Memoir of the Fukui Prefectural Dinosaur Museum 2: 123–131 (2003)

CONTRIBUTIONS OF NEW DINOSAUR MATERIALS FROM CHINA TO DINOSAUROLOGY

Zhiming DONG

Institute of Vertebrate Paleontology and Paleoanthropology, Academia Sinica, P. O. Box 643
Beijing, China 100044

ABSTRACT

Many new localities and remains of dinosaurs were discovered and excavated in China in the last few decades. There were three international dinosaur projects, such as the Sino–Japan Silk Road Dinosaur Expedition (1992–1993), the Sino–Belgium Dinosaur Project (1995–2001), the China–Japan–Mongolia Mongolian Plateau Expedition (1995–1999). The sedimentary rocks of the Jehol Group from northeastern China were deposited during the Early Cretaceous (125 Ma). It was formed by the lacustrine layers and produced abundant terrestrial biota, including early birds and feathered dinosaurs. The discoveries from Jehol Group have became a focus in paleontology.

Key words: : Dinosaur Project, China, Jehol Group, feathered dinosaurs

DINOSAUR PROJECTS IN CHINA

In the last few decades, many new localities and remains of dinosaurs and birds were discovered and excavated in China, especially in the western part of Liaoning Province, Northeast China (Hou et al., 1995; Ji and Ji, 1996; Chen et al., 1998; Xu et al., 1999a, b). These discoveries were made mainly by three joint teams, such as the Sino–Japan Silk Road Dinosaur Project, the Sino–Belgium Dinosaur Project, and the China–Japan–Mongolia Mongolian Plateau Expedition (Dong, 1997d). These new finds and expeditions have attracted considerable attention in both the scientific community and popular presses and expanded earlier discoveries, and brought us new insights into vertebrate paleontology. Here, I review and discuss these new finds in China.

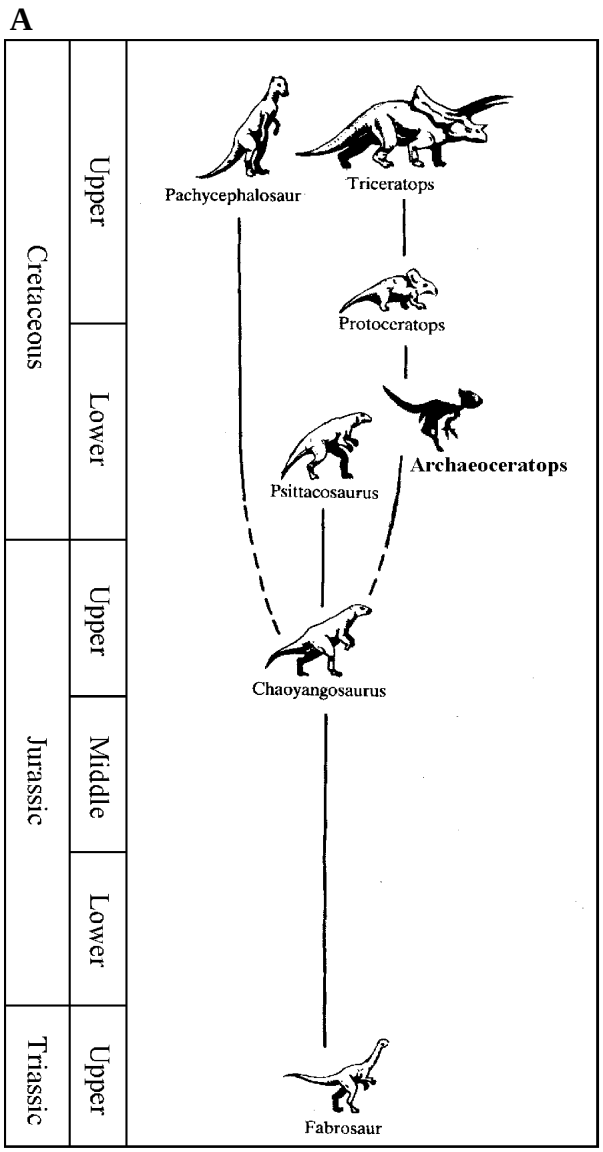
1. The Silk Road Dinosaur Expedition 1992–1993

In 1992, the Sino–Japan Dinosaur Expedition (The Silk Road Dinosaur Expedition) worked at the Gongpoquang Basin of the Western Corridor Area (97°30'–98°10' E and 41°30'–41°45' N), Gansu Province. The lower and middle parts of the deposits in the locality consist of red, gray, fine-grained sediments of fluvial and lacustrine facies, yielding remains of pelecypods and conchostracans. The upper part was deposited in a delta facies. Fossil and stratigraphic data suggested that the exposed deposits are of Early Cretaceous age. The sediments are called the Xinminbao Group in the Western Corridor Area.

Many new genera and species of turtles, crocodyliforms, dinosaurs, and mammals were named based on the material collected in this expedition. Six new genera and species of dinosaurs were described (Dong, 1997d). These new taxa include *Siluosaurus zhangqiani* (Hypsilophodontidae) (Dong, 1997a), *Probactrosaurus mazongshanensis* (Iguanodontidae) (Lu, 1997), *Psittacosaurus mazongshanensis* (Psittacosauridae) (Xu, 1997), *Archaeoceratops oshimai* (Neoceratopsia) (Dong and Azuma, 1997), and *Nanshiungosaurus bohlini* (Segnosauria) (Dong and Yu, 1997) from the Gongpoquang Basin.

