Many prehistoric animals have very long necks, but it is not always obvious why. A long neck may help reach leaves upon tall trees, but what use is a long neck that can't be raised up high? And what about long necks in marine animals?

Adam Stuart Smith and Nizar Ibrahim explain how even palaeontologists do not yet know all the answers to these questions

Prehistoric animals - stick

A long neck might seem a bad idea – the neck is a vulnerable part of the anatomy. It links the head to the body via vital blood vessels and various tubes for food, air, and nervous tissue.

For this to be exposed to the jaws of a predator is dangerous. An efficient blood circulation system is also required to provide the brain with oxygen. Giraffes even have a complex system of 'flaps' to prevent the blood from flowing back down the neck before reaching the head!

Long necks evolve through two processes: an increase in the length of the vertebrae (individual neck bones), and/or an increase in the number of vertebrae. The fact that so many different animal types have evolved a long neck tells us that there must be benefits. So what are they?

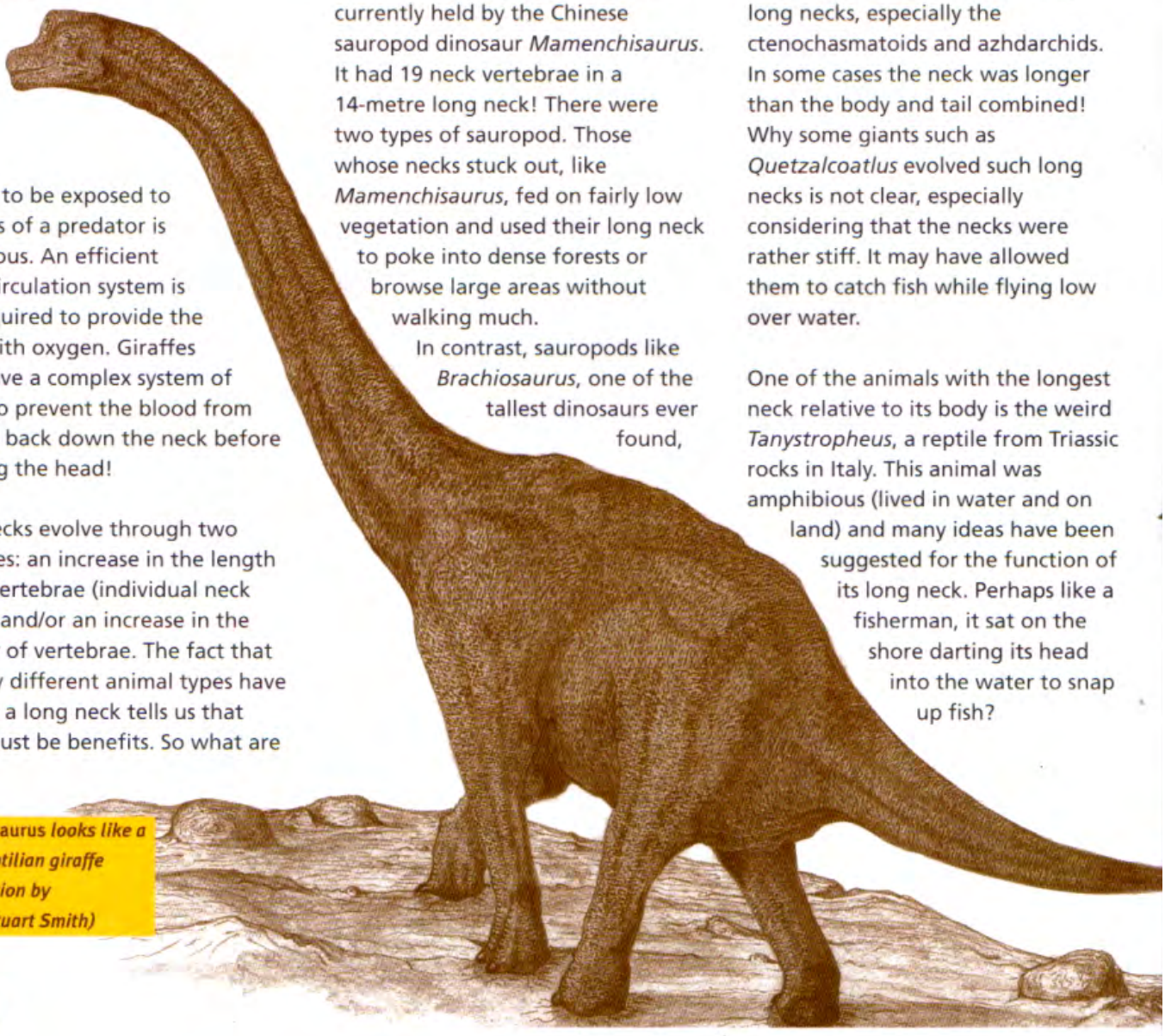
Long necks are generally related to feeding habits, but palaeontologists still don't know exactly why some creatures went to such extremes!

