

first appearance of the reproductive organs in the form of a few primitive ova placed dorsally and posteriorly, behind the branchial sac. The mass is of rounded form, and contains several young ova. (2) The formation of the intestine as an outgrowth posteriorly from the large branchial sac (mesenteron). It has the form of a short slightly curved blind tube (Pl. IX. fig. 9, *i*). (3) The union of the two lateral peribranchial spaces dorsally to form the future cloaca (Pl. IX. fig. 10, *p.br.*) Figure 9 represents a stage rather more advanced than figure 10. It shows the rectum leading up to the peribranchial cavity.

After this stage a gap occurs. With the exception of one specimen showing a transverse section through a branchial sac (Pl. IX. fig. 11) in which two rows of stigmata are already formed on each side and in which the endostyle is seen in the form of a pair of parallel folds, there are no further specimens till a stage is reached so far advanced that it can hardly be called a bud. It is a young Ascidiozoid (Pl. IX. fig. 12) with all its organs and four rows of roundish stigmata already formed. Its body is obscurely divided into the two regions of the adult Ascidiozoid, and, from the posterior end of the abdomen, the vascular appendage has begun to bud out. The position and destiny of this young Ascidiozoid will be discussed presently.

The preceding outline of the process of gemmation shows several points of interest, the first of which is the important position occupied by the vascular system in the formation of buds. In this respect, however, the present species does not stand alone, but resembles the Clavelinidæ amongst Ascidiæ Simplicis and *Didemnum styliiferum* (Kowalevsky), *Sarcobotrylloides wyvillii* and some other forms in the Ascidiæ Compositæ. The division of the archenteron into three longitudinal cavities, the two lateral being destined to form by their union dorsally the peribranchial cavity of the adult, seems to be a phenomenon of very general occurrence in Ascidian buds, and was described long ago by Metschnikoff in *Botryllus* and by Kowalevsky in *Perophora*, *Didemnum*, and *Amaroucium*. No transverse division of the buds such as takes place in *Botryllus* (Metschnikoff and Krohn), *Didemnum* (Kowalevsky), and *Amaroucium* (Kowalevsky) is met with in the present species.

In this case, as in others (see p. 59), I believe that it is possible to trace back the structures which enter into the formation of the bud to the two primary germ layers of the body of the adult Ascidiozoid. The wall of the vascular appendage which probably forms the outer layer of the bud is continuous with the mantle, and is therefore covered by ectodermal cells. The blood-corpuseles which lie in the vascular appendage and form the inner layer of the young bud are mesodermal cells. Now it has been shown by Kowalevsky and by E. van Beneden that in various Ascidians the mesoblast in the embryo is derived from the hypoblast.<sup>1</sup> Consequently the mesoblast cells, which become

<sup>1</sup> See also Seeliger, Zur Entwicklungsgeschichte der Ascidien, *Sitzungsb. d. k. k. Akad. d. Wiss. Wien*, Bd. lxxxv. Heft iv. p. 364, 1882.