A new family, Archaeoceratopsidae, is proposed based on the type genus *Archaeoceratops*. *Archaeoceratops oshimai* is a primitive neoceratopsid, and represented by a nearly complete skull and the associated skeleton. It had a lightly built body. Its jugal is shallow, the premaxillary dentition is present, containing 3–4 teeth. A palpebral is present and the frill is very short. The hind limb is relatively long when compared with the forelimb of protoceratopsids. The metatarsus is long and narrow. This new species is morphologically the most primitive and stratigraphically the oldest neoceratopsian dinosaur. It represents the most basal member of a group that radiated through Asia (protoceratopsid) and later into North America. *Archaeoceratops* is regarded as a common ancestor of ceratopsian dinosaurs (Fig. 1).

Fax: +86-10-68312683
E-mail: dinodong@sina.com



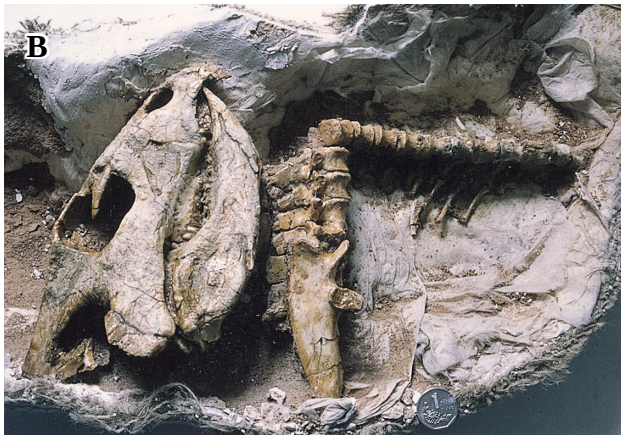


FIGURE 1. **A**. Phylogenetic relationships within the Neoceratopsian dinosaurs (Dong and Azuma, 1997); **B**. *Archaeoceratops oshimai.*

FIGURE 2. Members of the Silk Road Dinosaur Expedition at the Turpan Basin in 1993.

During the summer of 1993, the Sino–Japan Silk Road Dinosaur Expedition went to the Turpan Basin of Xinjiang (Fig. 2). They worked mainly on the Late Jurassic deposits and collected a large sauropod, which was described as a new taxon, *Hudiesaurus sinojapanorum* (Dong, 1997c). The Late Jurassic deposits of the Turpan Basin are named as the Qigu and Karaza formations (Dong, 1992, 1997b).

Hudiesaurus sinojapanorum is a new and gigantic sauropod. The top of the neural spines of the anterior dorsals forms a U-shaped, shallow cleft. A wing-like process arises between the bases of the postzygapophyses and the lateral margins of the neural spine. The estimated body length is 29–30 m, indicating that it is the largest sauropod from Asia.

2. The Field Activities of the Sino–Belgium in China, 1995 to 2001

In 1995, the Royal Science Academia of Belgium established a co-operative project, the Sino–Belgium Dinosaur Expedition (CBDE), with the concurrence of the Belgium Science Museum, Brussell and the Inner Mongolian Museum, Hohhto. The object of this project was to conduct surveys and excavations of dinosaurian fossils in the Inner Mongolian Gobi dessert, China.

During 1995, expeditions of the CBDE excavated bones from the Iren Dabasu Formation (Late Cretaceous) in Erenhot and surveyed Cenozoic deposits where some mammal fossils were collected (Fig. 3). They unearthed a quarry of hadrosaurs and collected three nearly complete skeletons which were referred to *Bactrosaurus johnsoni* (Godefroit et al., 1998).

In 1996, they worked at the Bayan Mandahu site and visited several famous dinosaur sites in the Ordos Basin. These expeditions yielded most gratifying results in terms of collections. The activities provided a framework for the localities investigated during the course of the Sino–Belgium Dinosaur Expedition. A nearly complete ankylosaur skeleton was collected from Bayan Mandahu site (Fig. 4). It was

FIGURE 3. Members of the Sino–Belgium Dinosaur Expedition at Eren Basin in 1995.

FIGURE 4. An ankylosaur found by the Sino–Belgium Dinosaur Expedition at the Bayan Madanhu site.

regarded as a new species, *Pinacosaurus mephistocephalus* and described by Godefroit et al. (1999).

In 1997, the third year of the Expedition, the Early Cretaceous beds of Tokhom site was investigated. They collected a nearly complete skull of *Alxasaurus*. This is a therizinosaurian dinosaur. In Alxa Gobi, they also found a site previously unearthed by the Sino–Russian Paleontological Expedition in 1960's. It was Dashuigou locality in which many skeletons of *Probactrosaurus* were collected.

3. China–Japan–Mongolia Mongolian Plateau Expedition 1995–1999

In the Inner and Outer Mongolian Gobi deserts there are many well-known faunal assemblages and relative strata. During the "cold war", these assemblages and rock strata could not be studied by multinational expeditions. The China–Japan–Mongolia Mongolian Plateau Expedition is the first study of stratigraphy and paleontology in Gobi Area after the cold war around the boundary of Mongolia and China.

In the summer of 1996, the members of the China–Japan–Mongolia Mongolian Plateau Expedition surveyed the well known Bayn Shireh, Nemegt, Bayn Dzak, Toogreeg and many other localities of southern Gobi. They made a brief review on these rock formations.

A nearly complete skeleton of oviraptorid was discovered at the Nemegt Basin. This is the youngest one in all of known oviraptorids (Lu et al., 2002).

In the summer of 1997, the China–Japan–Mongolia Mongolian Plateau Expedition worked at the Alxa Gobi of Inner Mongolia, China (Fig. 5). A quarry of dinosaurs was discovered in Suhongtu of the Alxa Gobi, Inner Mongolia, China (Fig. 6). Twelve well-articulated skeletons of an ornithomimid dinosaur from the Upper Cretaceous Ulansuhai Formation were discovered. These new materials of ornithomimids include juveniles and adults (Fig. 7) (Kobayashi and Lu, in press). They range in size from 60 cm to almost 2.5 m. These are edentulous small theropods with relatively long forearm and tail. Each skeleton contained a preserved gastrolith mass inside the rib cage. The gastrolith masses in this ornithomimid indicate that these non-avian toothless theropods may have had gizzards, and hence, been herbivorous (Kobayashi et al., 1999).

