appendage. In *Morchellioides affinis* (see p. 177) the post-abdomen terminates in distinct vessels which run for a short distance through the test and terminate in bulbs (see Pl. XXIV. fig. 17, *v.ap.*).

In the Botryllidæ the system of branched and anastomosing vessels in the test has become greatly enlarged, and probably forms an accessory organ of respiration.[1] The explanation of this system being so much more developed in the Botryllidæ than in the other Compound Ascidians is to be found in the evolution of the group. The Botryllidæ have probably sprung from the Simple Ascidians after these had acquired well-marked systems of respiratory vessels in their tests, while most of the other Compound Ascidians originated at an earlier point, while the vessels were still in the form of gemmiparous stolons (see under Phylogeny, below).

In those Distomidæ where the colony has become pedunculated (*e.g.*, *Colella*) the young Ascidiozooids are added at the base of the head, and those at the summit are the oldest; but in one species of the Polystyelidæ, *Goodsiria placenta*, the older Ascidiozooids seem to be next the peduncle, while the younger ones are at the upper end of the colony. In *Cœlocormus huxleyi* also the older Ascidiozooids seem to be in what must be regarded as the basal part of the colony. In all these cases the relative positions of the Ascidiozooids, and, to a certain extent, the shape of the colony, depend upon the method and the region in which gemmation is carried on.

Phylogeny.

The detailed investigation of the structure of the various groups of Simple and Compound Ascidians, and the consideration of their relationships, have gradually led me to the conclusion that the Ascidiæ Compositæ are polyphyletic in origin, being composed of several branches which have arisen from the Simple Ascidians at different times. Consequently, in order to explain the probable phylogeny of the Compound Ascidians, it will be necessary to refer to that of the Simple Ascidians discussed at the end of the first part of this Report.[2]

The ancestral Simple Ascidian there described, and which I regard as being also the common ancestor of all the Compound Ascidians, was probably derived from the Proto-Tunicata[3] after the separation of the Proto-Thaliacea and the primitive Appendiculariidæ (see fig. 11, p. 388). It was the first fixed Ascidian—the ancestral Tunicates, and the primitive Appendiculariidæ, Salpidæ, and Doliolidæ derived from them being all free

[1] See Herdman, On a New Organ of Respiration in the Tunicata, *Proc. Lit. and Phil. Soc. Liverpool*, vol. xxxix. p. 39, 1884–85.

[2] In vol. vi., 1882, part xviii. p. 285.

[3] For my views as to the origin of the Proto-Tunicata and their branches see A Phylogenetic Classification of Animals, Macmillan, 1885. A more detailed account of the probable phylogeny of the Tunicata, and of the relations of the Thaliacea to the other groups, will be given in the third and concluding part of this Report.