

following joints being axillaries. This is in accordance with the nomenclature employed by Zittel, who speaks of the joint in *Cupressocrinus*, which is called "articulare" by Schultze, and "second radial" by Roemer, as a "first brachial;" while he only describes one series of radials in the five-armed *Pisocrinus*.¹ The developmental history of the plates also indicates clearly that the second and following radials are really arm-joints. For they commence as imperfect rings, which soon become filled up with lengthening fasciculated tissue, just as is the case with the stem-joints and later brachials. But the *first* radials, like the basals and orals, commence as expanded cribriform films; while the endogenous additions by which they are subsequently thickened are cribriform like those of the basals, and not fasciculated like those of the two outer radials and the following arm-joints. Messrs. Wachsmuth and Springer² have been led by their study of the Palæocrinoids to the same conclusion, *i.e.*, that "the arms fundamentally commence with the second radials;" although they find in practice that for purposes of description "it is more convenient to regard the arms as commencing with the first free plate beyond the calyx." In very many Neocrinoids with ten or more arms this would be the second radial; and in the multiradiate *Metacrinus* (Pl. XXXVIII.; Pl. XLIII. fig. 2; Pl. XLVI.; Pls. XLVIII.–LII.) this is actually a syzygial joint with a pinnule on the epizygal just as in the simpler *Eudiocrinus indivisus*, but an axillary appears a few joints farther on, and the rays begin to divide. In the other Pentacrinidæ, however, in *Bathycrinus*, *Holopus*, and in most Comatulæ, as well as in the fossil *Encrinus* and Apiocrinidæ, the second joints above the primary radials are axillaries, and it is not till the second (or rarely the first) joints beyond these that pinnules appear. In all these types the axillary and the joint immediately below it are of the same width as the primary radials in the calyx. But in *Marsupites* and in many Palæocrinoids (*Platycrinus*, *Cyathocrinus*, &c.) they are very much smaller than the primary radials, just as the homologous joints are in *Hyocrinus* (Pl. VI.).

The primary radials which form the upper part of the calyx are generally distinguished as the *first* radials; while the following joints, as far as the first axillary inclusive, are called the second, third radials, &c., though they are really only arm-joints as is shown by their bearing pinnules in *Metacrinus* (Pl. XII. figs. 6, 8; Pl. XXXVIII.; Pl. XXXIX. fig. 1; Pl. XLIII. fig. 2; Pl. XLV. fig. 1; Pl. XLVI.; Pl. XLVIII. fig. 1; Pl. XLIX. figs. 1, 2; Pl. L. figs. 1, 8, 10, 14, 16; Pl. LI. fig. 1; Pl. LII. fig. 1). Since, too, it is very convenient for descriptive purposes to use different names for the different regions of the arms, I see no reason for altering the names by which these plates are generally known, provided that their real nature is not lost sight of.

The conventional use of the term "radials" for the joints between the calyx and the

¹ Palæontologie, pp. 348, 349.

² *Phil. Trans.*, 1865, p. 541, pl. xxvii. figs. 1, 3; *Ibid.*, 1866, pp. 729, 742, pl. xli. fig. 1.

³ Revision, part ii. p. 10.