In an attempt to find new dinosaur fossils and localities in Mongolia this investigation paid particular attention to the Jurassic deposits in the summer of 1998 or our third field mission. They surveyed the large lake area of the western part of Mongolia where extensive Late Jurassic and Early Cretaceous continental sediments are present. Several individuals of pterosaurs (Dsungaripteridae) and psittacosaurs were collected from the Early Cretaceous beds. A large sauropod also found from the Late Jurassic beds. This specimen may be referred to the mamenchisaurids. All materials from the western part of Mongolia are closely related to those from Junggar Basin of Xinjiang, China.

FIGURE 5. Camp site of the China–Japan–Mongolia Mongolian Plateau Expedition in the Alxa Gobi, Inner Mongolia.

FIGURE 6. The China–Japan–Mongolia Mongolian Plateau Expedition worked at the Alxa Gobi of Inner Mongolia. Several individuals of the ornithomimid, from the infants to adults, are exposed on the surface of the rock.

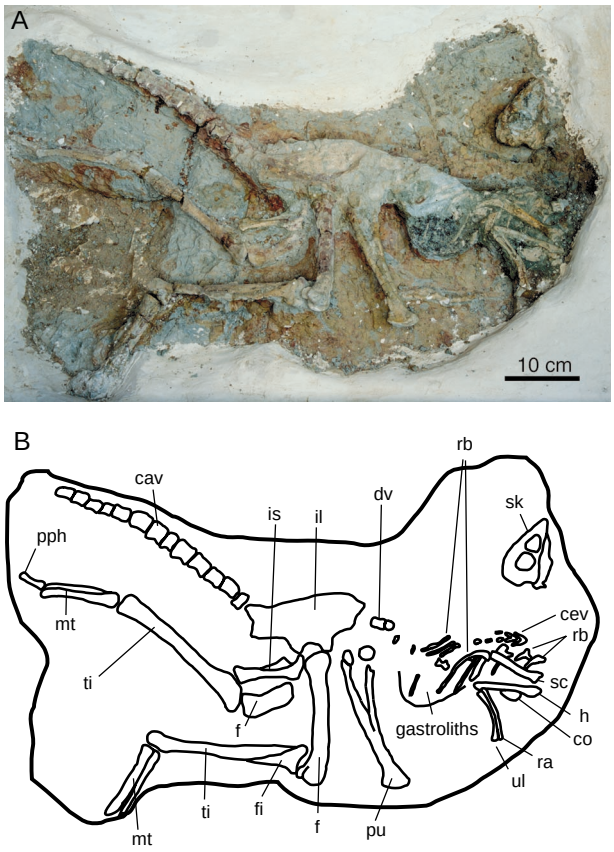


FIGURE 7. One of the small theropods collected at Suhongto, Alxa Gobi, Inner Mongolia. A juvenile ornithomimid: photograph (**A**) and line drawing (**B**). Abbreviations: **cav**, caudal vertebra; **cev**, cervical vertebra; **co**, coracoid; **dv**, dorsal vertebra; **f**, femur; **fi**, fibula; **h**, humerus; **il**, ilium; **is**, ischium; **mt**, metatarsal; **pph**, pedal phalanx; **pu**, pubis; **ra**, radius; **rb**, dorsal rib; **sc**, scapula; **sk**, skull; **ti**, tibia; **ul**, ulna.

THE "FEATHERED" DINOSAURS AND BIRDS

Six kinds of "feathered" dinosaurs and many birds were found in the Early Cretaceous Jehol Group of the western part of Liaoning Province (Sereno and Roa, 1992; Hou et al., 1995; Ji and Ji, 1996; Chen et al., 1998; Ji et al., 1998; Xu et al., 1999a, b; Zhou et al., 2003). The Jehol Group was widely distributed in northeastern China. The unit has become famous as a source of abundant terrestrial biota, including fishes, lizards, pterosaurs, birds, dinosaurs, insects, and early mammals as well as plants (Chang et al., 2001). The remains of birds and "feathered dinosaurs" have received considerable attention in both the scientific community and popular press. The impression of skins and feathers was preserved on the slabs thanks to the exceptional condition of fossilization. It could be called as the Chinese "Solnhofen" (Dong, 2002; Zhou et al., 2003).

The Jehol Group is a thick sequence of the Lower Cretaceous fluvial and lacustrine sediments interbedded with lavas and tuffs. The lower part of the sequence is assigned to the Yixian Formation while the upper part is referred to the Jiufotang Formation and the Fuxin Formation (Chen et al., 1980).

In 1996, a superb dinosaur skeleton preserved on a slab of sandstone was collected from the Yixian Formation by a farmer. It was named *Sinosauropteryx prima* as a primitive bird by Dr. Ji Qiang and his colleague of the National Geological Museum of China (Ji and Ji, 1996). A part of the specimen split into two is housed in the National Geological Museum of China, and the counterpart, in the Nanjing Institute of Geology and Palaeontology. Now *Sinosauropteryx* was referred to Compsognathidae (Chen et al., 1998).

The Chinese specimens present an interesting character. A row of "feathers", or integumentary structures, runs along the center of the back from the central of the skull to the tail end and around the tail extending forward to legs. The "feather" is 10–14 mm in length. The "feathers" are not the structures that show the fundamental morphological features of modern birds.

