The Sino/Canadian Dinosaur

IT TOOK FOUR FIELD SEASONS TO COMPLETELY EXCAVATE THIS SAUROPOD DINOSAUR FROM THE SHISHUGOU FORMATION OF SINJIANG. THE LONGEST VERTEBRA WAS 1.5 METERS, AND THE RIBS WERE MORE THAN THREE METERS LONG.

Royal Tyrrell Museum

Expeditions 1986-1990

It has long been known that most families of dinosaurs from the Upper Cretaceous have representatives in both Asia and North America. However, during Middle Jurassic to Early Cretaceous times, there was a barrier to faunal movements between the northern continents. Until recently, direct comparison between the animals has been difficult for political reasons. Furthermore, information on the paleoenvironments of central Asia has been scanty, and it was not known if apparent faunal differences were due to the environment.

The expeditions of the Dinosaur Project (China/Canada/Alberta/Ex Terra), better known as the Canada/China Dinosaur Project, were undertaken by the Institute of Vertebrate Paleontology and Paleoanthropology (Beijing), the Canadian Museum of Nature (Ottawa) and the Royal Tyrrell Museum of Palaeontology (Drumheller) to specifically compare the dinosaur faunas, and their environments, of Asia and North America. The Chinese Academy of Sciences, the governments of Alberta and Canada, and the Ex Terra Foundation of Edmonton, who also took an active role in expedition logistics, sponsored the work. The scientific coordinators were the dinosaur experts — Dong Zhiming (IVPP), Dale Russell (CMN) and Philip Currie (RTMP). Other Canadian and Chinese paleontologists and geologists were included to form a well-balanced, multidisciplinary team, and included specialists in palynology, invertebrates, turtles, lizards, crocodiles, birds, mammals, dinosaur footprints and sedimentology. Expeditions were sent to sites in northern China (Xinjiang and Inner Mongolia), to the Canadian arctic islands, and to Alberta.

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Twelve juvenile ankylosaur skeletons were found at Bayan Mandahu. The skeletons of three ankylosaurs were nearly complete, each 1.5 meters long, with their skulls to the left, tails to the right.

Middle, Upper Jurassic.

In 1987, researchers concentrated on the Middle and Late Jurassic beds of the Junggar Basin in northwestern China (Xinjiang). The expedition resulted in large, spectacular specimens including a sauropod with cervical vertebrae almost five feet long, and a well-preserved new species of large theropod—distinctly related to Allosaurus. Unfortunately, the rock is very hard and it took four field seasons to excavate the sauropod. Its skull was recovered finally in 1990. Several "fossil forests" were found in Xinjiang, along with numerous specimens of turtles, crocodiles and small herbivorous dinosaurs.

Lower Cretaceous.

A great deal of effort was spent at Lower Cretaceous localities in China and Canada to determine when intercontinental faunal exchanges began. The Tugulu Group in Xinjiang produced abundant remains of pterosaurs, turtles, crocodiles, and small dinosaurs characteristic of the Asian Psittacosaurus/pterosaur fauna. In Inner Mongolia, the Ordos Basin has strata of similar age. Field parties collected many specimens of Psittacosaurus, complete champsosaur skeletons, and a new species of stegosaur. An unusual turtle was found with wing-like processes extending from the shell. The most remarkable find was an almost complete skeleton of a troodontid theropod, curled up as though it had died in its sleep. This new genus and species is the most complete specimen ever found of this enigmatic type of small, carnivorous dinosaur. Scientists visited lower Cretaceous dinosaur footprint sites in this region in 1987 and 1990.

In western Canada, early Cretaceous dinosaurs are represented mostly by their footprints. A new footprint locality near Grande Cache is close in age to the Chinese sites in the Ordos, and the footprints are similar. This is particularly true of some unusual theropod tracks (Buckeburgichnus) that always have four-toe impressions rather than three. But, very different animals can make footprints that are very similar, so little can be said about faunal interchange.

In 1988, a Dinosaur Project group worked in the Alashan Desert of Inner Mongolia in the Lower Cretaceous Bayan Gobi Formation. Vertebrates recovered included psittacosaurs, sauropods and champsosaurs. One of the more unusual finds was a new type of segnosaurian dinosaur. Segnosaurs were unknown until recently, and the systematic position of these dinosaurs is not clear.

