

# Angela Milner (1947–2021)

Far-sighted palaeontologist who guided the Dinosaur Gallery at London's Natural History Museum, with interests in dinosaurs, early tetrapods and palaeoneurology.

Some palaeontologists work predominantly with information available from specimens already held in the drawers of museums, others like to go out and actively collect new fossils and seek new fossil-bearing deposits. Angela Milner, who died in August 2021, spanned the extremes of this spectrum. She arrived at the Natural History Museum, London, in 1976, becoming responsible for existing fossil amphibian, reptile and bird collections. However, her fieldwork also ranged from the Cretaceous rocks of hot and arid Niger in 1989, to the rather cooler and wetter early Carboniferous strata at East Kirkton Quarry near Bathgate in Scotland between 1987 and 1994. She was also among the very first western palaeontologists to be allowed to visit post-Maoist China in 1982.

Angela had not even intended to become a palaeontologist when she read zoology at the University of Newcastle upon Tyne, and only gained enthusiasm for the field after attending lectures by the vertebrate palaeontologist Alec Panchen. Thereafter, with her husband Andrew Milner and the late Jenny Clack, she became part of the 'Panchen School' of early tetrapod research, which boomed during the latter part of the twentieth century.

Early tetrapods are often thought of as all having had a rather similar salamander-like appearance, yet many clades evolved spectacular ecomorphologies during the Carboniferous. Angela's PhD research was into one such group, the nectrideans, some of which, such as *Diplocaulus*, had bizarre protrusions at the rear of their skull that gave their heads an arrowhead-shape. Angela often wore a brooch crafted to resemble such a skull. Other early tetrapod clades that Angela worked on include the oldest-known limbless land animals, the aïstopods, and a mostly aquatic group called baphetoids. Her work on the systematics of these early tetrapod clades has greatly helped to resolve the internal relationships of these groups.

As important as Angela's contribution to the field of early tetrapod research has been, she was probably better known for her work on theropod dinosaurs. A high point was her excavation of the spinosaur *Baryonyx walkeri* in Surrey, England, with



Angela Milner, holding a *Spinosaurus* jaw bone from the Natural History Museum, London. Credit: Natural History Museum, London / Science Photo Library

colleague Alan Charig. *Baryonyx* turned out to be a very unusual theropod, with large hand claws and a crocodile-like snout. Their discovery of dense fish scales in the gut region of *Baryonyx* showed for the first time that not all theropods ate other dinosaurs, and the description of *Baryonyx* (*Nature* 324, 359–361; 1986), cemented Angela's profile as a dinosaur researcher. Her other work on dinosaurs included studies of additional spinosaurs, a redescription of the early tyrannosauroid *Proceratosaurus*, studies of ornithopods and dinosaur palaeobiogeography. Her wide interests across theropods shaped the immensely popular Dinosaur Gallery at the Natural History Museum, which she ensured would showcase advances in our understanding of dinosaur biomechanics, physiology, reproduction and their relationship to living birds. Her place in the history of British theropod dinosaur research is honoured this month in the naming of a new theropod dinosaur from Wales, *Pendraig milnerae*.

Although Angela regarded her research as having two main strands, theropods and early tetrapods, palaeoneurology was arguably a third. Angela investigated brain

form in pterosaurs in the early 1990s and was quick to understand the potential of industrial X-ray micro-computed tomography (micro-CT) scanning as a tool to investigate osteological correlates of soft-tissue neurosensory structures that can also be recognized in fossil material. At that time, scanning equipment capable of achieving micrometre-scale resolution was rare in academic settings, and Angela had to travel to Texas, USA in 2003 to scan the 'London specimen' of *Archaeopteryx* and two Eocene seabirds. The results of this CT analysis (*Nature* 430, 666–669; 2004) showed that *Archaeopteryx* possessed a brain that was rather more bird-like than reptile-like.

Today, X-ray micro-CT facilities are widespread in academic settings, and CT analysis has become as routine an approach for visualizing the structure of objects as reflected light microscopy in the nineteenth century. Angela realized that a research institution like the Natural History Museum could not afford to be without a micro-CT scanner of its own, and drove a strategy to buy one. The museum now has two cabinet scanners, which are used for CT analysis by museum staff and external researchers. This legacy is very much a result of Angela's drive and vision for the museum.

Her success in procuring such an expensive piece of equipment highlights one important, but easily overlooked aspect of Angela's career: she was an exceptionally well organized and effective administrator, leading to her successive appointments as head of fossil amphibians, reptiles and birds section; head of fossil vertebrates and anthropology division, and associate keeper of palaeontology. Her dry wit and calm patience, coupled with that managerial effectiveness, would have made her a remarkable keeper of the department of palaeontology. When I was employed as a research assistant shared by her and Keeper Norman MacLeod, she told me she expected I would end up having to play her and Norman off against each other. I think she would have shrewdly spotted any attempts to do that if I had tried.

Angela retired in 2009, free finally to pursue research projects that her management roles had kept her from. Both Angela and Andrew enjoyed travel

and live orchestral music, activities that were unfortunately halted by the COVID-19 pandemic. They also enjoyed bird watching and visits to nature reserves together, and Angela had a particular fondness for the fens of East Anglia. She is survived by Andrew, one of the

last remaining students of the esteemed Panchen School.

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**Additional information**

S.W. first met Angela Milner at conferences in 1997. In 2003 he became a research assistant and postdoctoral researcher with her, and later a tomographer at the micro-CT lab she helped to create.