REPORT

Dinosaurs of China: feathery fossils in Nottingham

In the summer of 2017, Nottingham hosted the world exclusive exhibition 'Dinosaurs of China: Ground Shakers to Feathered Flyers', the first of its kind in Britain. The exhibition included fossils and casts of Chinese dinosaurs including the real type specimens of feathered dinosaurs, and also the tallest dinosaur skeleton ever displayed in the country. This was the first time many of the specimens were displayed outside Asia, providing visitors with a unique opportunity to explore the scientific evidence that connects large, ground-shaking dinosaurs to modern birds.

The last few decades have seen dramatic developments in Chinese palaeontology. Spectacular discoveries have drastically changed our understanding of dinosaur appearance, evolution and behaviour. Most of the dinosaurs in the exhibition were discovered and excavated in the last 30 years. Many Chinese deposits, such as those of the Yixian Formation of Liaoning Province, consist of fine sediments that buried the dinosaurs quickly and preserved their anatomy – including soft parts – in incredible detail. The deposits are also just the right age to preserve key events in dinosaur evolution.

Dinosaurs of China was the outcome of a partnership between the University of Nottingham and Nottingham City Council with the Institute of Vertebrate Paleontology and Paleoanthropology in Beijing and the Longhao Institute of Geology and Paleontology in Inner Mongolia. In 2006, the University of Nottingham became the first British university to establish a campus in Ningbo, which is now Nottingham's sister city in China.

The Institute in Beijing is part of the Chinese Academy of Sciences, and is one of the world's leading dinosaur research centres, dating back to 1929. Its scientists have discovered, described and named hundreds of new prehistoric species, and most of the 25 exhibition specimens were loaned by the Beijing Institute.

The Longhao Institute is the only private site in China that focusses on palaeontology and geology. It was established in 1996 and its scientists have named more than ten new dinosaur species, including the world-renowned *Gigantoraptor* – the largest bird-like dinosaur ever found.

The exhibition at Nottingham's Wollaton Hall was planned, written, curated and designed between 2015 and 2017, and was seen by 115,000 visitors during the four months of July to October, 2017. A third of its specimens were original fossils, another third were casts of flat fossils, and the final third were casts of mounted skeletons.

A cast of a predatory Sinraptor *sneaks up behind a taller cast of an unsuspecting* Mamenchisaurus, *both present inside the Great Hall of Wollaton Hall for the exhibition of fossil dinosaurs in China (photo: Nottingham City Museums).*

Real fossil specimen of Sinosauropteryx *with proto-feathers preserved (photo: IVPP, Beijing).*

Holotype specimen of Caudipteryx dongi*, with its bird-like feathers preserved (photo: IVPP).*

Ground shakers

The first gallery was located in the cavernous Great Hall of Wollaton Hall, and contained all of the 'ground shaker' exhibits. An immense *Mamenchisaurus* dominated the centre of the space, leaning back onto its strong hind limbs and tail, with its front limbs and neck raised up. This rearing posture made the skeleton 13.7 metres tall. Below the cast, a *Mamenchisaurus* femur provided an opportunity for visitors to touch and compare their height to a real fossil dinosaur bone.

This was a Jurassic hall with skeletons of all kinds of large, scaly species that fit a traditional view of dinosaurs. It contained other typical plant-eating ground shakers, including one of the earliest large dinosaurs from China (*Lufengosaurus*) and two armoured dinosaurs (*Pinacosaurus* and *Protoceratops*). Sneaking up on the *Mamenchisaurus* was one of the largest predatory dinosaurs from China (*Sinraptor*). In addition to the ground shakers, this gallery also highlighted the similarities between the bones of dinosaurs and birds.

Dinosaurs behaved like birds

After observing the similarities between the skeletons of dinosaurs and birds, visitors went into the Bird Room (with its permanent gallery of taxidermy bird dioramas), where three Chinese dinosaurs were displayed to provide evidence for their bird-like behaviour. A real dinosaur egg fossil and an *Oviraptor* skeleton cast were used to tell the story of dinosaur nesting behaviour. Also displayed here was a 3D-printed replica of a tiny *Mei long* skeleton, preserved coiled up into a bird-like sleeping pose with its head tucked under its arm. This room also represented a move forward into Cretaceous times.

