

*Guettardicrinus*, and in the majority of those of *Millericrinus*; and yet it is considered by Wachsmuth and Springer as a merely "accidental" occurrence, and the real symmetry of the top stem-joint in the *Apiocrinidæ* is described as interradi- al. It is actually and visibly so in some twenty species of *Millericrinus*. But they belong to that aberrant section of the genus which so closely approaches *Pentacrinus* in having a distinctly pentagonal stem with interradi- al angles, and articular faces the sculpture of which is very different from that of the typical *Apiocrinidæ* and somewhat closely resembles that of the joint-faces in certain *Pentacrinidæ*. In all of these species the top stem-joint, like those below it, has interradi- al angles, and the same is the case with the basal concavity into which it fits. But Wachsmuth and Springer tell us that the "natural" shape of this concavity in the *Apiocrinidæ* is to have radial angles, and they have not attempted to explain its interradi- al symmetry in these aberrant and *Pentacrinus*-like forms of *Millericrinus* by reference to any causes whatever, accidental or otherwise. Perhaps it has escaped their notice; but whether this be the case or not, it is somewhat surprising to students of the Neocrinoidea to be told that the distinctive characters of the top stem-joint in the *Apiocrinidæ*, presenting themselves in each of the three genera, and in by far the greater number of the species of this family, are due to "accidental" causes. Further discussion of this question, however, would be impracticable at present. I merely wish to point out that as soon as the centro-dorsal of the early larva of *Comatula* takes a definite shape its angles are distinctly radial, just as is permanently the case in the top stem-joint of *Apiocrinus*, and this is in itself an argument against the supposed change of symmetry in the latter type about which Wachsmuth and Springer write so positively. But when the cirri appear on the centro-dorsal and the basals begin to be transformed into the rosette, the outline of the centro-dorsal changes. The basals are no longer the principal plates in the calyx, but they undergo metamorphosis into the small rosette, and the centro-dorsal increases rapidly in size, more so than any other part of the skeleton, "so that it soon comes to pass beyond the circlet of basals, and to abut on the proximal edge of the first radials; and instead of stopping here it continues to increase in diameter until it conceals the whole inferior surface of the first radials, and sometimes even encroaches somewhat on the second." <sup>1</sup>

Here then we see the reason for the interradi- al angles of the centro-dorsal in the mature *Comatula*. It is an altogether secondary condition, and due to the fact that the fossæ on the ventral surface of the centro-dorsal lodge the radial plates, so that the ridges separating them are interradi- al, just as in *Apiocrinus* the fossæ on the top stem-joint lodge the basals and are interradi- al, so that the intervening ridges and the angles in which they terminate are radial. Even in fossil *Comatulæ* which have no rosette, but persistent basals, these plates are usually quite small and do not form a closed ring on the exterior of the calyx; so that the upper surface of the centro-dorsal is mainly occupied by the radial fossæ and has interradi- al angles as in recent *Comatulæ* (Pl. I. figs. 5, 6a, 8d; Pl. II.

<sup>1</sup> W. B. Carpenter, *Phil. Trans.*, 1866, p. 742.