

The pyloric method of budding is seen in the Didemnidæ, and the buds are formed as enlargements upon the ends of long tubular projections from the body-wall in the region where the thorax joins the abdomen. Such projections have precisely the same structure as the vessels in the Botryllidæ, but of course differ from them in position.

In the Diplosomidæ, and some Didemnidæ, an interesting modification of pyloric budding is found, in which the new Ascidiozoid is formed of two buds¹ from the parent body, which give rise to the thorax and the abdomen respectively, and only unite late on in their development. Della Valle² has added considerably to our knowledge of this method of gemmation, and has shown that the thoracic bud is derived from the wall of the peribranchial cavity of the parent, while the abdominal bud is formed as a diverticulum from the œsophagus.

This author states that in the Botryllidæ buds are only formed from the parietal layer of the peribranchial membrane, and are never formed in connection with the vascular prolongations of the ectoderm as had been declared by previous investigators. I have been able to satisfy myself, however, that Della Valle is mistaken on this point, and that, in the case of one species at least (*Sarcobotrylloides wyvillii*, see p. 59), buds are formed in the dilatations on the vessels of the test (see Pl. IV. fig. 13), and therefore probably the observations of Milne-Edwards, Giard, and others, in which the "marginal tubes" were described as being connected with reproduction by gemmation, were perfectly correct.

Wherever it is formed, I believe that the bud always contains (1) a cellular coating derived from the ectoderm of the parent; (2) some mesoderm cells, usually in the form of young ova; (3) some endoderm cells, either in the form of a diverticulum from some part of the alimentary canal of the parent, or as a group of undifferentiated blood-corpuscles, which in the young animal are formed from the hypoblast. The young bud soon takes the form of two concentric cellular layers, the primitive ectoderm and endoderm, with a few mesoderm cells between. The endodermal sac then becomes constricted at two points so as to divide its cavity into three sacs, the middle one becoming the alimentary canal and the two others joining to form the peribranchial cavity of the adult. The primitive alimentary canal soon divides into a larger anterior part, the future pharynx or branchial sac and a smaller posterior region, the future stomach and intestine. The stigmata form as slits in the double membrane separating the lumen of the branchial sac from the peribranchial cavity, the intestine elongates, and other organs begin to make their appearance. The further course of the development of the bud differs somewhat in the different groups of Compound Ascidiæ.³

¹ According to Jourdain's recent researches, however (*Comptes rendus*, t. c. p. 1512, 1885), the two buds arise as a single outgrowth from the œsophageal region of the parent Ascidiozoid, and afterwards separate.

² Nuovi Contribuzioni alla Storia Naturale delle Ascidie Composte, *Reale Accad. dei Lincei*, Roma, 1881.

³ For further details of the process of gemmation in the genus *Collella*, see pp. 90 and 101.