

very widely separated from the pedal. To this I should reply that in the Dibranchiate Cephalopoda, as has already been said, we may observe, in the degree in which the brachial ganglia are separated from the pedal, a whole series of successive stages (*Ommatostrephes*, *Sepiola*, *Loligo*, *Sepia*, *Octopus*), in which the brachial ganglia are gradually less and less distinctly separated, and in the last-named form a single mass, and are only marked off by a slight constriction.

I may further remark that this gradual separation of the brachial from the pedal ganglia, which is seen in passing from *Octopus* to *Ommatostrephes*, corresponds to an equivalent separation between the "superior buccal" and cerebral ganglia, the former separating from the latter even more than the brachial ganglia separate from the pedal. Whatever be the separation of the brachial and pedal ganglia, the pedo-brachial connective always remains much more important than the cerebro-brachial.

Thus then the great removal of the brachial and pedal ganglia (in *Ommatostrephes*) is not a primitive arrangement. It is adventitious, and due to the cause which separates at the same time all the anterior portion of the main mass of the central nervous system, as well supræoesophageal as subœsophageal.

Primitively, the brachial and pedal ganglia of the same side must have been in close apposition, as is shown by the observation of the development of the Decapoda (alluded to above) and as appears still to be the case in *Cirroteuthis*, according to the figures of Reinhardt and Prosch.<sup>1</sup>

In *Nautilus*, which is the most primitive of all, this separation of the brachial from the pedal ganglion has not yet taken place; in the female,<sup>2</sup> however, there is found a small ganglion corresponding to a part of the brachial ganglion, which innervates the internal labial appendages. But all the appendages of the male and the other appendages of the female are innervated directly by the anterior subœsophageal ganglionic ring, and the nerves to the funnel are seen to issue at the side of the last ventral "tentacular" nerves.

Some have desired to see in this anterior subœsophageal ring, which corresponds to the brachial and pedal ganglia of the Dibranchia, an external pedal portion and an internal cerebral portion. But in this case the latter would be only lateral and would not extend below the œsophagus (compare the figure of von Jhering<sup>3</sup>). This part would then innervate the tentaculiferous appendages; in this way it is sought to prove the cephalic nature of these latter.

This division is, however, quite imaginary, and it has remained invisible to those zoologists who have not been prejudiced by attempting to prove the cephalic nature of the appendages (Owen, Valenciennes, &c.). In reality this ring is entirely pedal, and

<sup>1</sup> Om *Sciadephorus Mülleri*, *K. dansk. Vidensk. Selsk. Afhandl.*, p. 19, pl. v. fig. 2.

<sup>2</sup> Owen, *Memoir on the Pearly Nautilus*, pl. vii. fig. 8.

<sup>3</sup> *Vergleichende anatomie de Nervensystemes und Morphologie der Mollusken*, p. 262, fig. 14.