Those show a central shaft with regular branches of barbs. Some paleontologists point out that these "feathers" are single vertical spicules that seem to behave much like the bristles of a brush.

Another specimen of *S. prima*, which holds a skeleton of a small lizard within the rib cage, is larger than the holotype and inferred as an adult individual (Fig. 8). It is housed in the Nanjing Institute of Geology and Palaeontology as a referred specimen (NIGP 127587) (Chen et al., 1998). It was obviously the dinosaur's last meal. It is assumed that *Sinosauropteryx* lived near the shores of lakes or lagoons. It was a speedy bipedal predator with an unusually long tail for its body. The ability of *Sinosauropteryx* to catch a small lizard is a testament to its speed and agility. Besides lizards, *Sinosauropteryx* probably fed on insects and small mammals as well.

Protarchaeopteryx robusta named by Ji Qiang and his colleague in 1997 is a long-armed, rather large and robust, non-avian coelurosaur, such as dromaeosaurids and troodontids. It had longer arms than those of *Sinosauropteryx*. *Protarchaeopteryx* had a short and high skull. Its premaxillary teeth were large and straight. The maxillary and dentary teeth were short and bulbous. All teeth have anterior and posterior serrations. There were plumulaceous feathers distributing on the chest.

Caudipteryx is the third feathered dinosaur from the Jianshangou–Sihetun area. It was named and described in a year after *Protarchaeopteryx* (Ji et al., 1998). *Caudipteryx* had a relatively short skull with a large orbit (Fig. 9). Premaxillary teeth are elongate and hooked, with broad roots. Maxillary and dentary teeth are not preserved. The tail of *Caudipteryx* is short relative to its body length. There are ten to eleven long tail feather attached to the end of the tail. Now *Caudipteryx* is referred to oviraptorosaurs. Oviraptorosaurs were a group of non-avian theropod and was regarded as birds (Maryanska et al., 2002; Lu, 2002).

Sinornithosaurus (Xu et al., 1999b) is the only feathered theropod dinosaur collected by professional paleontologists (staff of IVPP) from the Yixian Formation of western Liaoning, although many specimens from western Liaoning were collected by local farmers. It was a dromaeosaurid and closely related to birds.

Microraptor (Xu et al., 2000) is the smallest dinosaur of known mature dinosaurs. The specimen was collected from the Early Cretaceous Jiufotang Formation of the Jehol Group. It is referred to a dromaeosaurid and arboreal non-avian dinosaur.

Sinovenator (Xu et al., 2002) is the most basal troodontid found to date. It displays a lot of bird-like feathers and a laterally derived glenoid fossa and opisthopuby, suggesting a close relationships to birds.

A lot of fossil birds (*Confuciusornis*, *Liaoningornis*, and *Liaoxiornis*) were collected from the same bed of the "feathered dinosaurs" (Fig. 10). These fossil birds display a combination of primitive, *Archaeopteryx*-like features and other characteristics of modern birds. Previously the discoverers placed them in the Late Jurassic. Now they suggest as being Early Cretaceous in age, because *Confuciusornis* is more advanced than *Archaeopteryx* in a number of significant features.

Several skeletons of *Psittacosaurus* have been found in the Yixian Formation. *Psittacosaurus* was common in northern

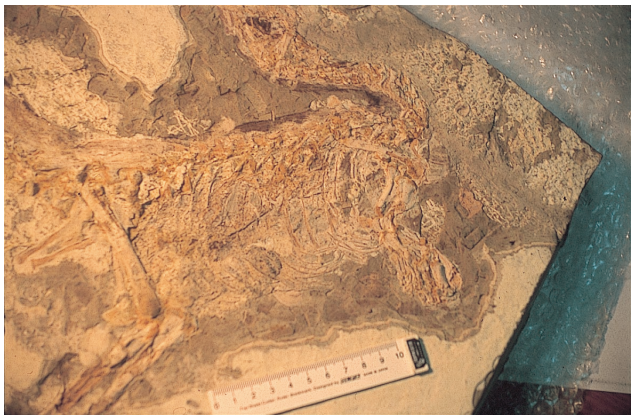


FIGURE 8. Skeleton of *Sinosauropteryx prima*.

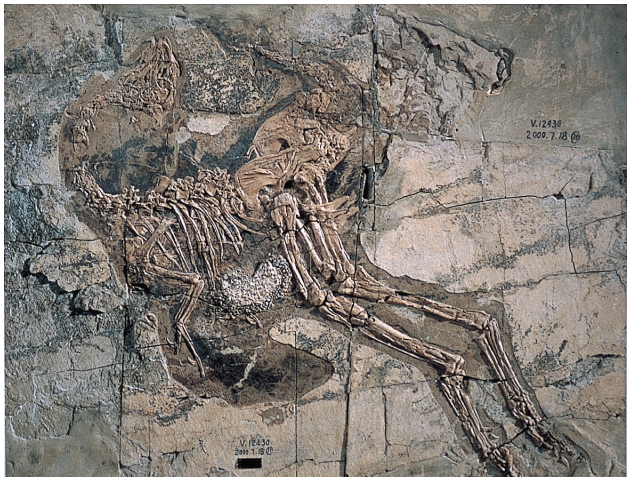


FIGURE 9. A skeleton of *Caudipteryx* with feather-like structures.

FIGURE 10. A complete skeleton of *Confuciusornis*.

China, from Shandong to Xinjiang, as well as in southwestern Siberia and northern Thailand (e.g. Sereno et al., 1988; Buffetaut and Suteethorn, 1992). All authors place the various *Psittacosaurus*-bearing beds in the Lower Cretaceous (Dong, 1992). The occurrence of *Psittacosaurus* certainly suggests that the Yixian Formation is of Early Cretaceous age rather than the Late Jurassic. A recent radiometric date of the Yixian Formation is 124–121 Ma or 126.7 Ma (Swisher et al., 1999) on the basis of $Ar^{40}-Ar^{39}$ dating method (Smith et al., 1995).

