Major Headway in Avian Origin Research

Editor's Note: The issue of avian digital homologies in avian origin research has long been puzzling paleontologists, and it is also one of the most controversial issues in evolutionary biology research. An international research team led by Prof. Xu Xing, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences and winner of the National Science Fund for Distinguished Young Scholars, proposed a new hypothesis for this study published in *Nature* on June 18. Meanwhile, National Science Foundation of the United States also announced this result in the front page of its official website and accepted relevant interviews. Dr. H. Richard Lane, program director in the Division of Earth Sciences of NSFC commented on this research on dinosaurs saying that it provides a whole new perspective on the evolution of bird manual digits. It is expected that this research will remove contradictions in avian digital homologies between paleontological and modern developmental data.

Scientists have discovered a unique beaked, plant-eating dinosaur in China. The finding, they say, demonstrates that theropod, or bird-footed, dinosaurs were more ecologically diverse in the Jurassic period than previously thought, and offers important evidence about how the three-fingered hand of birds evolved from the hand of dinosaurs. The discovery is reported in a paper published in this week's edition of the journal *Nature*.

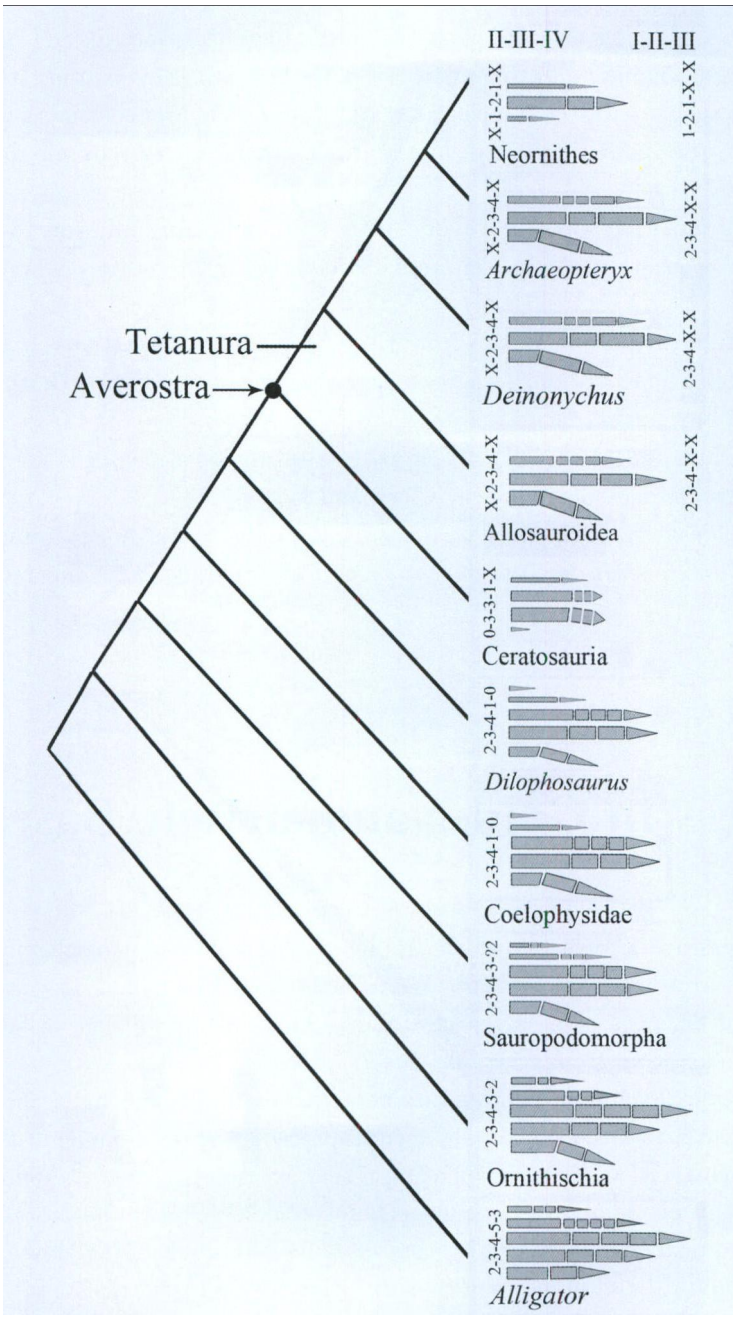
"This new animal is fascinating, and when placed into an evolutionary context it offers intriguing evidence about how the hand of birds evolved," said scientist James Clark of George Washington University.

Clark, along with Xu Xing of the Chinese Academy of Science's Institute of Vertebrate Paleontology and Paleoanthropology in Beijing, made the discovery. Clark's graduate student, Jonah Choiniere, also was involved in analyzing the new animal.

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

Limusaurus inextricabilis ("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.

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. Clark and Xu 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 Clark and Xu.

These include the oldest tyrannosaur, *Guanlong wucaii*; the oldest horned dinosaur, *Yinlong downsi*; a new stegosaur, *Jiangjunosaurus junggarensis*; and the running crocodile relative, *Junggarsuchus sloani*.

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New Progress in Gold-Nanoparticle-Based Biochips

A significant progress in the research on the application of gold nanoparticles in biochips has recently been obtained by the research team led by Prof. Wang Zhenxin at Changchun Institute of Applied Chemistry, Chinese Academy of Sciences. The research findings have been published in such top academic journals as *Analytical Chemistry* and *Biosensors and Bioelectronics*.

As a high-flux analytical technique coming into being in the 1990s, biochip technology has been widely applied to genomics research as DNA biochips gained unprecedented development, and, as a result, enormous success has been achieved in genetic sequencing research. Compared with the human genome project, research on proteomics and glycomics are facing much severer challenges, therefore, it has become one of the urgent tasks for analytical chemistry in life sciences to develop high-speed, low-cost and high-flux biochip-based proteomic analytical techniques.

By labeling biochips with biomolecule-modified gold nanoparticles, Prof. Wang and his research team succeeded in obtaining the expected new-type biochips via the application of surface enhanced Raman spectrum and resonant light scattering detection methods, realizing the precise detection of polypeptide, protein and carbohydrate on the one hand and making it possible to investigate into the interaction between zymolyte, enzyme, protein and antibodies on the other.

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