

It is in the character of the arms and pinnules, however, that *Hyocrinus* is most remarkable. The syzygial union of successive pairs of arm-joints is characteristic of *Rhizocrinus*; but in *Hyocrinus* the third and following joints are triple and not double only. A similar difference between the arms of *Heterocrinus simplex* and *Heterocrinus constrictus* has been already noticed.<sup>1</sup>

The arrangement of the pinnules of *Hyocrinus* was described by Sir Wyville Thomson as "hitherto entirely unknown in recent Crinoids, although we have something very close to it in some species of the Palæozoic genera *Poteriocrinus* and *Cyathocrinus*."<sup>2</sup> I do not think, however, that this resemblance is such a very close one after all. For the lateral appendages of the arms of *Hyocrinus*, long as they may be, are true pinnules. *Cyathocrinus*, on the other hand, has no pinnules whatever, but long branching arms, each branch bifurcating several times. It is true that the terminations of all the branches are about on the same level, as is the case with the arms and pinnules of *Hyocrinus*. But in the one genus a bifurcation gives rise to two equal arms which divide again, and in the other there is no bifurcation at all, but the arm-joints bear a series of pinnules which remain perfectly simple throughout their whole length, great though this may be. It has been already pointed out that the nearest approach to the pinnule arrangement of *Hyocrinus* is to be found in *Barycrinus herculeus* from the Carboniferous series of Indiana, United States (*ante*, p. 61). The so-called armlets of this type alternate with one another upon opposite sides of the main arm-trunk and bear no pinnules, so that they seem to correspond somewhat closely with the pinnules of *Hyocrinus*.

The closest approximation among the Neocrinoids to the arrangement of the pinnules which occurs in *Hyocrinus*, though still differing from it in important points, seems to me to be found in the Liassic genus *Extracrinus*. In this curious type each arm consists of a principal trunk bearing pinnules as usual, and giving off at intervals from its inner side a series of smaller armlets which also bear pinnules. The lowest of these are as long as the remaining portion of the arm-trunk from which they spring; and the following ones are of successively diminishing lengths, so that the ends of the original arm-trunk and of its numerous armlets are all on about the same level. In this respect the armlets of *Extracrinus* are comparable to the pinnules of *Hyocrinus*; but they bear pinnules themselves, and only come off from one side of the main arm-trunk, instead of alternating from opposite sides.

There is, therefore, no exact parallel to the condition of the arms of *Hyocrinus* to be found in any Neocrinoid; and remembering this, as well as the peculiarities of the calyx, we cannot say that *Hyocrinus* is specially related to any of the other Neocrinoidea, while it presents important characters which connect it with the Palæocrinoids.

<sup>1</sup> *Ante*, p. 53.

<sup>2</sup> *Journ. Linn. Soc. Lond. (Zool.)*, vol. xiii. p. 52.