

and its allies as forming "a free arch which braces the entire oral side of the body without the aid of oral plates."

The use of the term "aboral" as applied to the vault is somewhat unfortunate, for it actually does cover in the mouth; while the plates of the opposite or dorsal side of the body have generally been called aboral by writers on Echinoderm morphology. Wachsmuth himself applies this expression to the plates of the cup up to the level of the arms. In like manner he gives the name "apical dome plates"<sup>1</sup> to "a system of plates in the vault which occupy a position analogous to that of the apical plates of the calyx;" viz., a central plate, with a proximal ring of interradial, and a distal ring of radial plates disposed regularly around it. These must be carefully distinguished from the dorsocentral, basals, and radials, which are the apical plates of the calyx; and, as mentioned above, have definite homologues in the apical system of Urchins and Stellerids. [See Appendix, Note A.]

The suggestion of Wachsmuth and Goette that the Palæocrinoids represent a comparatively early stage in Crinoid ontogeny, before the opening of the tentacular vestibule to the exterior, has been very generally accepted. But it must be borne in mind that though the Palæocrinoids may be considered as permanent larval forms with respect to the closure of the actinal side, yet that in other respects they have developed to a far greater extent than any Neocrinoid. The solid vault of an *Actinocrinus* is a structure *sui generis*, unless, as I believe, its proximal ring of interradial plates is represented by the orals of a Neocrinoid. The extraordinary development of arms or of other appendages which we find in forms like *Callicrinus*, *Pterotocrinus*, *Ollacrinus*, *Eucalyptocrinus*, *Crotalocrinus*, &c., is entirely without a parallel among the more regular and symmetrical Neocrinoidea. We must be careful therefore not to make too much of the one or two embryonic characters presented by the Palæocrinoids, as compared with the facts of their great complexity of structure and immense variety of form.

The simplest type of summit to be met with in any Palæocrinoid is that presented by the Devonian genus *Haplocrinus*, which remains permanently in the condition of a very early larva. For the orals, together with certain upward processes of the radials on which they rest, form a closed pyramid just as in an early Pentacrinoid. There are five openings which lead in beneath this oral pyramid and correspond to the points of attachment of the arms; but its apex is completely closed so that there is no external mouth. The lines of suture between its component plates are generally marked by deep grooves which descend from the closed apex to end below at the radial openings. Wachsmuth and Springer call them compartments for the reception of the arms, while they have been described by Zittel<sup>2</sup> as "nach unten geschlossene, nach oben offene Ambulacralfurchen."

This appears to me to be a mistake, and I do not see any reason for supposing that these orals were ever covered in by plates as he elsewhere suggests.

<sup>1</sup> Revision, part i. p. 28.

<sup>2</sup> Palæontologie, p. 347.