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The origins of the cochlea and impedance matching hearing in synapsids

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The origin of tympanic hearing in early synapsids is still controversial, because little is known about their inner ear and the function of their sound conducting apparatus. Here I describe the earliest known tympanic ear in the synapsid lineage, the ear of *Pristerodon* (Therapsida, Anomodontia) from the Late Permian of South Africa, which was virtually reconstructed from neutron tomographic data. Although *Pristerodon* is not a direct ancestor of mammals, its inner ear with distinctive cochlear cavity represents a connecting link between the primitive therapsid inner ear and the mammalian inner ear. The anatomy of the sound conducting apparatus of *Pristerodon* and the increased sound pressure transformer ratio points to a sensitivity to airborne sound. Furthermore, the origins of the cochlea and impedance matching hearing in synapsids coincided with the loss of contact between head and substrate, which already took place at least in Late Permian therapsids even before the postdentary bones became detached from the mandible.

Key words: Therapsida, Anomodontia, cochlea, tympanic hearing, Permian, South Africa.

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