

# Fossil shows how the jaw became the ear

THE bones of your middle ear were once part of a mammalian ancestor's jaw. Now a remarkable Cretaceous fossil provides a snapshot of how this shift took place.

The lower jaws of modern mammals have just one bone: the tooth-bearing dentary. Reptiles, by contrast, also sport smaller bones where the jaw meets the skull. Biologists have long postulated that as mammals evolved, the smaller, post-dentary bones shrank to form the tiny bones of the middle ear.

Fossils of ancient mammals such as *Morganucodon* hint at this: the post-dentary bones are still attached to the dentary, and are used for both

hearing and feeding. What happened next had been left to best guesses.

Now *Liaconodon hui*, discovered in China by Jin Meng of the American Museum of Natural History in New York, has filled the gap. "It is the first unambiguous evidence showing that transitional stage," says Meng. The 120-million-year-old mammal, about the size of a large rat, was a close relative of early mammals. Of interest is a bridge called Meckel's cartilage, which connects the small bones to the jaw (see diagram).

Living mammals, including humans, have Meckel's cartilage as embryos, but it disappears as they mature. In the *L. hui* fossil - an adult - it is ossified and the fossil shows how it supported some of the post-dentary bones as they shifted into the ear (*Nature*, DOI: 10.1038/nature09921).

Two bones which support the eardrum, the ectotympanic and malleus, have lost contact with the dentary in *L. hui* but are still supported by Meckel's cartilage. The size and shape of the eardrum can be worked

out from the size of the ectotympanic bone, and this shows that *L. hui* would have had enhanced hearing compared to earlier mammals. "A smaller eardrum is more sensitive to higher-frequency sounds," he says, which would help it detect insects to eat.

"Charles Darwin predicted animals like this would have existed," says Rob Asher of the University of Cambridge. "Palaeontologists have hypothesised [about it] for a long time - now we have a very well-preserved specimen." Cian O'Lunaigh ■

## Evolving ear bones

The middle ear bones (yellow) were supported by the Meckel's cartilage (red) as they moved from jaw to ear

