

# THE CHINESE FOSSIL FRENZY COMES TO DENVER



Early Cretaceous biota represents lagerstätten of highest magnitude. Feathers of dinosaurs and birds, fur of mammals, buds of flowering plants, and wings of dragonflies are exquisitely preserved. The outpouring of information has shed light on a little-known yet critical interval in Earth's history that witnessed the zenith of dinosaur dominance and the dawn of modern mammals.

Now the Denver Museum of Nature & Science will share in the frenzy. Three new exquisite mammal specimens from the Jehol biota will arrive at the Museum in early 2007, where they will be prepared, studied, and exhibited in the Schlessman Family Laboratory of Earth Sciences.

## TREASURE HUNTING

In 2005, I received an e-mail from paleontologists at China's Dalian Museum of Natural History coolly asking, "Any interest?" The attached image hit me like a ton of bricks: it pictured a beautifully preserved fossil of a complete mammal skeleton. Cretaceous mammal fossils rarely consist of more than tiny, isolated teeth. I was equally cool in my reply, "Yeah, sure."

In early February 2006, I traveled to the Dalian museum to assess the specimen. Zhe-Xi Luo, PhD, a colleague from the Carnegie Museum of Natural History in Pittsburgh, was also in Dalian. He is a renowned Mesozoic mammal expert and a native Chinese speaker, well acquainted with the landscape and workings of the Chinese paleontological community.

Dalian is in China's Liaoning Province on the southern tip of the Liaodong Peninsula. It is among China's most important ports for trade and tourism, and with 5.5 million people is nearly twice as large as metro Denver. It boasts an excellent natural history museum with particularly strong Jehol exhibits and collections.

After arriving at the Dalian museum, Luo and I joined our host paleontologists to examine the specimen from all angles, from the skull down to the tail. As we suspected from the photo, it was a mammal called *Repenomamus*. Two species are already known, one of which is represented by a spectacular specimen with stomach contents proving that some larger Mesozoic mammals dined on juvenile dinosaurs. So although

the specimen was visually impressive and scientifically significant, it was not new to science. The specimen would add data to the mammal's record; however, it would not result in the high-profile publication that the Chinese colleagues had set their sights on.

All was not lost, however. Our hosts cleared the *Repenomamus* from the table and brought out four new mammals from their Jehol biota treasure trove. Each was encased in its own Chinese gift box, appropriate for these breathtaking 120 million-year-old mammals. Among the Jehol specimens, some were preserved in lake deposit shales after sinking from the surface and being gently but quickly buried by layers of fine grain sediments. Although these specimens often have organic traces hinting at the body outline, most are flattened by the weight of the rock layers, obscuring the three-dimensional quality. Other Jehol specimens were rapidly preserved in silty mudstones, having died in mass from the fallout of a volcano. While these specimens rarely have organic traces of body outlines or feathers, they are preserved three-dimensionally with minimal distortion.

Two of the boxes contained flattened specimens of multituberculates. These extinct mammals have no modern descendants and can be characterized as Mesozoic "rodents." Their teeth and jaw mechanics were adapted for grinding up what must have been a varied diet, and their postcranial anatomy suggests that some of them could have been small, agile climbers, while others were hopping animals that lived on the ground.

The other two boxes contained specimens that were preserved three-dimensionally. The first specimen had some very well preserved features on the skull but a very puzzling preservation of its skeleton. Visible features of the dentition and the ear region hinted of a mammal new to science that might reside on a branch just below modern mammals on the tree of life. In order to be certain, however, we decided to bring the specimen to Denver for skillful preparation that would more fully reveal the details of its dental and cranial features.

The other three-dimensional specimen was even more interesting. Although it needed preparation, the evident details of the dentition and limbs convinced us that we were looking at something significant. It had several features that placed it very near the origin of modern mammals and also distinguished it from the other known modern mammals from the Jehol biota. It had all the ingredients for publication in a high-profile journal. This news pleased our Chinese collaborators and made my trip to Dalian immediately successful.

We hammered out a formal collaboration with Meng Qingjin, the museum's director. We suggested that we begin our collaboration by working on the *Repenomamus* and the two three-dimensional specimens. The specimens are coming to the

United States in early 2007, where they will be CT scanned at Penn State University Medical School, then come to Denver to receive preparation in the Museum's Earth Sciences Lab. Volunteer Jim Engelhorn will take on this challenge under the guidance of Ken Carpenter, Bryan Small, and myself.

## AN EMBARRASSMENT OF RICHES

During my first trip to Dalian, the snowy weather prevented a trip to the magnificent Jehol fossil beds. However, Luo invited me to return with him to China in June to attend an international workshop and field conference. It was a unique opportunity to tour the Jehol localities with the scientists that discovered them.

Our trip provided perhaps the single most dramatic example of the importance of this lagerstätten. The bus carrying our 25-person group from Beijing was met by a police escort at the outskirts of Chaoyang City. We were greeted at our hotel by the mayor of Chaoyang City, dignitaries, and the media. After this moving gesture, we rode 30 minutes outside the city to the Sihetun Locality National Geopark. We stopped in front of a 50-foot-tall cliff face that exposed the finely bedded shale beds and ash layers of the Yixian Formation. Never before has the clichéd description of rock layers as pages in the book of Earth's history seemed more fitting. Hammers in hand we set about splitting these pages open to find the plants, fish, and insects that died in this lake 120 million years ago.

Even more striking was the unassuming museum that sat 200 yards away from the cliff. While the exhibit on the second floor of the museum had the complement of exceptional Jehol specimens I expected, the exhibit on the ground floor provided an exclamation point like no other. The exhibit space was randomly set aside when the museum was built so that workers could slowly excavate down on the underlying fossil-bearing deposits. In a dramatic example of their embarrassment of paleontological riches, the exhibit space was now populated with approximately 25 glass cases that covered museum quality specimens of dinosaurs, birds, lizards, fish, and invertebrates that just happened to lay in situ within this small patch beneath the museum. One can only imagine what paleontological riches still wait to be uncovered.

## LEARN MORE

On Wednesday, January 31, Dr. Greg Wilson will present a lecture about the amazing Jehol biota and the specimens that are coming to the Museum in 2007. Information: p. X of the Lectures & Programs insert.

For updates on when the Jehol fossils will arrive at the Museum, visit [www.dmns.org](http://www.dmns.org).

By Gregory Wilson, PhD, curator for vertebrate paleontology, Earth Science Department

Lagerstätten are the mother lode for paleontologists. This German word describes geological deposits rich with well-preserved fossils, representing a wide variety of life from a particular slice in time. They are amazingly comprehensive, preserving rare clues—such as skin impressions, stomach contents, and soft-bodied organisms—that help paleontologists piece together intricate details of past life. Lagerstätten form the basis for the Museum's award-winning Prehistoric Journey exhibition, bringing the past to life with a sequence of ecosystem "snapshots" through Earth's history.

Although there have been many advances in paleontology since Prehistoric Journey opened 10 years ago, none has been more significant than the 120 million-year-old treasures unearthed from northeastern China's Jehol fossil biota. This