Above-described "feathered dinosaurs" have a great significance for understanding the relationships of small theropods and birds as well as considering the physiology of dinosaurs. Many dinosaurologists have restored some small theropods with feather-like coverings on the body surface, and suggested that small theropods were possibly warm-blooded (Bakker, 1986). These Chinese specimens have a thick coat of "feather"-like structures. Warm-blooded small theropods may have been an incubator (Xu et al., 2002). Thus, new discoveries provided much evidence about the origin and evolution of feathers (Xu et al., 2001).

Although there is a notion that the small theropods are closely related to birds, in other words, birds were dinosaur descendants, another hypothesis suggests that birds and theropods are merely sister groups. A series of new discoveries of feathered dinosaurs from China demonstrate that birds and dinosaurs (small carnosaurs) are very closely related to each other. Svend Palm of Denmark (1996) pointed out that birds may have evolved from a tree-dwelling quadrupedal diapsids through several intermediate stages; each stage must have been more adaptive than the previous stage for flight. There is a concept of the "pre-bird" in Palm's hypothesis. These Chinese specimens seem to represent a "protofeather" stage in the evolution of flight. Birds (*Confuciusornis*) and small theropods (*Sinosauropteryx*, *Protarchaeopteryx*, *Caudipteryx*, and *Microraptor*) probably had a common ancestor in the Middle or Early Jurassic age, although the question on the origin of birds is still unsettled.

In summer of 1998, a fragmentary skeleton was collected from the Quarry of Sihetun by staff of the IVPP. It is probably referred to therizinosauroid (Segnosauria) dinosaurs and named *Beipiaosaurus* (Xu et al., 1999a). This skeleton also preserved long "feathers" on their chest and forelimbs.

Four pterosaurs (*Eosipterus*, *Dendrorhynchoides*, *Haopterus*, and *Jeholopterus* have been described from the Yixian Formation (Ji and Ji, 1997, 1998; Ji et al., 1999; Wang and Lu, 2001; Wang et al., 2002). The *Dendrorhynchoides* was originally referred to Rhamphorhynchidae of the Late Jurassic on the basis of long tail (Ji and Ji, 1998). Recently, some works pointed out that the long tail was not originally associated with the rest of the skeleton (Unwin et al., 2000). Later, this pterosaur was moved to the Anurognathidae.

Luo (1999) has pointed out that in the Early Cretaceous (Jehol Group) eastern Asia was a refugium for some Late Jurassic taxa. Russell (1993) argued that eastern Asia had an endemic assemblage in the Early Cretaceous. These non-marine sediments in eastern Asia frequently intercalates lava deposits, and are widely distributed in northeastern Asia including the Tetori Group (Southwest Japan), the Gyeongsang Group (South Korea), the Jehol Group (Liaoning), the Zhidan Group (Ordos Basin), the Tugulu Group (Xinjiang), and the Tsagaantsav Svita (western Mongolia). These strata yield the members of Jehol Biota.

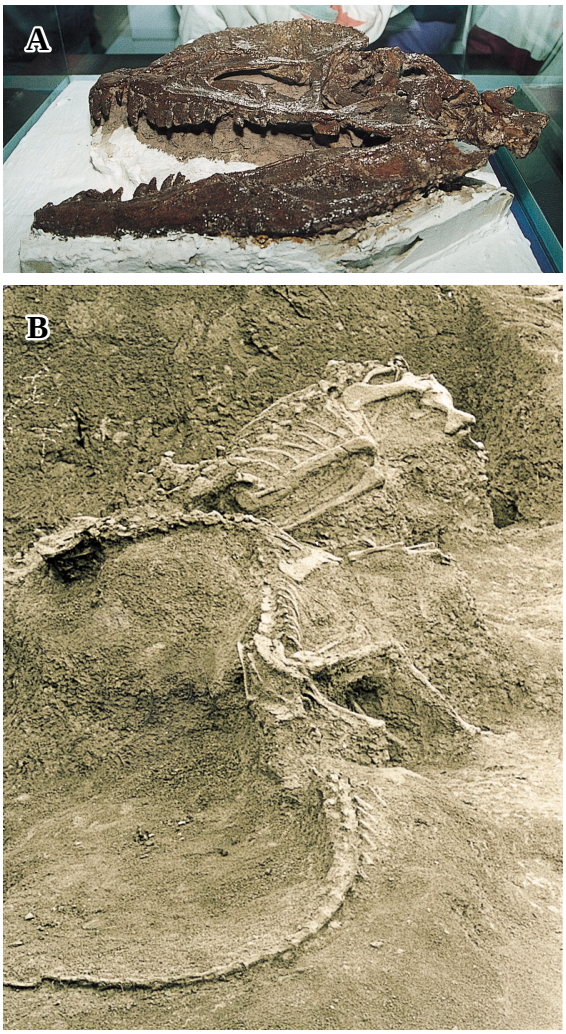


FIGURE 11. A skull (**A**) and a skeleton (**B**) of *Dilophosaurus sinensis* from Lower Lufeng Formation.

