

of *Apiocrinus*, are continued upwards on to the surface of the disk between the ambulacra. Wachsmuth and Springer described this ventral disk of *Onychocrinus* and of other Ichthyocrinidæ as "composed of a more or less soft or scaly integument, yielding to motion in the body and arms;"<sup>1</sup> and they regard it as homologous with the more solid vault of *Platycrinus* and *Actinocrinus*. I believe, however, as I shall explain more fully further on, that this was the real ventral surface of the Crinoid and not a "vault" at all; while the so-called proboscis or anal tube with the small interradians round it is just in the condition which the anal appendage of *Thaumatocrinus* would assume, did it exist in a larger Crinoid such as *Pentacrinus asteria* (Pl. XIII. fig. 1), with a well-plated perisome between the rays. This plating may be continued up on to the disk and to the summit of the anal tube (Pl. VI. fig. 4; Pl. XVII. fig. 6; Pl. XXVI. figs. 1, 2; Pl. XXXIV. fig. 2; Pl. XXXIX. fig. 2; Pl. LV.).

It unites the lower arm divisions closely together; and any additional appendage in the anal interradius would naturally be bound in with it, just as the four to seven joints of the anal appendage in *Onychocrinus* are bound in with the numerous minute pieces between the rays. But I see no reason for supposing that such an appendage would form part of the tube up to its opening, and be in any way grooved on its inner side. For it seems to taper away rapidly and to become merged into the general plating of the anal interradius in the flexible vault, or disk as I should call it. The passages quoted above both from Meek and Worthen, and from Wachsmuth and Springer, would admit of this interpretation; and in the first case at any rate, it seems (from the context) to be the one which was intended. But Wachsmuth and Springer also speak of the anus of the Ichthyocrinidæ as "unknown except in *Taxocrinus* and *Onychocrinus*, which have a small lateral tube."<sup>2</sup> This observation refers to the small appendage already mentioned; but it must not be understood to imply (as it well might) that this appendage is hollow and pierced by the rectum.

Some older Crinoids, however, than *Taxocrinus* and *Onychocrinus* seem to have had an anal appendage like that of *Thaumatocrinus*, which was sometimes surrounded by numerous minute interradian pieces, so as to form a support to the anal side of the disk between the rays. I mean the genera *Heterocrinus*, Hall; *Reteocrinus*, Billings; and *Xenocrinus*, Miller, all from the Lower Silurian of America.<sup>3</sup>

According to Wachsmuth and Springer's definition of *Reteocrinus*, the posterior

<sup>1</sup> Revision, part i. p. 31.

<sup>2</sup> Revision, part i. p. 31.

<sup>3</sup> As regards the second of these, I shall speak of it in the sense in which it is used by Wachsmuth and Springer, Wetherby, and others (Revision, part ii. p. 191; *Amer. Journ. Sci. and Arts*, April 1883, p. 256). I should say, however, that S. A. Miller differs from his fellow-workers in America upon this subject, and refers the species grouped under *Reteocrinus* by Wachsmuth and Springer to, at least, three genera (*Amer. Journ. Sci. and Arts*, August 1883, p. 105; and *Journ. Cinc. Soc. Nat. Hist.*, vol. vi., December 1883, pp. 217-230). As, however, all the species referred by them to this genus appear to possess an anal appendage like that of *Thaumatocrinus*, *Onychocrinus*, and *Taxocrinus*, it is obviously more convenient to consider them all as congeneric, as I am also inclined to do for other reasons (see *Phil. Trans.*, 1883, pp. 923-933).