The record for the longest neck is currently held by the Chinese sauropod dinosaur *Mamenchisaurus*. It had 19 neck vertebrae in a 14-metre long neck! There were two types of sauropod. Those whose necks stuck out, like *Mamenchisaurus*, fed on fairly low vegetation and used their long neck to poke into dense forests or browse large areas without walking much.

In contrast, sauropods like *Brachiosaurus*, one of the tallest dinosaurs ever found, held their necks upright. They probably sought food at the tops of towering trees.

Some pterosaurs, the flying reptiles of the Mesozoic period, had very long necks, especially the ctenochasmatoids and azhdarchids. In some cases the neck was longer than the body and tail combined! Why some giants such as *Quetzalcoatlus* evolved such long necks is not clear, especially considering that the necks were rather stiff. It may have allowed them to catch fish while flying low over water.

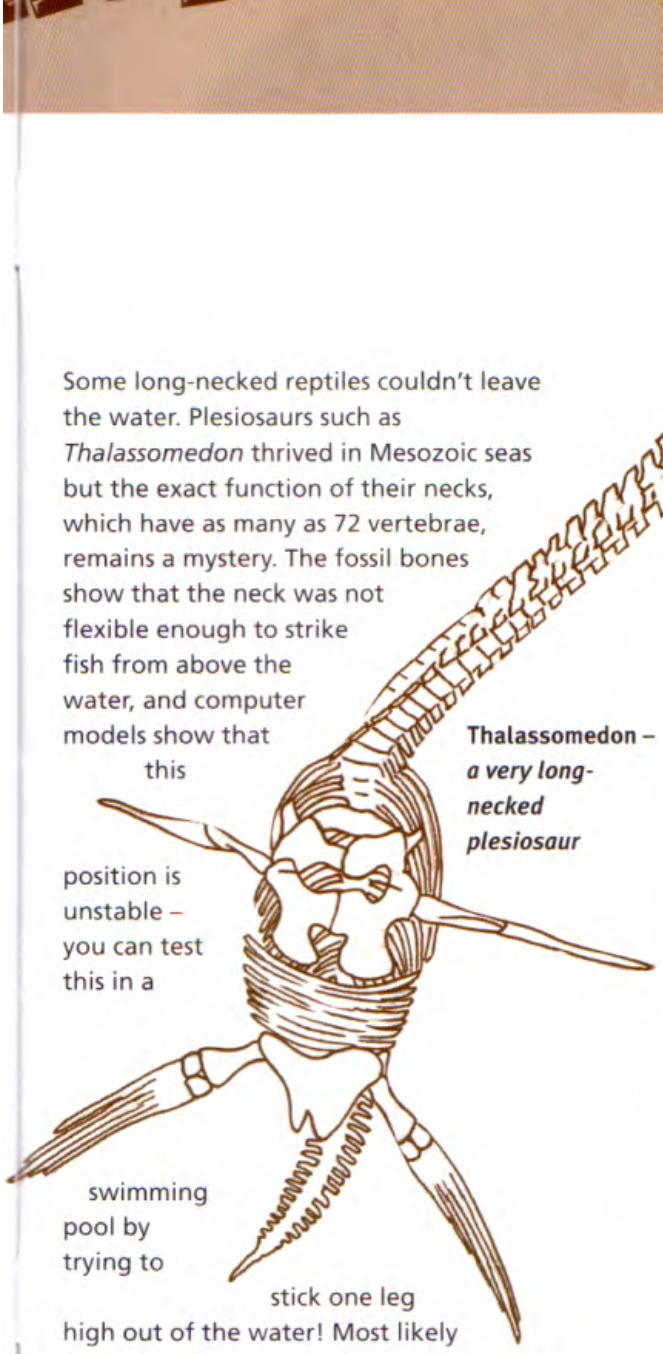
One of the animals with the longest neck relative to its body is the weird *Tanystropheus*, a reptile from Triassic rocks in Italy. This animal was amphibious (lived in water and on land) and many ideas have been suggested for the function of its long neck. Perhaps like a fisherman, it sat on the shore darting its head into the water to snap up fish?



