

the inner vesicle, but near the point where the digestive tract is growing out.

It is quite probable that free cells of the blood also take part in the formation of all these organs, as appearances strongly indicate such an occurrence, but these cells themselves are derived from the inner vesicle, which is clearly seen to give them off into the body space, especially at very early stages.

The ectoderm, therefore, is not actively concerned in the bud development, but the duty of providing the material for the formation of all the internal organs devolves solely upon the inner or 'endodermal' vesicle.

*Notes on the Structure and Development of the Type of a New Family of so-called Social Ascidiæ from the Coast of California.* W. E. RITTER.

In its superficial characters the new form closely resembles *Clavelina*. Studied in detail, however, its affinities are found to be much closer with the *Polyclinidæ*, e. g., with the genus *Amaroucium*, than with *Clavelina*. The acidizoids are wholly distinct from one another, excepting for their attachment to a common basal stolon, as in *Clavelina*, and in form, size and color they closely resemble the zooids of some species of this genus, e. g., *C. savigniana* M. Edw.

They are flute-shaped, the attachment being at the small end. Their average length is about 3 cm. The colonies usually contain many zooids closely crowded together, as in *Clavelina*. But beyond this the distinctively clavelinian characters cease. The general features of the individual zooids are distinctly those of the *Polyclinidæ*. The body is divided into three well-defined regions: viz, the thorax, containing the branchial sac; the abdomen, composed mainly of the intestine; and the post-abdomen, containing the gonads and the heart.

In *Clavelina*, on the other hand, the

gonads are situated within the intestinal loop, and the heart along side of it—in other words, *Clavelina* has no post-abdomen.

Now it will be noted that the *Polyclinidæ* are entirely typical ascidiæ compositæ; i. e., not only does reproduction by gemination take place, but the blastozoids thus produced become closely crowded together and all wholly embedded in a common testicular mass.

This brief comparison will suffice to call attention to the fact, which becomes much more striking when the comparison is carried out in detail, that in the new form we have an ascidian which in the relation of the blastozoids to one another in the colony is strictly a so-called social ascidian, while in the structure of the individual zooids it is as strictly a compound ascidian.

Another illustration is thus produced of the artificiality of a classification of the tunicata which attempts to base primary subdivisions on the condition of the blastozoids of the colony as regards a common test-mass.

The characters which prevent the form from being admitted to the family *Polyclinidæ*, and make necessary the establishment of a new one for it, are founded in the structure of the gonads and the oviduct; the relations of the epicardiac tubes; and in the arrangement of the branchial tentacles.

The study of the embryology is still quite incomplete. The embryos are developed in a long expanded proximal portion of the oviduct which may properly be called a uterus. About a dozen embryos are found in each uterus, these being placed in a single row, usually with the oldest farthest forward and the youngest nearest the ovary, or farthest back.

The larval stage is much abridged, the metamorphosis of the nervous system being nearly complete before the larva leaves the parent. It is doubtful if there is any free-swimming tadpole stage at all.

Numerous amœboid cells are always present in the uterus among the embryos. These are probably concerned in the nutrition of the embryos, since they may be seen passing through the uterine wall, and the uterus is surrounded by a great quantity of cells filled with yellow granules, probably of food material.

Perhaps the most important developmental point thus far made out is that the peribranchial sacs arise as two well defined ectodermal invaginations on the dorsal side of the embryo.

The results, then, support the conclusions of Kowalevsky, Seeliger, Willey, Hjort and Caullery on this head, and oppose those of Della Valle, van Beneden et Julin, Pizon and Garstang, who hold, in one way and another, that these structures arise from the endoderm.

*Notes on Chelyosoma productum, Stimpson.* F. W. BANCROFT.

An examination of about 20 individuals in the collections of the University of California shows that this western ascidian is quite distinct from its Atlantic and Arctic representative, *C. macleayanum*. Stimpson describes the species as having the disk, which is characteristic of the genus, divided into fourteen plates; but in the individuals examined the number was found to vary from thirteen to twenty. This variability is associated with a muscular system that is quite different from what is found in the other member of the genus. In *C. productum* the systems of short muscles joining adjacent plates are wanting, except around the orifices, and are replaced by a series of fibres extending from near the center of the disk to its periphery and some distance down the sides of the animal. The method of attachment of these muscles is different from that described for any other ascidian. Both ends of every bundle of muscle fibres are firmly attached to little projections of

the inner surface of the test. On these the ectoderm is thrown into deep folds and pockets which greatly increase the surface of contact with the test, so that the muscles which are joined to the inner ends of the ectoderm cells cannot tear them away.

The matrix of the test, like that of some other tunicates, consists of an inner layer of cellulose and an outer one, very distinctly separated from it, which is not cellulose, and which corresponds to the 'yellow layer' of the early authors. In our species it is easily seen that this outer layer is formed from the cellulose matrix by the activity of the mesodermic bladder cells which the latter contains. The first traces of the 'yellow substance' are seen about isolated bladder cells near the outer layer, and all transitions can be traced from this stage until the cell and the yellow substance it has produced are incorporated into the outer layer. The other organs of *Chelyosoma* are of a less exceptional character and clearly show that it is more closely related to *Corella* than to any other genus.

*On the Plan of Development of a Myxinoid.* BASHFORD DEAN.

The marked dissimilarity in the development of *Bdellostoma* and *Petromyzon* was noted. In the former a large supply of yolk produces a merocytic condition at a very early stage; The head region of the embryo, appearing first, very much as in *Elasmo-* branches, takes its position near the animal pole; the body region is then laid down, apparently by concrescence, in an almost straight line extending in the direction of the yolk pole almost the entire length of the egg. The subsequent growth of the embryo constricts both head and tail from the yolk sac, and in very late stages an embryo of nearly two inches lies coiled within the egg. A preliminary study confirms Professor Price's observations as to the great number of gill slits.