

IV.—THE RAYS.

A. THE RAY-DIVISIONS AND ARMS.

The arms of a Neocrinoid, viewed in a strictly morphological aspect, must be regarded as commencing with the first joints beyond the primary radials. The same is the case in many Palæocrinoids, of which Schultze says, "Die Arme (brachia) beginnen unveränderlich da, wo eine deutliche Gelenkfacette eines festen Kelchstückes ihren Ursprung anzeigt."¹ In the Platycrinidæ and other Palæocrinoids, and in all Neocrinoids (excepting perhaps *Guettardicrinus*), this articular face is on the first radial. In the five-armed *Eudiocrinus indivisus* the next joints beyond the radials are syzygial, with pinnules on the epizygals,² which clearly shows that they must be considered as arm-joints and not as belonging to the calyx, although they undoubtedly represent the so-called second and third radials of a ten-armed Crinoid. The other species of *Eudiocrinus* have these two primitively separate joints not united by syzygy but articulated, just as in *Thaumatocrinus* (Pl. LVI. figs. 1-4). The second one bears a pinnule both in *Thaumatocrinus* and in *Eudiocrinus varians*; but in *Eudiocrinus semperi* and *Eudiocrinus japonicus* the first pinnule is on the fourth joint after the radial. This would correspond to the second brachial of a ten-armed Crinoid, but it is really the fourth brachial in *Eudiocrinus*. Lastly, in Perrier's *Eudiocrinus atlanticus*³ the first pinnule is on the fifth brachial, which corresponds to the third brachial of an *Antedon*.

The well-known genus *Rhizocrinus* resembles *Eudiocrinus indivisus* in the syzygial union of the first two joints beyond the primary radials (Pl. X. figs. 1, 2, 6-8, 20). They have generally been called the second and third radials; and there is some ground for this in the case of *Rhizocrinus lofotensis*, as they are considerably broader than all the joints which follow them except the first (Pl. IX. figs. 1, 2). But in *Rhizocrinus rawsoni* (Pl. IX. fig. 3; Pl. LIII. fig. 7) they are not much larger than the four following joints, which contribute with them to support the visceral mass (Pl. X. fig. 20); while the first pinnule is on the last of these, *i.e.*, on the sixth joint above the calyx (Pl. IX. fig. 3; Pl. X. fig. 20). Considering the evidence afforded by *Eudiocrinus*, I think, however, that it will be more consistent to describe *Rhizocrinus* as having only one radial; while the first pinnule would then be on the sixth (*Rhizocrinus rawsoni*) or on the eighth brachial (*Rhizocrinus lofotensis*). The terms second and third radials would then be used only in those cases where there are ten or more arms, owing to the third radials and more or fewer of the

¹ *Op. cit.*, p. 5. See also the genus *Actinometra*, *Trans. Linn. Soc. Lond. (Zool.)*, ser. 2, vol. ii. pp. 20-25, 1883; Zittel's *Palæontologie*, t. i. p. 339; de Loriol, *Paléont. Franç. Terr. Jurass.*, t. xi. p. 15; Wachsmuth, *Revision*, part ii. pp. 9, 10.

² *Eudiocrinus* and *Atelecrinus*, *Journ. Linn. Soc. (Zool.)*, vol. xvi. p. 495, 1882.

³ Sur des *Eudiocrinus* de l'Atlantique et sur la nature de la faune des grandes profondeurs, *Comptes Rendus*, t. xvi. No. 11, p. 726.