

Beaked, bird-like dinosaur tells story of finger evolution

June 17 2009

James Clark, the Ronald B. Weintraub Professor of Biology in The George Washington University's Columbian College of Arts and Sciences, and Xu Xing, of the Chinese Academy of Science's Institute of Vertebrate Paleontology and Paleoanthropology in Beijing, have discovered a unique beaked, plant-eating dinosaur in China. This finding demonstrates that theropod, or bird-footed, dinosaurs were more ecologically diverse in the Jurassic period than previously thought and offers important new evidence about how the three-fingered hand of birds evolved from the hand of dinosaurs. The discovery is featured in this week's edition of the journal *Nature*.

"This new animal is fascinating in and of itself, and when placed into an evolutionary context it offers intriguing evidence about how the hand of birds evolved," said Dr. Clark. Clark's graduate student, Jonah Choiniere, also was involved in analyzing the new animal.

Dr. Xu, said, "This discovery is truly exciting, as it changes what we thought we knew about the dinosaur hand. It also is amazing to bring conciliation between the data from million-year-old bones and molecules of living birds."

Limusaurus inextricabilis (meaning "mire lizard who could not escape") was found in 159 million-year-old deposits located in the Junggar Basin of Xinjiang, northwestern China. The dinosaur earned its name from the way its skeletons were preserved, stacked on top of each other in fossilized mire pits that were the subject of a 2008 National Geographic

film, "Dino Death Trap." A close examination of the fossil shows that its upper and lower jaws were toothless, demonstrating that the dinosaur possessed a fully developed beak. Its lack of teeth, short arms without sharp claws and possession of gizzard stones suggest that it was a plant-eater, though it is related to carnivorous [dinosaurs](#).

The newly discovered dinosaur's hand is unusual and provides surprising new insights into a long-standing controversy over which fingers are present in living birds, which are theropod dinosaur descendants. The hands of theropod dinosaurs suggest that the outer two fingers were lost during the course of evolution and the inner three remained. Conversely, embryos of living birds suggest that birds have lost one finger from the outside and one from the inside of the hand. Unlike all other theropods, the hand of *Limusaurus* strongly reduced the first finger and increased the size of the second. Drs. Clark and Xu and their co-authors argue that *Limusaurus*' hand represents a transitional condition in which the inner finger was lost and the other fingers took on the shape of the fingers next to them. The three fingers of most advanced theropods are the second, third and fourth fingers--the same ones indicated by bird embryos--contrary to the traditional interpretation that they were the first, second and third.

Limusaurus is the first ceratosaur known from East Asia and one of the most primitive members of the group. Ceratosaurs are a diverse group of theropods that often bear crests or horns on their heads, and many have unusual, knobby fingers lacking sharp claws.

The fossil beds in China that produced *Limusaurus* have previously yielded skeletons of a variety of dinosaurs and contemporary animals described by Drs. Clark and Xu and their colleagues. These include the oldest tyrannosaur, *Guanlong wucaii*; the oldest horned dinosaur, *Yinlong downsii*; a new stegosaur, *Jiangjunosaurus junggarensis*; and the running crocodile relative, *Junggarsuchus sloani*.

Dr. Clark has spent the last 18 years searching the Gobi Desert for dinosaurs. In 1991, he helped organize the first American expedition to Mongolia with the American Museum of Natural History. For the past seven years, his field work with Dr. Xu has focused on dinosaurs from the middle of the Jurassic Period, in the far western reaches of the Gobi.

The article, "A Jurassic ceratosaur from China and its significance for theropod digit reduction and avian digital homologies" appears in the June 18 edition of *Nature*.

Source: George Washington University

Citation: Beaked, bird-like dinosaur tells story of finger evolution (2009, June 17) retrieved 27 April 2024 from <https://phys.org/news/2009-06-beaked-bird-like-dinosaur-story-finger.html>

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