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A Natural Cast of the Inner Ear of a Dicynodont

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In 1912 Robert Broom published a description of an imperfect occiput of a moderate-sized dicynodont, in which he had dissolved much of the bone to leave a partial natural cast of the inner ear region (Broom, 1912). This specimen was among Broom's collection of South African fossils which was bought by the American Museum of Natural History in 1913, and it is now specimen A.M.N.H. No. 6156. It appears in Broom's (1915) catalogue of the American Museum collection, in which it is referred to as *Dicynodon ?bolorhinus*, and is stated to have come from the lower part of the *Cistecephalus* zone. However, there is no means of identifying either the genus or the species to which the specimen belongs, and it seems preferable to restrict its identification to "dicynodont."

The figures in Broom's 1912 paper show what was visible at that time. Various canals for blood vessels and nerves can be seen, but the inner ear is largely concealed on one side and lacks the semicircular canals on the other. The writer recently developed the specimen further, using an Airdent machine; this produces a fine jet of abrasive particles, which gradually erode any surface onto which they are directed. As can be seen from the accompanying photographs, this has made it possible to expose a complete and free-standing natural cast of the inner ear, including the semicircular canals, the minimum diameter of which is less than 1 mm.

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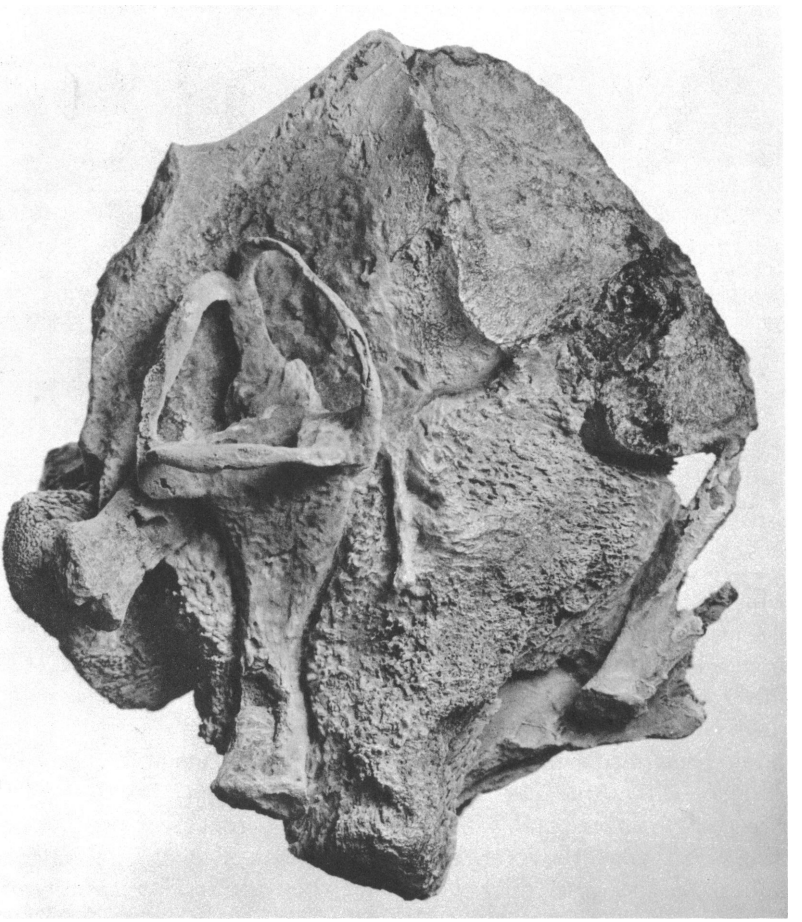

FIG. 1. Dicynodont (A.M.N.H. No. 6156) from right side. × 2.

The two vertical semicircular canals join dorsally at the crus communis canalium, the posterior vertical canal entering somewhat below the level of the anterior canal. The crus communis canalium was separated from the cranial cavity by a thin septum of bone. The two vertical semicircular canals meet at an angle of about 75 degrees, which is considerably less than the angles found by Olson (1944) in his sectioned specimens. The anterior ampullar recess and the exterior ampullar recess are confluent. The horizontal semicircular canal runs from here back to join the posterior vertical semicircular canal just above the posterior ampullar recess.

