated to be as much as 2.1 million years old.

The find may add a new chapter to the story of hominin evolution, suggesting that some of these species left Africa far earlier than once believed and managed to travel over 8,000 miles east of their evolutionary birthplace.

The age of the Chinese tools suggests that the hominins who made them were neither tall nor big-brained. Instead, they may have been small bipedal apes, with brains about the size of a chimpanzee's.

“The implications of all this are large,” said Michael Petraglia, a paleoanthropologist at the Max Planck Institute for the Science of Human History, who was not involved in the new study. “We must re-evaluate our understanding of human prehistory in Eurasia.”

The human lineage arose in Africa; the ancestors of modern humans separated from those of chimpanzees over seven million years ago. But scientists have known for many years that Asia has a long human history.

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In 1891, the Dutch explorer Eugene Dubois discovered a humanlike skull in Indonesia that turned out to be about half a million years old. Paleoanthropologists later named Dubois's skull *Homo erectus*, a species subsequently found at many other sites across Asia; some specimens were as old as 1.6 million years.

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Asian fossils showed that these hominins were about as tall as living humans and had fairly big brains. While chimpanzees have brains about a third the size of ours, *Homo erectus* had a brain about two-thirds as large.

In Africa, paleoanthropologists were discovering an even longer fossil record of hominins. The oldest yet found date back more than six million years.

Stone tools may have helped make it possible for hominins to travel far from Africa, archaeologists said. Zhaoyu Zhu

The earliest hominins could walk on two legs, but they were short and only had chimpanzee-size brains. By 1.9 million years ago, *Homo erectus* or some close relative was striding across East Africa.

Many paleoanthropologists came to assume that *Homo erectus* were the first migrants to leave Africa. But this picture grew blurry in the 1990s, as older hominin bones were discovered in other parts of Asia.

In Dmanisi, Georgia, scientists uncovered remarkably ancient fossils, some as old as 1.75 million years. Some stone tools found there appeared to be even older: 1.82 million years.

The Dmanisi hominins didn't much resemble *Homo erectus*: They were short and had tiny brains.

In China, researchers also found evidence of early hominin occupation. In 1964, researchers unearthed a *Homo erectus* skull in a western county called Lantian. Initial estimates found it to be 1.15 million years old.

But in 2001, Zhaoyu Zhu, a geologist at the Chinese Academy of Sciences in Guangzhou, and his colleagues began taking a fresh look at the fossil site. They determined that the Lantian skull was actually much older: 1.63 million years.

In their surveys of the region around the fossil, Dr. Zhu and his colleagues also came across what looked like ancient stone tools embedded 200 feet deep in the side of a gully.

The researchers decided to make a thorough search of the gully, clambering across the steep slope to search for more artifacts. "Working up and down it can be hair-raising at times," said Robin Dennell, a paleoanthropologist at the University of Exeter who joined Dr. Zhu's team in 2010.

The risk paid off. The researchers found over a hundred stone tools embedded in 17 geologic layers of the gully.

But it was painstakingly slow work, because the researchers wanted to make a compelling case that these really were tools made by hominins — and that they really were ancient.

“We wanted to make it watertight and bombproof,” said Dr. Dennell.

In the new study, he and his colleagues argue that the stones could not have been naturally damaged. The surrounding rock had formed from grassland soil, which didn’t contain stones the size and shape of the tools.

Instead, the researchers argue, the hominins at Lantian must have traveled miles away to mountain streams to find the right stones for making tools. The hominins carried the tools with them to use in gathering food, perhaps using sharp-edged stones to carve meat from carcasses.

To determine the age of the tools, the researchers took advantage of the planet’s changing magnetic field.

From time to time, Earth’s magnetic field flips, turning north to south. Magnetic minerals in the soil and ocean are pushed into alignment with the field; when they are trapped in rocks, they still point in the telltale direction.

Geophysicists have precisely determined the timing of these magnetic flips, which have taken place at the same time all around the world. It’s a useful way to date the material found in layers of rock.

Dr. Zhu and his colleagues used the Earth's magnetic fields to help determine the age of the rocks found in the Shangchen and Qinling Mountains. Zhaoyu Zhu

The layers in the gully formed over many hundreds of thousands of years. And the oldest tools were neatly sandwiched between rocks that formed between two flips of the magnetic field: one 2.14 million years ago, and a second about 1.85 million years ago.

Dr. Dennell and his colleagues estimate that the tools are close to the far end of that window: 2.12 million years old. That would make these tools the oldest evidence of hominins ever found outside Africa.

And that makes it unlikely that the first hominins to expand out of Africa were *Homo erectus*. Instead, Dr. Dennell speculated, a much earlier branch of the human tree ventured forth.

The trigger for that migration? Maybe it was figuring out how to make sharp stone tools.

“Suddenly you had a primate that could obtain meat from a carcass, and it opened up a new world for them,” Dr. Dennell said. “That simple technology was enough to get them out of Africa and right across Asia.”

Rick Potts, the head of the Smithsonian Institution’s Human Origins Program, found the new study compelling, offering strong evidence that the stones were indeed tools and that they were extremely old. “I think they’ve got it,” he said.

Dr. Potts did not think that the hominins of Lantian were short and small-brained, though. Instead, he speculated that there are *Homo erectus*-like fossils older than 2.1 million years waiting to be discovered back in Africa.

But John J. Shea, a paleoanthropologist at Stony Brook University, is yet to be convinced that anyone crafted the stones. At the very least, he argued, Dr. Dennell and his colleagues should make a statistical comparison between these supposed tools and naturally damaged rocks.

And Dr. Shea was leery of relying on tools alone for evidence that hominins were in Asia over two million years ago.

“Bottom line — no hominin fossils, no hominins,” he said.

Since paleoanthropologists have already found a 1.63 million-year-old skull in the Lantian province, Dr. Dennell said it was possible that researchers might someday find a far more ancient hominin fossil lurking alongside the tools.

“Mind you, it will take some time,” he said. “But it will be worth looking.”

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