NEW DISCOVERIES FROM LUFENG BASIN

In 1994, a nearly complete theropod skeleton was collected from the Lower Lufeng Formation of the Lufeng Basin (Fig. 11A). The skull is well preserved and has two ridges on the top. It was identified as a species of *Dilophosaurus*, *D. sinensis*. It is a medium-sized theropod, and the skeleton found

FIGURE 12. Exposing dinosaur fossils at Chuanjie Village, Lufeng Basin.

in 1987 measures some 5.6m in length (Fig. 11B). Recently, I reviewed this specimen and considered it to be similar to *Sinosaurus* erected by Young in 1948. *Sinosaurus* had a deep notch at the suture between premaxillary and maxillary bones. This notch was very powerfully built, possibly to anchor muscles that would produce a powerful bite. *Sinosaurus* might have been either a scavenger or a predator. The premaxilla was probably covered with the narrow, hooked beak used to tear skins and abdominal walls of poor victims. A crested crown, which is sometimes fan-shaped, may have been helpful to keep the abdominal wall open while devouring. The feet of *Sinosaurus* were similar to those of Himalayan vultures, and had become adapted to eating the corpses of large animals, such as prosauropods.

In 1995, a new dinosaur "grave" was found from the Upper Lufeng Formation of the Middle Jurassic in Lufeng Basin (Fig. 12). This is a quarry yielding abundant dinosaur fossils, containing seven nearly complete sauropod skeletons, a theropod and several turtles. The sauropods are identified as a new species of mamenchisaurid, estimated 19 m long. The theropod is closely related to *Szechuanosaurus* from the deposits of the Middle Jurassic in Sichuan Basin. It is clear that the Upper Lufeng Formation is the Middle Jurassic deposits. On the basis of the analysis of palaeoenvironments, it is evident that the bodies of these dinosaurs were moved after death, although not for a great distance. The carnosaur skeletons are nearly complete. This might suggest a mass-mortality event. This "grave" covers more than 8,000–9,000 m^2 and embraces over 100 individuals underneath. This place is preparing to be a combined base for scientific studies and tourism. The local government has sectioned off 15 ha of the excavated land and designated it as a reservation area. A Lufeng Research Center of Dinosaurs was constructed in the locality.

ON THE PROBLEMS OVER SMUGGLING FOSSILS OUT OF CHINA

In 1993, numerous egg fossils were discovered in Xixia Basin, Henan Province of China. In fact, a farmer discovered some fossil eggs in 1991 while he founded a house. They were identified as dinosaur eggs by a geologist. Soon, villagers began selling eggs to fossil dealers who smuggle these eggs to the international market. Those well-preserved eggs were given different names, and have now become world-wide wonders. The eggs came from the Upper Cretaceous deposits.

A result of research on the Cretaceous fossil eggs, 9 genera of dinosaur eggs were described (Fang et al., 1998). An incomplete skeleton of an embryo of a theropod called "Baby Louie", was moved overseas, and exhibited on the Dinofestival in 1999. The eggs are elongated ellipsoids with 42 cm in length and identified as *Macroelongatoolithus xixiaensis*. It was an edentate theropod referred to Ornithomimosauria or Oviraptorosauria.

Recently, a mysterious skeleton of a psittacosaur is reported (Buffetaut, 2001; Dalton, 2001). It had integumentary structures (Fig. 13). A photograph of a nearly complete skeleton of psittacosaur was shown at the seventh International Symposium on Mesozoic Terrestrial Ecosystems held in Buenos Aires, Argentina. The specimen presumably came from the

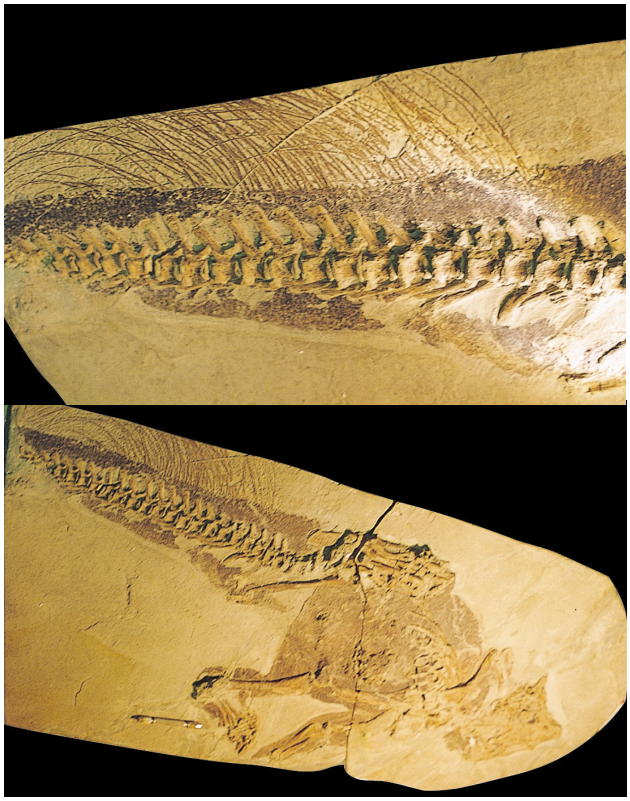


FIGURE 13. A skeleton of *Psittacosaurus* (horned dinosaur) with extraordinarily preserved integument.

Yixian Formation, western Liaoning, China, and it is highly possible that the fossil was smuggled.

From the 25th February to 5th March 2000, I visited Italy and had an opportunity to see this specimen. It was a nearly complete skeleton, about a 1.2 m-long adult animal, on a shale slab, lacking a distal part of the tail. It can be referred to *Psittacosaurus* cf. *P. mongoliensis* based on features of skull and teeth. It has a special feature on the tail, with 78–82 long bristle-like integumentary structures along the dorsal margin of the tail. They range in length from 20 mm to 38 mm. The longest one is on the base of the tail. These structures differ from downy plumage (integumentary filaments) of *Sinosauropteryx* and feathers of *Caudipteryx*. Perhaps these stuctures are bony tendons. They overlaid the vertebrae of the tail. These bony tendons were dislocated to make up this structures, which see probably in some small ornithopods and iguanodontids. (Norman and Weishampel, 1990). We negotiated to repatriate the specimen to China. Since it was sold to Frankfurt it was described in Naturwissenschaften Vol.89 no.8 (Mayr et al., 2002).

