JAW SUSPENSION IN MAMMALS

Mammals brought many innovations to the vertebrate design, several involved the skull. One change already noted is in the lower jaw.

In early amniotes, as in **gnathostomes** generally, the *jaws articulate with the brain case* via the articular-quadrate joint.

In mammals:

i)This is quite different. The jaws articulate via the dentary-temporal joint.

ii)Several postdentary bones become lost during this transition to mammals.

iii)The quadrate and articular move to the middle ear.

iv)The dentary expands posteriorly to form a new articulation with the skull, namely, via the **dentary-temporal joint**.

v)Bones located at the back of the primitive amniote lower jaw were **either lost or altered in function from jaw articulation to hearing**.

Q.If postdentary bones moved to the middle ear, how could they abandon jaw suspension without producing an individual with no method of supporting the jaw against the skull?

(a)G. Cuvier, nineteenth-century French anatomist, argued that evolution could not occur for just such a reason, because a change in structure would disrupt function and stop evolution in its tracks before it had begun.

G.Cuvier

Diarthrognathus, a late cynodont [Some characteristics of the cynodonts were: Lower jaw formed only by the dentary bone, while the other jaw bones became the ossicles of the middle ear (the articular, the quadrate and the angular bones evolved into the malleus, the incus and the stapes)] close to primitive mammals, suggests an answer.

Its name means two (di-) sites of articulation (arthro-) of the jaw (gnathus). In addition to the articular-quadrate joint inherited from reptiles, **a dentary-squamosal joint** was apparently present.

Some birds, such as the skimmer, for example, feed by holding their lower jaw just below the water's surface and flying swiftly along until they strike a fish. Then the jaws snap shut to snatch the fish. A secondary articulation seems to strengthen the lower jaw and help prevent its dislocation as it collides with the fish.

Diarthrognathus did not feed on fish, but it may have wrestled with struggling prey or fought with competitors.

(b)A second jaw articulation would make the jaw stronger. Whatever its advantages, a dentary-squamosal joint was established before the postdentary bones departed from the lower jaw, therefore, when the quadrate and articular bones departed, an alternative method of lower jaw-skull articulation was already in place.

This is significant because loss or movement of these bones to support hearing did not disrupt the function they abandoned, jaw suspension. The existing dentary-squamosal articulation was in a sense "ready to serve," preadapted for a new or expanded function.

(c)*Probainognathus*, another late cynodont, like *Diarthrognathus* exhibits a posterior extension of the dentary to establish a secondary point of jaw articulation with the skull (**figure2**).

Q.What do you mean by double jaw articulation?

(d) Probainognathus, Diarthrognathus, and several other late cynodonts with similar **transitional double jaw articulations** suggest how a harmonious transition in form and function might have occurred. They remind us again that a series of anatomical changes alone are an incomplete statement about evolutionary events.

(e) They must be coupled with hypotheses about the accompanying functional series of changes. Form and function go together, and both must receive attention if we are to bring some understanding to the process of evolutionary change.