

these changes, and has furnished a standard to determine their relative rank; as it cannot be doubted, that the earlier stages of growth of an animal exhibit a condition of relative inferiority, when contrasted with what it grows to be, after it has completed its development, and before it enters upon those phases of its existence which constitute old age, and certain curious retrograde metamorphoses observed among parasites.

In the young Comatula there exists a stem, by which the little animal is attached, either to sea weeds, or to the cirrhi of the parent; the stem is at first simple and without cirrhi, supporting a globular head, upon which the so-called arms are next developed and gradually completed by the appearance of branches; a few cirrhi are, at the same time, developed upon the stem, which increase in number until they form a wreath between the arms and the stem. At last, the crown having assumed all the characters of a diminutive Comatula, drops off, freeing itself from the stem, and the Comatula moves freely as an independent animal.¹

The classes of Crustacea and of Insects,² are particularly instructive in this respect. Rathke, however, has described the transformations of so many Crustacea, that I cannot do better than to refer to his various papers upon this subject,³ for details relating to the changes these animals undergo during their earlier stages of growth. I would only add, that while the embryo of the highest Crustacea, the Brachyura, resembles by its form and structure the lowest types of this class, as the Entomostraca and Isopoda, it next assumes the shape of those of a higher order, the Macroura, before it appears with all the characteristics of the Brachyura.

Embryology furnishes, also, the best measure of the true affinities existing between animals. I do not mean to say, that the affinities of animals can only be ascertained by embryonic investigations; the history of Zoölogy shows, on the contrary, that even before the study of the formation and growth of animals had become a distinct branch of physiology, the general relationship of most animals had already been determined, with a remarkable degree of accuracy, by anatomical investigations. It is, nevertheless, true, that in some remarkable instances, the knowledge of the embryonic changes of certain animals gave the first clue to their true affinities, while, in other cases, it has furnished a very welcome confirmation of relationships, which, before, could appear probable, but were still very problematical. Even Cuvier considered, for instance, the Barnacles as a distinct class, which he placed

¹ A condensed account of the transformations of the European Comatula, may be found in E. FORBES'S History of the British Starfishes, p. 10. The embryology of our species will be illustrated in one of my next volumes.

² See AGASSIZ'S Twelve Lectures, p. 62, and Classification of Insects, etc., q. u. It is expected that Embryology may furnish the means of ascertaining the relative standing of every family.

³ See above, page 79, note 2.