SUMMARY

More than 119 species of Chinese dinosaurs have been reported. About a half of them are known from nearly complete and articulated skeletons, which have greatly increased our knowledge of comparative anatomy and taxonomy of dinosaurs. The discoveries of Liaoning feathered dinosaurs are especially important for providing evidence for the presence of the feather-like integumentary coverings in non-avian theropods. These materials would be greatly helpful for understanding the close relationships between dinosaurs and birds.

REFERENCES

Bakker, T. R. 1986. The dinosaur heresies. Williiam Morrow and Company, INC, New York.

Buffetaut, E. 2001. Tantalizing glimpse of a vanishing dinosaur. Nature 414: 147.

Buffetaut, E., and V. Suteethorn. 1992. A new species of the ornithischian dinosaur *Psittacosaurus* from the Early Cretaceous of Thailand. Palaeontology 35: 801–812.

Chang, M. M. (= Zhan, M.), P.-J. Chen, Y.-Q. Wang and Y. Wang. 2001. Jehol biota. Shanghai Science and Technology, Shanghai. 143pp.

Chen, P.-J., S. X. Wen, Z. Y. Zhou, B. X. Li, Q. B. Lin. 1980. Studies on the late Mesozoic continental formations of western Liaoning. Institute of Geology and Paleontology, Academia Sinica, Bulletin 1: 2–25.

Chen, P.-J., Z. Dong and S.-N. Zhen. 1998. An exceptional well-preserved theropod dinosaur from the Yixian Formation of China. Nature 391: 147–152.

Dalton, R. 2001. Wandering Chinese fossil turns up at museum. Nature 414: 571.

Dong, Z. 1992. Dinosaurian Faunas of China. Springer-Verlag, Berlin. 188p.

Dong, Z. 1997a. A small Ornithopod from Mazongshan area, Gansu Province China; pp. 24–26 *in* Z. Dong (ed.), Sino–Japanese Silk Road Dinosaur Expedition. China Ocean Press, Beijing.

Dong, Z. 1997b. Vertebrates of the Turpan Basin, the Xinjiang Uygur Autonomous Region China; pp. 96–101 *in* Z. Dong (ed.), Sino–Japanese Silk Road Dinosaur Expedition. China Ocean Press, Beijing.

Dong, Z. 1997c. A gigantic sauropod (*Hudiesaurus sinojapanorum* gen. et sp. nov.) from the Turpan Basin, China; pp. 24–26 *in* Z. Dong (ed.), Sino–Japanese Silk Road Dinosaur Expedition. China Ocean Press, Beijing.

Dong, Z. 1997d. Hunting dinosaurs in China; pp. 259–264 *in* D. L. Wolberg, E. Stump and G. D. Rosenberg (eds.), Dinofest International Proceedings of a Symposium, Arizona State University, Academy of Natural Sciences.

Dong Z. 2002. Dinosaurs and birds. Liaoning Science and Technology Press, 99p.

Dong, Z., and Y. Azuma. 1997. On a primitive neoceratopsian from the Early Cretaceous of China; pp. 68–89 *in* Z. Dong (ed.), Sino–Japanese Silk Road Dinosaur Expedition. China Ocean Press, Beijing.

Dong, Z., and H. Yu. 1997. A new segnosaur from Mazongshan area, Gansu Province, China; pp. 90–95 *in* Z. Dong (ed.), Sino–Japanese Silk Road Dinosaur Expedition. China Ocean Press, Beijing.

Fang X., L. Lu, Z. Cheng, Y. Zou, Q. Pang, T. Wang, K. Chen, Z. You, X. Wang J. Liu H. Xie and Y. Jin. 1998. On the Cretaceous fossil eggs of Xixia County, Henan Province. Geological Publishing House, Beijing. 125p.

Godefroit P, Z. Dong, P. Bultynck, L. Hong and F. Lu 1998. New *Bactrosaurus* (Dinosauria: Hadrosauroidea) material from Iren Dabasu (Inner Mongolia, P. R. China); pp. 1–56 *in* P. Bultynck and A. V. Dhondt (eds.), The Sino–Belgian Dinosaur Expedition in Inner Mongolia. Bulletin de l'Institut Royal des Sciences Naturelles de Belgique Vol. 68 Supplement, Brussel.

Godefroit P., X. P. Suberbiola, L. Hong and Z. Dong. 1999. A new species of the ankylosaurid dinosaur Pinacosaurus from the Late Cretaceous of Inner Mongolia (P. R. China); pp. 17–36 *in* P. Bultynck and A. V. Dhondt (eds.), The Sino–Belgian Dinosaur Expedition in Inner Mongolia. Bulletin de l'Institut Royal des Sciences Naturelles de Belgique Vol. 69 Supplement, Brussel.

Hou, L. H., Z. H. Zhou, L. D. Martin and A. Feduccia. 1995. A beaked bird from the Jurassic of China. Nature 377: 616–618.

Ji, Qiang, P. J. Currie, M. A. Norell and Shu-an Ji. 1998. Two feathered dinosaurs from northeastern China. Nature 393: 753–761.

Ji, Q., and S.-A. Ji. 1996. On discovery of the earliest bird fossil in China and the origin of birds. Chinese Geology 233: 30–33.

Ji, Q., and S.-A. Ji. 1997. Protarchaeopterygid bird (*Protarchaeopteryx* gen. nov.) — fossil remains of archaeopterygids from China. Chinese Geology 238: 38–41.

Ji, S., and Q. Ji. 1997. Discovery of a new pterosaur in western Liaoning, China Acta Geologica Sinica 71 (1): 1–6.

