peribranchial cavities form a continuous space in the interior of the body, opening externally by the branchial and atrial apertures, and traversed obliquely from the dorsal and anterior end to the ventral and posterior by a long narrow vascular band, which represents the dorsal lamina, the dorsal blood-vessel, and the neighbouring part of the dorsal edge of the branchial sac of an ordinary Ascidian. The alimentary canal is placed ventrally. It may either be stretched out so as to extend for some distance anteriorly, or—as is more usual—be concentrated to form along with the reproductive organs a rounded opaque mass near the posterior end of the body, known as the visceral mass or “nucleus.” The embryonic development is direct, no tailed larva being formed.

This sub-order contains two very distinct families, the Salpidæ, which are the typical members, and the Octacnemidæ, including a single very remarkable form *(Octacnemus bythius),* which in some respects does not conform with the characters given above.

The *Salpidæ* includes the single genus *Salpa* (Forskål), which, however, may be divided into two well-marked groups of species,—(1) those, such as *S. pinnata,* in which the alimentary canal is stretched out along the ventral surface of the body, and (2) those, such as *S. fusiformis* (fig. 14, A), in which the aliment­ary canal forms a compact globular mass, the “ nucleus,” near the posterior end of the body. About fifteen species altogether are known ; they are all pelagic forms and are found in nearly all seas. Each species occurs in two forms—the solitary asex­ual (*proles solitaria)* and the aggregated sexual *(proles gregaria)—*which are usually quite unlike one another. The soli­tary form (fig. 14, B) gives rise by internal gemmation to a complex tubular stolon, which contains processes from all the more important organs of the parent body and which becomes seg­mented into a series of buds or embryos. As the stolon elongates, the embryos near the free end which have become advanced in their deve­lopment are set free in groups, which remain attached together by processes of the test, each enclosing a diverticulum from the mantle so as to form “chains” (fig. 15). Each member of the chain is a *Salpa* of the sexual or aggregated form, and when mature may—either still attached to its neighbours or se­parated from them (fig. 14, A)— produce one or several embryos, which develop into the solitary *Salpa.* Thus the two forms alter­nate regularly. The more import­ant points in the structure of a typical *Salρa* are shown in fig. 16. The branchial and atrial apertures are at opposite ends of the body, and each leads into a large cavity, the branchial and peribranchial sacs, which are in free communica­tion at the sides of the obliquely- running dorsal lamina or “gill.” The test is well developed and adheres closely to the surface of the mantle. The muscle bands of the mantle do not completely encircle the body. They are present dorsally and laterally, but the major­ity do not reach the ventral sur­face. In many cases neigh­bouring bands join in the med­ian dorsal line, (fig. 14). The anterior end of the dorsal la­mina is pro­longed to form a prominent tentacular organ, the languet, pro­jecting into the branchial sac. The nerve ganglion, subneural gland, dorsal lamina, peripharyngeal bands, and endostyle are placed in the usual positions. A pigment spot and an otocyst are found in connection with the ganglion. The large spaces at the sides of the dorsal lamina (often called the gill or branchia of *Salpa),* by means of which the cavity of the branchial sac is placed in free communication with the peribranchial cavity, are to be regarded as gigantic stigmata formed by the suppression of the lateral walls of the branchial sac. Fig. 16 represents an aggre­gated or sexual *Salpa* which was once a member of a chain, since it shows a testis and a developing embryo. The ova (always few in number, usually only one) appear at a very early period in the developing chain *Salpa,* while it is still a part of the gemmiparous stolon in the body of the solitary *Salpa.* This gave rise to the view put forward by Brooks (*25*), that the ovary really belongs to the solitary *Salρa,* which is therefore a female producing a series of males by asexual gemmation, and depositing in each of these an ovum, which will afterwards, when fertilized, develop in the body of the male into a solitary or female *Salpa.* This idea would of course entirely destroy the view that *Salpa* is an example of alterna­tion of generations. The sexual or chain *Salpa,* although really hermaphrodite, is always protogynous : *i.e*., the female elements or ova are produced at an earlier period than the male organ or testis. This prevents self-fertilization. The ovum is fertilized by the spermatozoa of an older *Salpa* belonging to another chain, and the embryo is far advanced in its development before the testis is formed. At an early period in its development a part of the embryo becomes separated off, along with a part of the wall of the cavity in which it lies, to form the “ placenta,” in which the embryonic and the maternal blood streams circulate in close proximity (or actually coalesce during one period) and so allow of the passage of nutriment to the developing embryo. At a somewhat later stage a number of cells placed at the posterior end of the body alongside the future nucleus become filled up with oil-globules to form a mass of nutrient material—the elæoblast—which is used up later on in the develop­ment. Many suggestions have been made as to the homology of the elæoblast. The most probable is that it -is the disappearing rudiment of the tail found in the larval condition of most Ascidians.

The family *Octacnemidæ* includes the single remarkable form *Octacnemus bythius,* found during the “ Challenger ” expedition, and first described by Moseley *(29).* It is apparently a deep- sea representative of the pelagic *Sal­pidæ,* and may pos­sibly be fixed. The body is somewhat discoid, with its margin prolonged to form eight taper­ing processes, on to which the muscle bands of the mantle are con­tinued. The ali­mentary canal forms a compact nucleus (fig. 17) ; the endostyle is very short ; and the dorsal lamina is apparently absent. The re­production and life-history are entirely unknown.

Order III.—ASCIDIACEA.

Fixed or free-swimming Simple or Compound Ascidians which in the adult are never provided with a tail and have no trace of a notochord. The free-swimming forms are colonies, the Simple Ascidians being always fixed. The test is permanent and well developed ; as a rule it increases with the age of the individual. The branchial sac is large and well developed. Its walls are per­forated by numerous slits (stigmata) opening into the peribranchial cavity, which communicates with the exterior by the atrial aperture. Many of the forms reproduce by gemmation, and in most of them the sexually-produced embryo develops into a tailed larva.

The *Ascidiacea* includes three groups,—the Simple Ascidians, the Compound Ascidians, and the free-swimming colonial *Pyrosoma.*

Sub order 1.—Ascidiæ Simplices.

Fixed Ascidians which are solitary and very rarely reproduce by gemmation ; if colonies are formed, the members are not buried in a common investing mass, but each has a distinct test of its own. No strict line of demarcation can be drawn between the Simple and the Compound Ascidians, and one of the families of the former group, the *Clavelinidæ* (the Social Ascidians), forms a transition from the typical Simple forms, which never reproduce by gemmation, to the Compound forms, which always do (see p. 618 below). The *Ascidiæ Simplices* may be divided into the following families :—

Family I.—Clavelinidæ. Simple Ascidians which reproduce by gemmation to form small colonies in which each ascidiozooid has a distinct test, but all are connected by a common blood-system.