

Crinoids, one is not surprised to find Ludwig limiting himself to the following statement—“Die winzigen Zellen, die sich zwischen den Nervenfasern finden, sind vielleicht auch nur die Kerne von Zellen, die in den Verlauf der Fasern eingeschaltet sind;”¹ and my own observations have not enabled me to add anything to this suggestion.

Hamann's observations on the Asterids have led him to discover that the so-called ambulacral nerves are only specially developed parts of a general subepithelial plexus containing ganglion-cells. This surrounds the whole body, and is traversed, though very sparingly, by vertical fibres extending downwards from some of the “Stutzzellen”; while sense-cells are intercalated among these at the bases of the respiratory cæca and elsewhere. Hamann has found a similar ectodermic plexus, distinct from the radial nerve, in Holothurians; and the presence of a corresponding structure in Cœlenterates, Nemertines, Turbellarians, Chætognatha, &c., is now thoroughly established. Thus, then, there would seem to be no reasonable doubt respecting the existence of an ectodermic nerve-plexus in the Crinoids. But even if the existence of this plexus be admitted, it is difficult to suppose that the nervous system of a Crinoid with its innumerable pairs of muscular bundles is limited to the subepithelial band in the floor of the food-grooves, its tentacular branches, and the as yet undemonstrated plexus. Leaving the latter out of consideration for the moment, Where, I would ask, are the nerves of the pinnules of *Antedon acoela* and *Antedon angusticalyx* which are shown in Pl. LIV. figs. 1–3, 5? Where is the nervous system of the large number of arms on the two posterior rays of the gigantic *Actinometra magnifica* represented on Pl. LVI. fig. 7, or that of the numerous ungrooved arms on the three other rays?

It is difficult to conceive that these ungrooved arms and pinnules (Pl. LXI. fig. 3), which form so large a part of the entire organisation of this animal, are entirely unprovided with a nervous system, and yet the ambulacral nerve is altogether absent (fig. 4). Even when this is present, Ludwig himself admits that he has seen no other branches proceeding from it than those which supply the tentacles.

Now the muscular system of a Crinoid is unusually well developed. From the first radials to the ends of the arms every two joints are united by a pair of muscular bundles (Pl. LXI. figs. 4, 5), except in the case of the syzygies and the rare ligamentous articulations. The pinnules are always united to the arms by muscles, and in many forms there are muscles between several pairs of the pinnule-joints (fig. 6 on p. 121, *m*).

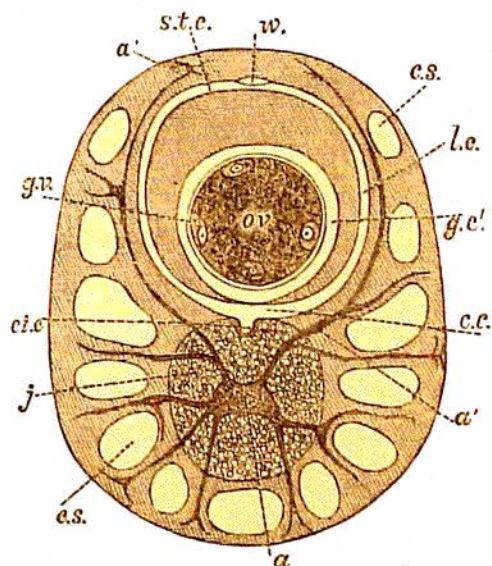


FIG. 4.—Diagrammatic transverse section of an ungrooved ovarian pinnule of *Actinometra parvicirra*, $\times 50$. *a*, axial cord; *a'*, the branches proceeding from it; *c.c.*, cœlic canal; *c.i.c.*, ciliated cup; *c.s.*, connective tissue spaces in the perisome; *g.c.*, genital canal; *g.v.*, genital vessel; *j*, skeleton of the pinnule-joint; *l.c.*, lateral canal connecting the cœlic and subtentacular canals; *ov*, ovary; *s.t.c.*, subtentacular canal; *w*, radial water-vessel.

¹ Crinoideen, *loc. cit.*, p. 264.