

Early Mammals Did Get Big in Mesozoic

Once again Liaoning fills in another blank with amazing specimens. This time it is a fossil of a badger-sized mammal named *Repenomamus robustus* (the name combines reptile and mammal) which was found with the remains of a young dinosaur (*Psittacosaur*) in its stomach. In addition, it was found near the remains of an even larger mammal named *Repenomamus giganticus* which is about the size of a 30 pound dog. It is exciting because it was thought that mammals were shrew sized, but this shows that not only were they large, they were carnivores. The reptile features include large pointy teeth and sprawling limbs. But the limbs are more flexible like those of mammals with some resemblance to the Tasmanian devil. The victim dino was in small chunks indicating that the mammal did not chew it. This seems to turn the tables on the small mammals hiding from the dinosaurs because now we know that some of them got bigger and did eat dinosaurs. (Chicago Tribune Jan 11 from Nature article)

Most Important Fossil Find of 2004?

The winner seems to be between two exciting new finds – *Dilong paradoxus*, the *T. rex* ancestor from Liaoning with feathers and *Homo floresiensis*, the human dwarf from Indonesia. While the first confirms what many paleontologists believed – that some early dinosaurs had feathers, evolved for insulation, the second presents something completely unexpected – that there were side branches of *Homo* around very recently. Strangely, *Dilong* did not make *Discover's* Top 100 science stories of 2004. What do you think?

Also 2004 was a good year for new dino species with 17 valid genera described, making it #7 on the list. The years in order are 2003 (30), 1998 (26), 2001 (25), 1999 (24), 2000 (19), 1996 (18), 2004 (17), 1991 (16), 1994 (15), and 1979 (13).

New Illinois State Fossils – Reptile and Amphibian

The ballots are in and the winners are – Illinois State Amphibian is the eastern tiger salamander (19,217 votes) – and the Illinois State Reptile is the painted turtle (16,742 votes). The Chicago Herpetological Society was the instigator of the project.

Date of Old World Monkey and Hominoid Split

Evidence from fossils and DNA have estimated a split of Old World Monkeys and hominoids at 23 to 25 MYA at the Oligocene/Miocene boundary. A new technique called quartet analysis has now been used for greater precision. Chimpanzees and humans were used for the hominoid branch and baboon and macaque were used for the other. They estimate that the split occurred in the Early Oligocene at 29 to 34.5 MYA. This means that there are a lot of early fossils still to be found and *Proconsul* may not be the earliest of all hominoids. (Proc. Natl. Acad. Sci. V. 101/17021)

As a sidelight a new macaque has been found living in India near the China border. It is named *Macaca munzala* and it lives at 3500 meters as one of the highest dwelling primates in the world. 14 troops have been spotted over 1200 square km which indicates that they are thriving. (Intl J. of Primatology)

Feeding Traces Tell Story of Extinction

What happens to surviving competitive species after an extinction event? In a study of shell-drilling muricid snails in the Western Atlantic a difference in predatory traces tells a story. Before the Plio-Pleistocene extinction some 3 MYA most of the prey were victims of shell edge drilling. After the extinction the drilling was through the cell wall, which is considered to be a safer and slower process. This would indicate that there was more competition before the event that caused the snails to attack at the quicker shell edge. After there was less competition and the safer wall drilling was predominant. They have confirmed this behavior on current snails under competitive stress and without it. (Dietl et al in Science Vol. 306/Dec. 24)

New Titanosaur from Liaoning – Borealosaurus

Several bones were found that are believed to be from a new titanosaurid sauropod based on the shape of the mid-distal caudal vertebrae. It is unique because the vertebra is opisthocoelous (convex-concave, posterior hollow) in shape like no other sauropod. The full name is *Borealosaurus wimani* and is named for its location in northern China and for Swedish paleontologist Carl Wiman who named the first Chinese dinosaur. They also found other scattered bones they believe came from this animal including a tooth crown, and a right humerus. There are similarities to a Late Cretaceous titanosaur *Opisthocoelicaudia skarzynskii* from Mongolia which has 15 opisthocoelous caudal vertebrae, but amphiplatyan (concave-concave) mid caudal vertebrae. This characteristic may mean that these 2 animals form a subclade of titanosaurids. (Hailu, Lamanna et al in Acta Geologica Sinica Vol. 78-4/Aug)

New Basal Sauropod from Jurassic Morocco – Tazoudasaurus

Early Jurassic rocks have revealed a new primitive vulcanodontid sauropod that has been named *Tazoudasaurus naimi* after its location and for its slender size. The holotype consists of a partially articulated skeleton with cranial material including left mandible with teeth, quadrate, jugal, postorbital, frontal and occipital. There is also a juvenile specimen which is considered referred. They estimate its size at 9 m (29.5 feet) with spatulate "D" shaped teeth with denticles and wear patterns indicating chewing (not thought to happen in this group). It shares some characteristics of prosauropods as well and appears to be making the transition to sauropod. The authors believe that the better known Moroccan dinosaurs may also have been in North America because it was in the Middle Jurassic the sea floor spreading began to separate the continents. (Allain et al in Comptes Rendes Palevol 3,2004)

Field Museum Scans Mummies

Digital X-ray technology is revealing secrets from the past encased in mummies. A powerful special machine valued at \$250,000 (one of two from Mikron Digital Imaging in Michigan) was used to analyze several museum specimens recently with interesting results. A purchased cat mummy from 1925 turned out to be a fake from 500 BC, one of many such mummies now resting in collections. The process is non-destructive and faster than traditional X-rays and was made for medical use. They were very pleased by the scans of 60 objects including a large Egyptian sarcophagus and would love to have the machine on a full time basis. (Chicago Tribune/ Dec. 23)