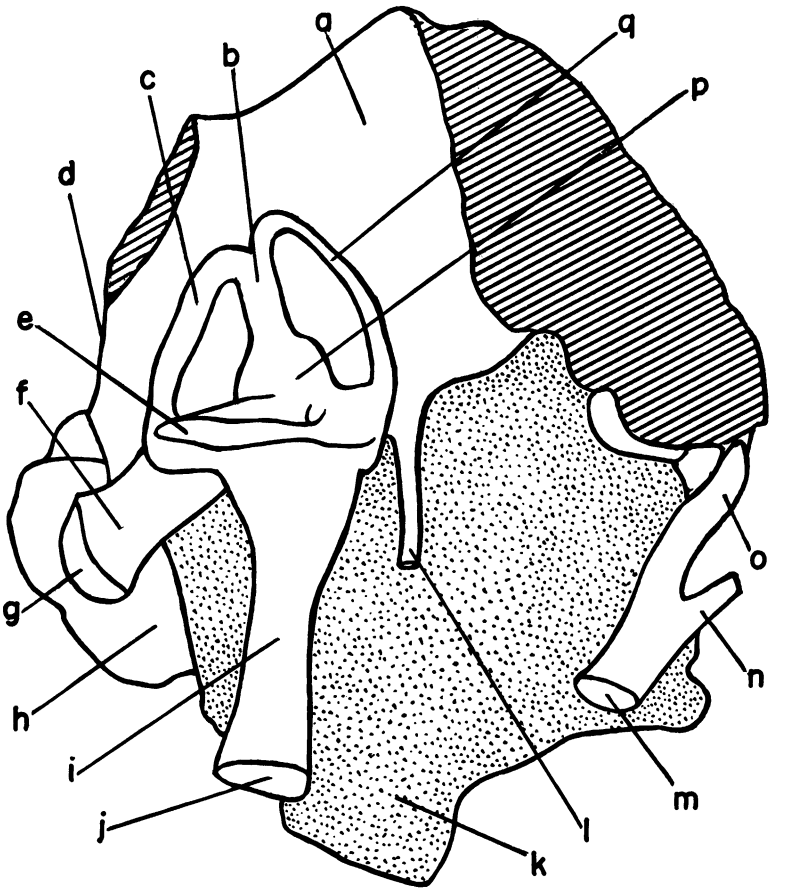

FIG. 2. Diagram to show the principal features of the dicynodont shown in figure 1. *Key:* a, outer surface of cast of cranial cavity; b, crus communis canalium; c, posterior vertical semicircular canal; d, foramen magnum; e, horizontal semicircular canal; f, jugular canal; g, jugular foramen; h, occipital condyle; i, sacculus; j, fenestra ovalis; k, eroded surface of brain case; l, canal for facial nerve; m, internal carotid foramen; n, canal for ophthalmic artery; o, canal for internal carotid artery; p, utriculus; q, anterior vertical semicircular canal.

As noted by Broom (1912), the anterior and posterior sides of the utriculus bear irregular excrescences, which may represent vascular spaces which have become filled with matrix. The sacculus has the elongate form characteristic of dicynodonts, forming a tube descending to the fenestra ovalis.

There is no sign that the perilymphatic duct had a separate opening

FIG. 3. Dicynodont (A.M.N.H. No. 6156) from above. × 2.

through a fenestra rotunda. The jugular canal is confluent with the vestibule of the inner ear at the level of junction of the sacculus and utriculus, and the perilymphatic duct probably entered directly into the jugular canal. Olson (1944) found a similar condition in his sectioned dicynodonts.

On the posterior side of the jugular canal, the single hypoglossal canal can be seen entering it from the cranial cavity. The canal for the facial nerve leaves the cranial cavity just in front of the inner ear and passes ventrolaterally. Farther forward, the canal of the internal carotid artery can be seen running anterodorsally into the pituitary fossa. Another, smaller, canal branches off from the internal carotid canal; Broom (1912)

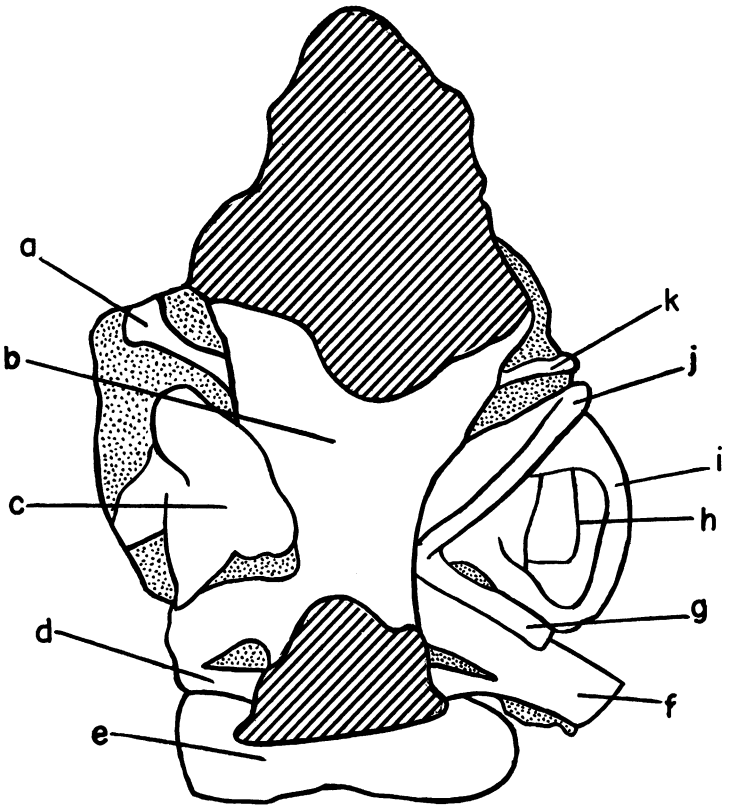

FIG. 4. Diagram to show the principal features of the dicynodont shown in figure 3. *Key:* a, canal for left facial nerve; b, outer surface of cast of cranial cavity; c, remains of left inner ear; d, hypoglossal canal; e, occipital condyle; f, jugular canal; g, posterior vertical semicircular canal; h, fenestra ovalis; i, horizontal semicircular canal; j, anterior vertical semicircular canal; k, canal for right facial nerve.

suggests that this may have contained the equivalent of the ophthalmic artery of lizards.

ACKNOWLEDGMENT

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