

gradually come to lie in canals within the radials, and so are relatively (though of course not absolutely) nearer the epidermis on the exterior of the body, which in this case is antambulacral.

The ontogenetic change in the relative position of the axial cords of a Crinoid is thus directly the opposite of that which Marshall supposes to have taken place phylogenetically. On his theory the antambulacral portion of the primitive nerve-sheath should commence by being outside the radials, between them and the epidermis; whereas, as he himself admits, the radials are at first in the form of "calcareous plates between the cords and the integument." His argument is, therefore, only one of analogy, and the outward movement of the axial cords in the Crinoid larva is not comparable morphologically to the inward movement, which must have taken place during the development of the radial nerve of an Urchin from the primitive nerve-sheath of a Starfish.

It appears to me, however, that there is a possible view of the phylogeny of the axial cords which would not conflict in this way with their ontogenetic movement. According to Götte's observations, the ciliated ambulacral epithelium of the Crinoids is derived from the cellular lining of the left peritoneal sac;<sup>1</sup> so that the ambulacral nerve, which is in such close relation with this epithelium, is endodermic in its origin. On the other hand, the axial cords of a larval Crinoid lie in the walls of the dorsal portion of the body-cavity, which is lined by an epithelium derived from that of the right peritoneal sac; and I would therefore suggest that the embryonic axial cords might have the same primitive relation to this epithelium as the ambulacral nerves must have to that of the left peritoneal sac, if Götte's observations be correct. The outward movement of the cords during development, away from the epithelium of the body-cavity, would then be, so to speak, serially homologous with the supposed inward movement of the ambulacral nerves of an Urchin. In other words, the axial cords are the nerves of the right antimer, while the subepithelial bands of the ambulacra are those of the left antimer, both being derived in the first instance from the epithelium of the enterocoel.

In the Neocrinoids the axial cords eventually come to be some little distance from this epithelium; though they must have remained close to it in those Palæocrinoids which had imperforate radials, just as they are in the Pentacrinoid larva. A variation of the same nature, though of course altogether different in degree, presents itself in the relation of the ambulacral nerve in certain species of Neocrinoids. I refer to the presence or absence of a delicate connective tissue lamella between the nerve and the overlying epithelium. This layer is often very conspicuous in *Antedon eschrichti*, but occasionally seems to be absent; while its presence in *Antedon rosacea* is doubtful. I have never satisfied myself of its existence in any other species, though Ludwig and Marshall seem to quote me as having noted its occurrence in *Actinometra*. Ludwig<sup>2</sup> long ago

<sup>1</sup> *Archiv. f. mikrosk. Anat.*, Bd. xii. pp. 591-593.

<sup>2</sup> *Beiträge zur Anatomie der Crinoideen*, *Nachricht. v. d. kgl. Gesellsch. d. Wiss. zu Göttingen*, No. 5, 1876, p. 108.