Field's Peru Studies Continue to Amaze

Field curator Jonathon Haas and wife Winifred Creamer report on the stone pyramids of Norte Chico 100 miles north of Lima Peru. Although these tower up to 8 stories in height, they harbored no gold or silver and were not studied until now. Even their age was not known. Now they have been dated to 5000 YA which makes them the same age of the Egyptian pyramids. Their extensive dating at the site shows that this was a sizable enduring culture. One reason it was successful was the development of local trading which included trading fish from the sea for cotton from the valleys. This kind of behavior would allow people to live in groups and to build significant structures. This seacoast culture even preceded and probably affected the Incan Machu Picchu site. This appears to be the America's oldest civilization. They found remains of fish and edible root plants on the pyramids and signs of cotton being grown nearby. The valley people grew cotton to make the nets that the fishermen used to harvest the vast anchovy schools off Peru's coast. Canals were found indicating crops. Why the pyramids were built and rebuilt is not known. There are no fortifications or signs of burning and destruction found indicating no war. The discovery is being hailed as an important finding so far. (Nature and Chicago Tribune/Dec. 23)

Illinois Archaeology Flourishing

In 1970 Illinois had only 5,150 registered sites in the state. But that was when federal law required an archaeological assessment for all public funded projects. Now in 2004 there are 52,170 registered sites increasing at a rate of 2,000-3,000 new ones a year. The sites cover evidence of the woodland cultures some 3,000 years ago to the arrival of Europeans and early explorers. They include sites with a few stone flakes to mound cities. New technology being used includes electromagnetic analysis that can detect fired clay, certain metals, and high concentrations of organic matter. The surface can be scanned to see if there is anything of interest beneath the topsoil – a much faster method than was used before that delayed building projects. Studying artifacts like stone pipes can help tell about the lives of the pipemakers and about trade routes among Native Americans. (Chicago Tribune)

Live Young for Triassic Marine Reptiles

Did ancient Sauropterygian marine reptiles come onto land to lay eggs(oviparity) or did they give live birth in the water?. Ichthyosaurs and mososauroids did give live birth (viviparity) and it was thought that so did plesiosaurs, pachypleurosaurs and nothosaurs. Now there are two fossil specimens of Keichousaurus hui (a pachypleurosaurs) that are pregnant. One is 8 inches and the other is 10 inches long and both have embryos preserved on both sides of their bodies. One has 2 on both sides and the other has 2 on one side and 3 on the other. This shows that this animal had 2 oviducts. Although the normal position for giving birth is tail first both of these specimens have it reversed with the babies positioned with their heads toward the back. The authors actually state that this is probably why the mothers and young died. These specimens also help to show the sexual dimorphism of the species. Characteristics used are the length ratio between the humerus and femur and the structure of the humerus. The female thus has a humerus as long as the femur and structurally simple. The males the humerus is much longer than the femur and it is structurally massive. These specimens also show another characteristic of marine animals – the sacral ribs are not fused to the sacral vertebrae. This would help with some marine movements but could also help in the birthing process. (Cheng et al in Nature V. 432/Nov. 18)

New Early South American Mid-Holocene Site – Los Ajos

While archaeological discoveries have been made in Pre-Colombian South America in the Andes and parts of the Amazon basin (including the exciting discoveries of Anna Roosevelt), there was nothing found in the east. Until now. Several sites in southeastern Uruguay have now been dated to 3,500 YA. In an area that was wetlands and thought to be a “marginal area”, they are finding agricultural communities that existed until about 500 YA. Extensive excavation and dating establish Los Ajos as a complex village with several cultivated crops. There are 6 flat topped mounds in a horseshoe formation with two domed mounds at its open end, framing a plaza. There were separate areas for food preparation and for tool making. Plant remains including phytoliths indicate that they grew maize, squash and beans. Around 4,000 YA the climate got drier and there was a transition to conditions conducive to agriculture. The earliest farming settlements before had been dated to 1,000 YA. This earliest level dated to 4,190 YA is called the Preceramic Archaic Component under the Preceramic Mound Component followed by the Ceramic Mound Period dating from 3,000 YA to 500 YA. There are also other mound complexes nearby are dated within these times and indicates a thriving population in the area. The plans of Los Ajos are earlier and different from those of Amazonia meaning that there are still many questions to be answered about the origins of the groups that lived there. (Iriarte et al in Nature V. 432/Dec. 2)

Chicken Genome Finished with Evolutionary Implications

Chickens are a favorite species for biological research because they are easy to maintain and reproduce rapidly. The chicken embryo develops like mammals and can be studied inside the egg. Chickens and mammals have similar symptoms for diseases and they have similar immunological responses. The genome of Gallus gallus or the red

jungle fowl was studied as it is considered the predecessor of the domestic chicken. The chicken genome is about 1/3 the size of the average mammal genome and contain abundant microchromosomes (unlike mammals but like some fish and reptiles). They are mapping the genome so that they will be able to identify the various genes that produce desirable traits in chickens to help breeders. They will also work to identify coding genomic sequences between different organisms and try to understand their regulatory structures. Since chickens diverged from humans some 310 MYA it can be considered an outgroup for comparison purposes. By comparing the precise base pairs that differ they can determine the ones that evolution has left alone over all those years – the ones that are most probably functional in the human. They have found 70 million base pairs of sequence that are conserved between chickens and humans and these will now be studied to determine what they are and why they have not changed over time. One interesting discovery is that chickens apparently do have a sense of smell. In addition the chicken genome is probably the closest we will get to dinosaur genomes. (International Chicken Genome Sequencing Consortium & International Chicken Polymorphism Map Consortium & Wallis et al in Nature V. 432/Dec. 9)

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