

the fourth and fifth, and the seventh and eighth brachials (Pl. VII. fig. 2). The third brachial is articulated by muscles and ligaments to those before and behind it, as are also the sixth and ninth brachials. Beyond this point trifascial and muscular articulations alternate with one another throughout the arm. But those brachials which are united to their successors trifascially bear no pinnules as the remaining joints do; and in this respect they lose their morphological value as arm-joints, just as the hypozygal of a syzygium does. From this point of view, therefore, the description of the trifascial articulations as syzygia is perfectly correct. But they do not correspond to Müller's definition of a syzygy as an immovable sutural union of two joints. They occupy a curiously intermediate position between a bifascial articulation and a syzygy proper; for they resemble the former in the movement of the joints upon one another, and the latter in their occurring throughout the whole length of the arms, and in the absence of a pinnule on the lower joint of every pair so united. They correspond exactly in their distribution to the syzygies of *Rhizocrinus*, which come nearest to them in character, being perfectly plain and simple, and not marked with radiating ridges as in the Comatulæ and some Pentacrinidæ. But the trifascial articulation must not be confounded with the peg and socket form of syzygy which is met with in *Rhizocrinus* (Pl. X. figs. 1, 6, 8, 17, 18). In both cases there is a pit near the dorsal edge of one of the apposed faces; but in *Bathycrinus* this lodges a ligament (Pl. VIIb. fig. 8, *ld*) which is attached in a corresponding pit in the other face (Pl. VIIa. figs. 16, 22, *ld'*); while in *Rhizocrinus* this other face bears a peg-like process (Pl. X. fig. 17) which fits into the pit, and thus checks rather than facilitates motion.

It is noteworthy that there seems to have been a trifascial articulation between the two outer radials of the fossil *Apiocrinus insignis*, d'Orbigny, for the articular face of the second radial is described by de Loriol¹ as presenting "un bourrelet vertical large, épais et bifurqué près du bord externe." The fork of this ridge at its dorsal end gives the joint-face an altogether different appearance from the corresponding part in *Apiocrinus parkinsoni*, and it is difficult to see what can have been lodged in the fossa between the two limbs of the fork, except a third ligamentous bundle such as occurs in *Bathycrinus*.

In all the Neocrinoidea muscular articulations occur between the first and second radials, between every axillary and the two joints which it bears, and between most of the following arm-joints (Pl. III.; Pl. VIIa. figs. 15, 17, 18, 19, 21, 23; Pl. X. figs. 1-4; Pl. XII. figs. 3-6, 8, 9, 12, 19, 20, 23; Pl. XXI. figs. 1a, 1b, 2a, 2b, 3b, 4b, 4c, 5c, 6d, &c.). When the arms divide and the axillaries are simple, they may be united by muscles to the preceding joints in *Pentacrinus* and *Metacrinus* (Pl. XII. fig. 3); though this is never the case in the Comatulæ. But if the axillaries are syzygial joints, there is always a muscular articulation below the hypozygal. No

¹ Paléontologie Française. Terrain Jurassique, t. xi. Crinoïdes, p. 309, pl. lvi. fig. 2c.