

All these specimens from the Antarctic belong to Savigny's first variety (var. *a*), being of a yellowish brown colour and of large size, and having the processes short. The condition of the diaphragm varies greatly (see Pl. II. fig. 4, and compare with fig. 1). In the specimen measured the diaphragm is of considerable breadth, leaving only a small aperture 1 cm. across. In the large fragment, on the other hand, there is practically no diaphragm, the lumen of the common cloaca being very little reduced at its opening. In one or two specimens the diaphragm is turned outwards, so that its free edge points away from the opening in place of across it. There can be no doubt as to the contractility of the diaphragm, although several of the older observers evidently considered it as an inert cartilaginous immovable prolongation of the test. Bennet in 1837 described it as being moveable in the living *Pyrosoma*; and the very various conditions in which it is found in different specimens would certainly lead one to believe that it can be readily contracted and dilated.

The diaphragm is a prolongation of the common test, and is, like the rest of the test in the colony, composed of a gelatinous or cartilaginous matrix, in which numerous rounded, fusiform, and stellate test cells are embedded. It is, however, penetrated by a large number of closely placed tubes, containing muscle fibres in their walls. These tubes were recognised by Huxley, who showed them to be prolongations from the dorsal edges of the bodies of the Ascidiozooids; but he refers to them as stolons, and makes no statement in regard to their probable function. From their appearance, structure, and arrangement, however, they evidently correspond to the tubular retractor muscles of the Ascidiozooids found in the test of many colonies of the Compound Ascidiarians.¹

These muscular tubes in the diaphragm of *Pyrosoma* are closely placed (Pl. I. fig. 9), and run from the end of the colony inwards to the free edge of the diaphragm. Each tube when highly magnified (300 diam.) is seen to have its wall formed of two layers, an external epithelial, which is evidently a prolongation of the ectoderm of an Ascidiozooid, and an internal muscular, which is formed of a layer of unstriated muscle fibres running longitudinally along the tube (Pl. I. fig. 10, *m.b.*). The contraction of these muscle fibres would draw the free edge of the diaphragm outwards, and so enlarge the common cloacal aperture, while probably the elasticity of the test-matrix suffices to extend the diaphragm when the muscles relax.

The colour of the specimens from the Antarctic varies somewhat, some of them being distinctly browner than others. The brown tint is caused by numerous masses of reddish-brown pigment cells which are scattered over the surface of the viscera. It is not due to food, or to any brown substance lying in the branchial sac, as described by Savigny. On cutting a section of the brownest colony in the collection the colour is distinctly seen to be confined to the deeper layer of the colony where the alimentary and reproductive viscera of the Ascidiozooids are placed, and on dissecting out an

¹ See this Report, Part II.