

Our specimen violates every one of these conditions. The epineurals are opposite; their pointed ends against the straight border of the food groove; their thick, blunted, truncate ends apposed to those of their neighbors of the opposite row; their great length allows these ends to touch only by the inner edges of their end faces (closure not valvate); when closed the ridge is high, the angle at the summit being about  $65^{\circ}$  (plate II, figs. 3 and 6); the closure at the ends is often very imperfect (see 13th epineural in upper row, plate II, figs. 1 and 2 and the 5th epineural in lower row on arm IV, plate III, fig. 4); the plates are too wide to secure valvate closure at their lateral margins and the majority have these margins imbricated and with either the orad or aborad margins under. These plates, in shape and arrangement, are so at variance with what we would naturally expect that they call to mind the double row of flat spines that protect the food grooves in *Pentaceros*. To derive the latter from the former would seem to require less alteration than that which has already taken place.

Some of these changes might be considered as indicative of a loss of the primary function, but the specialized form of joint and free end and the marked increase in length, breadth, and thickness must be taken to indicate that these changes are all adaptations secured by a new function or functions that were added to the primitive one and finally came to surpass it in importance.

Two possible new functions will be considered; the first of these a new method of securing food supply and the second a new aid to locomotion. Before taking up either it will be necessary to make a brief study of the evidences of the muscular system which our specimen possessed.

#### MUSCULATION.

That the epineurals are arranged alternately with the adambulacra below them may be seen by an examination of the fourth and sixth epineurals of the lower row in plate III, fig. 4. The position of the eleventh epineural of the upper row in plate II, fig. 1, and the position which the tenth of this series must have occupied will give additional evidence. In the last figure the epineurals have their free ends swung aborad, in the former figure they are swung orad. This indicates that the epineural adductors were in pairs and their origins were in the very prominent, central, elongated, sunken muscle fields which are so clearly shown on the oral surfaces of all adambulacra except the first of a series. The muscle pits are commensurate with the size and importance of the epineurals themselves. The abductors were also probably arranged in pairs and the muscle