



AMERICAN MUSEUM OF NATURAL HISTORY

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Wednesday, June 5, 2013

DISCOVERY OF OLDEST PRIMATE SKELETON HELPS CHART EARLY EVOLUTION OF HUMANS, APES

FOSSIL SUGGESTS THAT EARLIEST PRIMATES WERE TINY DAY-DWELLING TREE-CLIMBERS

An international team of researchers has announced the discovery of the world's oldest known fossil primate skeleton, an animal that lived about 55 million years ago and was even smaller than today's smallest primate, the pygmy mouse lemur. The new specimen, named *Archicebus achilles*, was unearthed from an ancient lake bed in central China's Hubei Province, near the course of the modern Yangtze River. In addition to being the oldest known example of an early primate skeleton, this almost complete new fossil is crucial for illuminating a pivotal event in primate and human evolution: the divergence between the lineage leading to modern monkeys, apes, and humans (collectively known as anthropoids) and the branch leading to living tarsiers – small, nocturnal tree-dwelling primates. The discovery, described today in the journal *Nature*, also provides evidence that the earliest primates were active during the day, climbed trees, and primarily ate insects.

"*Archicebus* marks the first time that we have a reasonably complete picture of a primate close to the divergence between tarsiers and anthropoids," said lead researcher Xijun Ni, a scientist at the Institute of Vertebrate Paleontology and Paleoanthropology at the Chinese Academy of Sciences in Beijing and a research associate at the American Museum of Natural History. "It represents a big step forward in our efforts to chart the course of the earliest phases of primate and human evolution."

The fossil was recovered from sedimentary rock strata that were deposited in an ancient lake roughly 55 million years ago, a time of global greenhouse conditions, when much of the world was shrouded in tropical rainforests and palm trees grew as far north as Alaska. Like most other fossils recovered from ancient lake strata, the skeleton of *Archicebus*

was found by splitting apart the thin layers of rock containing the fossil. As a result, the skeleton is now preserved in two complementary pieces, each of which contains elements of the actual skeleton as well as impressions of bones from the other side.

In order to study the entire fossil, the scientific team scanned the specimen with a world-leading level of detail and contrast using the state-of-the-art high energy x-ray facilities of the European Synchrotron Radiation Facility (ESRF) in Grenoble, France.

“To reveal the remarkable secrets that have been hidden in the rock for millions of years, we undertook extensive work, applied state-of-the-art technology, and set up intensive international cooperation behind the scenes at several museums,” said John Flynn, Frick Curator of Fossil Mammals and dean of the Richard Gilder Graduate School at the American Museum of Natural History. “It took us 10 years.”

Three-dimensional digital reconstruction of the fossil using the scans performed at the ESRF allowed the team to study the tiny, fragile skeleton of *Archicebus* in intricate detail.

“Speaking virtually, we made the skeleton stand up,” said Paul Tafforeau, paleoanthropologist and beamline scientist at the ESRF.

The skeleton of *Archicebus* is about 7 million years older than the oldest fossil primate skeletons known previously. It belongs to an entirely separate branch of the primate evolutionary tree from those specimens, lying much closer to the lineage leading to modern monkeys, apes, and humans.

“*Archicebus* differs radically from any other primate, living or fossil, known to science,” said Christopher Beard, a paleontologist at the Carnegie Museum of Natural History. “It looks like an odd hybrid with the feet of a small monkey, the arms, legs and teeth of a very primitive primate, and a primitive skull bearing surprisingly small eyes. It will force us to rewrite how the anthropoid lineage evolved.”

The evolutionary relationships among primates and their potential relatives have been debated intensively for many years.

“To test these different hypotheses and determine the phylogenetic position of the new primate, we developed a massive data matrix including more than 1,000 anatomical characters and scored for 157 mammals,” said Jin Meng, a curator in the Division of Paleontology at the American Museum of Natural History.

Statistical analyses aimed at reconstructing *Archicebus* show that it would have weighed about 20 to 30 grams (about 1 ounce) as an adult. Its tiny size and very basal evolutionary position support the idea that the earliest primates, as well as the common ancestor of tarsiers and anthropoids, was miniscule. This overturns some previous scientific ideas suggesting that the earliest members of the anthropoid lineage were quite large, the size of modern monkeys.

Other authors include Daniel Gebo, Northern Illinois University, and Marian Dagosto, Northwestern University in Chicago. Funding was provided by the Chinese Academy of Sciences, the National Basic Research Program of China, the National Natural Science Foundation of China, the U.S. National Science Foundation, the ESRF, and the American Museum of Natural History.

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The American Museum of Natural History, founded in 1869, is one of the world's preeminent scientific, educational, and cultural institutions. The Museum encompasses 45 permanent exhibition halls, including the Rose Center for Earth and Space and the Hayden Planetarium, as well as galleries for temporary exhibitions. It is home to the Theodore Roosevelt Memorial, New York State's official memorial to its 33rd governor and the nation's 26th president, and a tribute to Roosevelt's enduring legacy of conservation. The Museum's five active research divisions and three cross-disciplinary centers support 200 scientists, whose work draws on a world-class permanent collection of more than 32 million specimens and artifacts, as well as specialized collections for frozen tissue and genomic and astrophysical data, and one of the largest natural history libraries in the Western Hemisphere. Through its Richard Gilder Graduate School, it is the only American museum authorized to grant the Ph.D. degree. In 2012, the Museum began offering a pilot Master of Arts in Teaching program with a specialization in earth science. Approximately 5 million visitors from around the world came to the Museum last year, and its exhibitions and Space Shows can be seen in venues on five continents. The Museum's website and collection of apps for mobile devices extend its collections, exhibitions, and educational programs to millions more beyond its walls. Visit amnh.org for more information.

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