An attempt to find arctic dinosaurs in the Lower Cretaceous Isachson Formation on Axel Heiberg Island was unsuccessful in 1986, although the recovery of other fossils helped define the depositional environment.

Late Cretaceous.

The first central Asian dinosaurs were found near Erenhot in 1922. The area has changed very little, and it was relatively easy to identify the major collecting areas of previous expeditions. The dinosaurs show more similarities to the dinosaurs of Alberta than they do to the dinosaurs of other central Asian sites due to environmental similarities. Both hadrosaurine and lambeosaurine hadrosaurs were found, along with a surprising abundance of ornithomimids. Two species of large carnivores and several small theropods were represented by isolated bones and teeth. A skeleton of the tyrannosaurid Alectrosaurus was collected in 1990. Sauropod remains were found in bone beds dominated by hadrosaurs. Two or three genera of segnosaurids were common. Nests of dinosaur eggs were collected, and a nesting site with five nests (each with a dozen eggs) was identified during the last expedition.

The work in Alberta focused on Dinosaur Provincial Park, where five Chinese colleagues joined staff members of the Tyrrell Museum in looking for and excavating dinosaurs and associated animals. The most significant specimen collected was a well-preserved braincase of Troodon, which provides information on the transition between dinosaurs and birds. A well-preserved skull of a horned dinosaur, Centrosaurus, was another prize. Dong Zhiming also had occasion to visit the Tyrrell Museum's Pachyrhinosaurus quarry near Grande Prairie in 1986 and 1989.

Study of the Upper Cretaceous beds on Ellesmere Island failed to reveal dinosaurs in 1986. Geologists from Memorial University found the first dinosaur bones on Canada's arctic islands the following year. The Canadian Museum of Nature subsequently sent an expedition to Bylot Island in 1988, which proved successful enough for another Sino/Canadian arctic expedition in 1989. This one recovered dinosaur and bird bones from Bylot Island, and possible fragments of dinosaur bones from Ellesmere Island.

The 1988 and 1990 expeditions put their greatest efforts into Bayan Mandahu, where extensive Upper Creta-

ceous exposures are equivalent to the Djadokhta Formation of Mongolia. Protoceratops is the most common dinosaur, and everything from eggs to an adult with a skull one-meter long were found. One site revealed a cluster of five parallel skeletons of Protoceratops in the side of a "fossilized" dune. The animals may have been buried in a sandstorm, which occurs often in the region even today.

Another excavation eventually revealed twelve juvenile skeletons (each skeleton is 1.5 meters long) of Pinacosaurus in a group. As most of them were lying parallel to each other, they probably died of suffocation when they were buried by shifting sands in a wind storm. Like the Protoceratops site, the evidence suggests that Pinacosaurus was a gregarious dinosaur. The baby ankylosaurs have some armor on the skull and two bands of armor plates on the neck. However, the rest of the body seems to have been unprotected, and there is no sign of a tail club. At yet another site, embryonic remains of this dinosaur were collected in 1990.

Bayan Mandahu represents an ancient desert, so direct comparisons could be made between the sedimentary features of the modern and ancient deserts. The dry nature of the paleoenvironment also is demonstrated by the low diversity but high number of dinosaurs, and by the nature of the trace fossils. The difference seen in the faunas of this ancient desert and the coastal lowlands of the Cretaceous of Alberta are therefore easily understood. The comparison will be pursued in the future by more work at North American sites representing drier Cretaceous paleoenvironments.

The expeditions of the Dinosaur Project were large multidisciplinary, multinational teams that were extremely successful in collecting specimens and data. Within the five years of the expeditions, more than 60 tons of specimens were shipped from the field in China alone. The collaborative research will continue for years. The scientific results will be published in special issues of the Canadian Journal of Earth Sciences, beginning in 1992. And some of the better specimens will travel around the world as part of a major exhibition being put together by the Ex Terra Foundation.

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The Dinosaur Project searched several sites in northern China and North America to compare the dinosaurs from the Upper Cretaceous.