

In the recent Pentacrinidæ, however, there are never as many as two hundred arm-joints, and several of the outermost are entirely devoid of functional pinnules, having nothing but mere stumps in their place, without any ambulacral plates at the edges of their ventral grooves (Pls. XXXVIII., XL., XLII.-XLIV., XLVIII., XLIX.). Nearly one-third of the length of the arm of a *Pentacrinus* or *Metacrinus* may be in this undeveloped condition, which is never met with among the Comatulæ.

In almost all Neocrinoids the articular facets on the first radials occupy the whole width of their distal faces, so that the lowest parts of the rays, whether divided or not, are of nearly the same width as the radial plates which bear them. In many Palæocrinoids, however, such as *Platycrinus*, the articular facet of the first radial simply occupies the middle of its distal edge, so that the lowest parts of the rays are quite small compared with the calyx. This is the case among the Neocrinoids in *Hyocrinus* (Pl. VI.), *Plicatocrinus*, and to a less extent also in *Marsupites*; while it is very characteristic of the young stages of the Pentacrinoid larva of *Comatula*. But the occurrence of this feature is far more general among the Palæocrinoids than in the later forms.

Except in some species of *Encrinus*, the arms of a Neocrinoid are invariably uniserial, *i.e.*, composed of a single series of joints which are placed end to end, and bear pinnules alternately on opposite sides. The arms of the earlier Palæocrinoids were also composed of single joints; but in all the three principal divisions of the group the composition of the arms changed from a single to a double row in the Upper Silurian period. If this is to be considered as an advance in development, then all the Post-Triassic Crinoids are in this respect permanent larval forms. According to Wachsmuth and Springer's description of *Mariacrinus*, the double joint arrangement is brought about by the coalescence of two contiguous arms, an approach to which may perhaps be found in the flattening of the sides of the lower parts of the arms in many Pentacrinidæ and Comatulæ, and in *Holopus* (Pl. Va, fig. 3; Pl. XV. fig. 2; Pl. XVI. fig. 1; Pl. XXX. fig. 1). But this is merely superficial, and the alternate arrangement of the pinnules is unchanged, which is far from being the case in Palæocrinoids with biserial arms. Other Palæocrinoids, such as the Ichthyocrinidæ and some Cyathocrinidæ, seem to have had no pinnules at all, though the arms branched freely.

It will be apparent from what has been said above that except in one or two points, *e.g.*, the symmetry of the calyx, the differences between the so-called Tessellata and Articulata are not so great as has been sometimes imagined. But there is one other structural character of great importance, to which attention has been especially drawn of late by Messrs. Wachsmuth and Springer as distinguishing the two groups. I refer to the condition of the mouth and of the oral surface generally.

The American palæontologists¹ define the cup of a Palæocrinoid as "closed on the

¹ Revision, part i. p. 30.