Brachiosaurus *looks like a giant reptilian giraffe (illustration by Adam Stuart Smith)*

ing their necks out

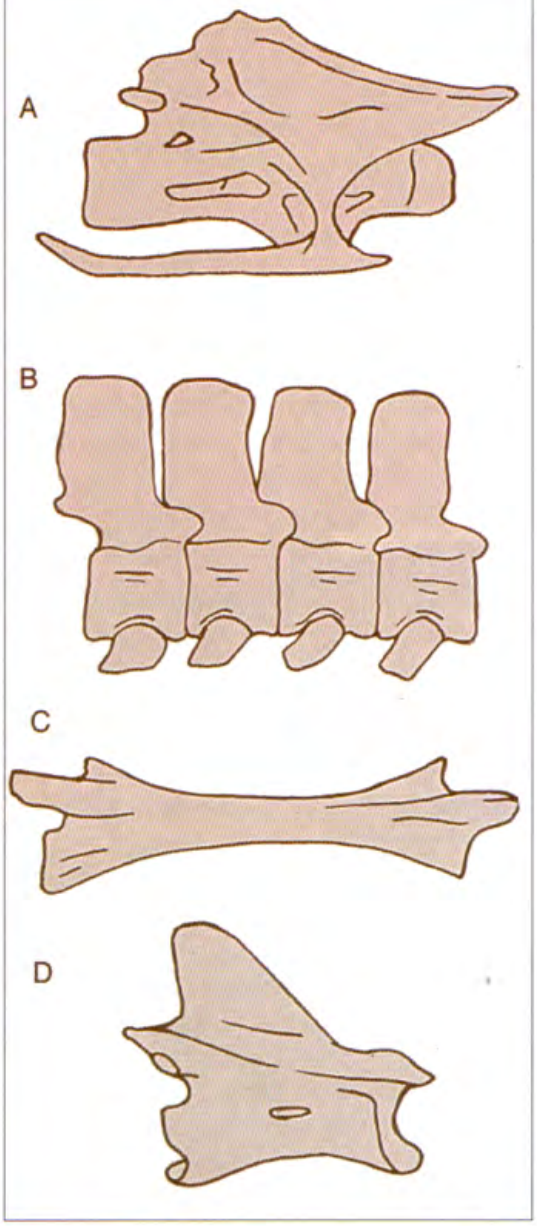
Some long-necked reptiles couldn't leave the water. Plesiosaurs such as *Thalassomedon* thrived in Mesozoic seas but the exact function of their necks, which have as many as 72 vertebrae, remains a mystery. The fossil bones show that the neck was not flexible enough to strike fish from above the water, and computer models show that this position is unstable – you can test this in a swimming pool by trying to stick one leg high out of the water! Most likely the long neck was used to trick fish – the small head could have approached a school of fish without them noticing the large body. Or perhaps the long neck reached down to allow the animal to eat seashells and other creatures on the seabed?



Thalassomedon – *a very long-necked plesiosaur*

Can you think of any other long-necked animals? Maybe you can also think of other possible functions for a long neck?

Side views of fossil neck vertebrae from long-necked prehistoric animals.



A. sauropod dinosaur;

B. plesiosaur (four articulated vertebrae);

C. *Tanystropheus*;

D. pterosaur. All the vertebrae face to the right.