

wanting. Such are the heads and vertebral joints of the existing Placoids; and such, reasoning from analogy, seem to have been the character and construction of the heads and vertebral joints of the Placoids of the Silurian period, — earliest-born of the Vertebrata.

The most ancient brain-bearing craniums that have come down to us in the fossil state, are those of the Ganoids of the Lower Old Red Sandstone; and in these fishes the true skull appears to have been as entirely a simple cartilaginous box, as that of the Placoids of either the Silurian period or of the present time, or of those existing Ganoids, the sturgeons. In the Lower Old Red genera *Cheiracanthus* and *Diplacanthus*, though the heads are frequently preserved as amorphous masses of colored matter, we detect no trace of internal bone, save perhaps in the gill-covers of the first-named genus, which were fringed by from eighteen to twenty minute osseous rays. The cranium seems to have been covered, as in the shark family, by skin, and the skin by minute shagreen-like scales; and all of the interior cerebral framework which appears underneath exists simply as faint impressions of an undivided body, covered by what seem to be osseous points, — the bony molecules, it is probable, which encrusted the cartilage. The jaws, in the better specimens, are also preserved in the same doubtful style, and this state of keeping is the common one in deposits in which every true bone, however delicate, presents an outline as sharp as when it occupied its place in the living animal. The dermal or skin-skeleton of both genera, which consisted, as has been shown (pages 55 56) of shagreen-like osseous scales and slender

Fig. 8.



a

b

a. *Osseous centrum of Spinax Acanthias.*

b. *Osseous centrum of Raja clavata.*

(Nat. size.)