

h21 Triassic mammals replace cynodonts

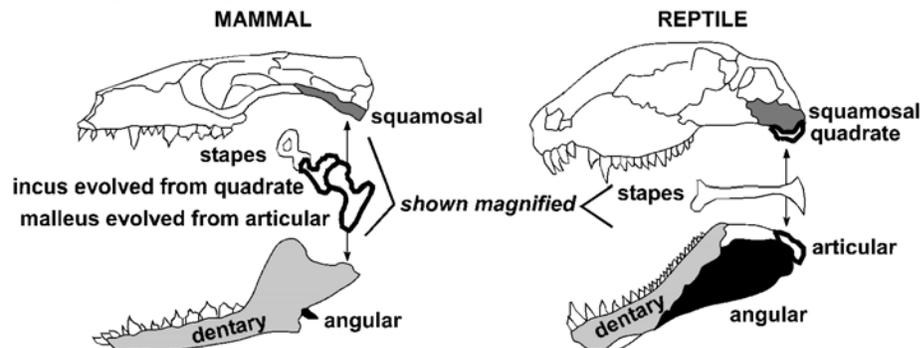
< single jaw bone, mosaic evolution >

Right till the end, – ‘something knocking in the pipes,’ as he liked to call it – gave him a kind of assurance.
—Siddhartha Mukherjee.¹

Primitive mammals (subclass Prototheria) are represented today by the single order Monotremata, which includes one duckbill-platypus species and two spiny-anteater species. Protothers are presumed to have replaced, by the end of the Triassic, advanced mammallike reptiles (cynodonts) from which, and among which, they evolved. The vanishing of cynodonts themselves is more an artifact of classification than that they became extinct. Indeed, as Edwin Colbert in *Evolution of the Vertebrates*, 1980, writes: “[replacement] across the threshold from reptile to mammal, as preserved in the fossil record, is so gradual—so smoothly accomplished in the evolutionary sense—that it is a moot point as to where the reptiles leave off and the mammals begin.”² The replaced cynodonts had flourished during the Triassic. The oldest primitive mammal yet identified is the more than 260 million years old sheep-sized Permian *Anomocephalus africanus* (“lawless-headed one of Africa”).³

Primitive mammals and cynodonts possessed a mosaic of reptilian and mammalian features. Some distinguishing features are:

Lower jaw dentary — In mammals it is the lower jaw bone, whereas, in the cynodonts it is merely enlarged among other reptilian jaw bones.



Jaw-skull joint — In mammals it is the dentary-squamosal joint. Some cynodonts have similar and others retain a reptilian articular-quadrate joint.

Middle-ear bones — The mammalian condition from when, and defining when, the earliest true mammals appeared 160 million years ago, is: stapes (stirrup), incus (anvil), and malleus (hammer). In living mammals, the tiny ear ossicles (bones) start out as part of the jaw but as a mammal embryo matures, the ossicles tear away from the jaw and migrate. Timothy Rowe has discovered that in opossums, ossicles stop growing after 3 weeks.⁴ However, the brain continues to enlarge for another 9 weeks and the pressure of its growth tears the ear ossicles from the jaw and pushes them backward until they reach the adult position. Possibly the middle ear separation from the jaw followed from an enlargement of the brain as the primary condition of early mammals. Stapes only is the cynodont condition, as in reptiles.

Secondary palate — Usually well developed in mammals, partially developed in cynodonts, and absent in reptiles (excepting modern crocodiles).

Teeth — Fully differentiated (incisors, premolars and molars) in mammals and first so in the prototheria (primitive mammals). The cynodont condition is some-differentiation. The reptilian condition is no-differentiation.

Warm- or cold-blooded — Mammals are warm-blooded, the cynodonts were probably warm-blooded, and the usual reptilian condition is cold-blooded. □