Ji, S., and Q. Ji. 1998. A new fossil pterosaur (Rhamphorhynchoidea) from Liaoning. Jiangsu Geology 22 (4): 1999–206.

Ji, S., Q. Ji and K. Padian. 1999. Biostratigraphy of new pterosaurs from China. Nature 398: 573–574.

Kobayashi Y., and J. Lu., in press. A new ornithomimid dinosaur with gregarious habits from the Late Cretaceous of China. Acta Palaeontologica Polonica.

Kobayashi Y., J. Lu, Z. Dong, R. Barsbold, Y. Azuma and Y. Tomida. 1999. Herbivorous diet in an ornithomimid dinosaur. Nature 402: 480–481.

Lu, J. 1997. A new Iguanodontidae (*Probactorosaurus mazongshanensis* sp. nov.) from Mazongshan area Gansu Province China; pp. 27–47 *in* Z. Dong (ed.), Sino–Japanese Silk Road Dinosaur Expedition. China Ocean Press, Beijing.

Lu, J. 2002. A New Oviraptorosaurid (Theropod: Oviraptorosauria) from the Late Cretaceous of southern China. Journal of Vertebrate Paleontology 22 (4): 871–875.

Lu, J., Z. Dong, Y. Azuma, R. Barsbold and Y. Tomida. 2002. Oviraptorosaurs compared to birds; pp. 175–189 *in* Z. Zhou and F. Zhang (eds.), Proceeding of the 5th Symposium of the Society of Avian Paleontology and Evolution.

Luo Z. 1999. A refugium for relicts. Nature 400: 23–25.

Mayr, Gerald, D. S. Peters, G. Plodowski and O. Vogel. 2002. Bristle-like integumentary structures at the tail of the horned dinosaur *Psittacosaurus*. Naturwissenschaften 89 (8): 361–365.

Maryanska, T, H. Osmolska and M. Wolsan 2002. Avialan status for Oviraptorosauria. Acta Palaeontologica Polonica 47 (1): 97–116.

Norman, D. B., and D. B. Weishampel. 1990. Iguanodontidae and related ornithopods; pp. 510–533 *in* D. B. Weishampel, P. Dodson and H. Osmolaska (eds.), The Dinosaurs, University of California Press, Berkeley.

Palm, S. 1996. Flight and Evolution of the Birds. MS. 1–86, Copenhagen, Denmark.

Russel, D. A. 1993. The role of Asia in dinosaurian biogeography. Canadian Journal of Earth Science 30: 2002–2012.

Sereno, P. C., Z. Cheng and C. Rao. 1988. *Psittacosaurus meileyingensis* (Ornithischia: Ceratopsia), a new psittacosaur from the Lower Cretaceous of northeastern China. Journal of Vertebrate Paleontology 14: 366–377.

Sereno, P. C., and C. G. Roa. 1992. Early evolution of avian flight and perching: new evidence from the Lower Cretaceous of China. Science 255: 845–848.

Smith, P. E., N. M. Evenson, D. York, M. Chang, F. Jin, J. Li, S. Cumbaa and D. Russell. 1995. Date and rates in ancient lakes: Ar^{40}-Ar^{39} evidence for an Early Cretaceous age for the Jehol group, northeast China. Canadian Journal of Earth Science 32: 1426–1431.

Swisher, C. C., Y.-Q. Wang, X.-L. Wang, X. Xin and Y. Wang. 1999. Cretaceous age for the feathered dinosaurs of Liaoning, China. Nature 400: 58–61.

Unwin, D. M., J. Lu and N. N. Bakhurina. 2000. On the systematic and strtigraphic significance of pterosaurs from the Lower Cretaceous Yixian Formation (Jehol Group) of Liaoning, China. Mitteilungen Museum fur Naturkunde Berlin, Geowissenschaftlichen Reihe 3: 181–206.

Wang, X., and J. C. Lu. 2001. Discovery of a pterodactylid pterosaur from the Yixian Formation of western Liaoning, China. Chinese Science Bulletin 46 (13): 1112.

Wang, X., Z. Zhou, F. Zhang and X. Xu. 2002. A nearly complete articulated rhamphorhynchoid pterosaur with exceptionally well-preserved wing membranes and hairs from Inner Mongolia, northeast China. Chinese Science Bulletin 47 (3): 226–230.

Xu, X. 1997. A new psittacosaur (*Psittacosaurus mazongshanensis* sp. nov.) from Mazongshan area Gansu Province China; pp. 48–67 *in* Z. Dong (ed.), Sino–Japanese Silk Road Dinosaur Expedition. China Ocean Press, Beijing.

Xu, X., M. A. Norell, X. L. Wang, P. J. Makovicky and X.-C. Wu. 2002. A basal troodontid from the Early Cretaceous of China. Nature 415: 780–784.

Xu, X., Z. L. Tan, and X. L. Wang. 1999a. A therizinosaurid dinosaur with integumentary structures from China. Nature 399: 350–354.

Xu, X., X. L. Wang and X. C. Wu. 1999b. A dromaeosaurid dinosaur with a filamentous integument from Yixian Formation of China. Nature 401: 262–266.

Xu, X., Z. H. Zhou and X. L. Wang. 2000. The smallest known non-avian theropod dinosaur. Nature 408: 705–708.

Xu, X., Z. H. Zhou and R. O. Prum. 2001. Branched integumental structures in *Sinornithosaurus* and the origin of feathers. Nature 410: 200–204.

Young, C. C. 1948. On two new saurisuchians from Lufeng, Yunnnan. Bulletin of the Geological Society of China 28: 75–90.

Zhou, Z., P. M. Barrett and J. Hilton. 2003. An exceptionally preserved Lower Cretaceous ecosystem. Nature 421: 807–814.