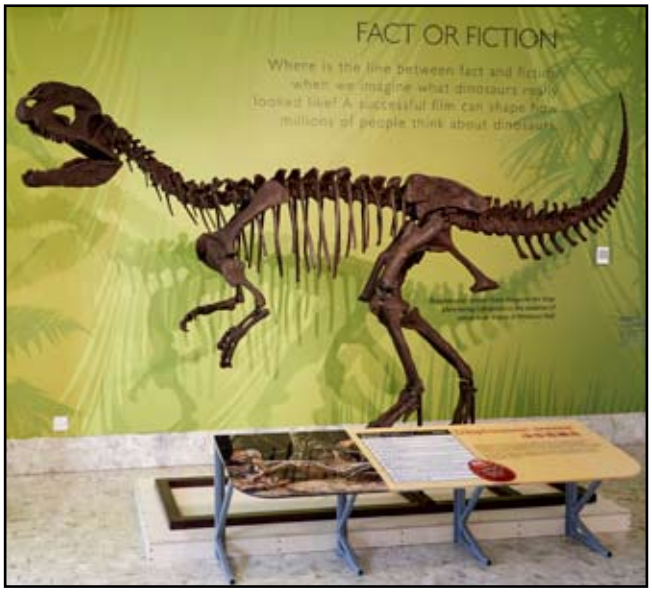
The real holotype specimen of the flying dinosaur Microraptor gui*, with wing feathers that are preserved (photo: IVPP).*

After seeing evidence for bird-like dinosaur bones and behaviour, visitors climbed the grand staircase to the first floor, with its display of precious fossils of feathered dinosaurs discovered in China. This material included two real type specimens of the feathered dinosaurs, *Microraptor gui* and *Caudipteryx dongi*. Another important real fossil was *Sinosauropteryx*, a referred specimen of the first feathered dinosaur species ever described by palaeontologists in 1996. This trio of real specimens, all from the Cretaceous Jehol biota of Liaoning Province, provided examples of three key categories of feathered dinosaurs: *Sinosauropteryx* had fuzzy feather-like integument ('protofeathers'), *Caudipteryx* had bird-like feathers but was flightless, whereas *Microraptor gui* had wing feathers and could fly. A key specimen among the ten feathered dinosaur species in this gallery was a mounted cast of the 8-m-long *Gigantoraptor* from Inner Mongolia, the largest bird-like dinosaur in the world. Wollaton Hall became the first site where this species had been displayed in a public museum.

Feathered flyers

A fourth gallery of Chinese specimens was set up on a balcony overlooking the ground shakers in the Great Hall; specimens of Cretaceous birds were displayed to complete the evolutionary picture. This section celebrated the capability of flight, including specimens of early birds (*Protopteryx, Confuciusornis*), a bizarre flying dinosaur (*Yi qi*) and pterosaurs (*Wukongopterus)*. From this high vantage point visitors again encountered the gigantic *Mamenchisaurus* to reinforce the message of the exhibition: "*Mamenchisaurus* rises up to meet her modern relatives – the birds!"

The permanent Africa Gallery was used to pose the question "What happened next?". African animals are creatures that could only evolve into niches left vacant following the extinction of the ground-shaking dinosaurs. The Gallery's waterhole diorama contains some modern dinosaurs – ostriches and crowned cranes – as a fitting end to the Dinosaurs of China exhibition.



Cast of a skeleton of 'Dilophosaurus sinensis' *(*=Sinosaurus triassicus*) on display in Nottingham University's Lakeside Arts' Angear Gallery (photo: University of Nottingham).*

Lakeside Arts

A satellite exhibition at Lakeside Arts focused on palaeoart – the science of bringing dinosaurs to life in art. Depictions of dinosaurs have changed over the decades, and Chinese feathered dinosaurs have influenced modern palaeoartists. Two dinosaurs were displayed here because of their connection to this topic: a specimen of *'Dilophosaurus sinensis'* (=*Sinosaurus*) because it is a star of Jurassic Park, and an *Alxasaurus* because it represents a key group of feathered dinosaurs.

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