visceral mass may be transferred to the inner surface of the mantle, referred to above. If not, it is discharged through the branchial siphon on the contraction of the adductor muscles.

(3) Gills, as is well known, collect matter and conduct it forward along a ventral groove to the palps.

(4) The inner surfaces of the palps bear ciliated ridges. In a peculiar manner, the cilia of the ridges drive particles to the mouth. Around the entire margin of the palp is a tract on which the ridges do not extend. Its cilia swiftly carry matter away from the mouth, throwing it off from the posterior, free tips of the palp, into the branchial chamber. Eventually this may be discharged from the body as previously described. By muscular movement these edges may be applied to any surface within reach, sweeping it clean of particles which it may be bearing, and casting the material into the branchial chamber.

In *Yoldia*, which lives in soft mud, the mechanism of the palp, though it performs the same general function, is very much more complex. The plate gills, also, which collect particles with amazing swiftness, may, if desirable, transfer them to the palps, or may be rid of the material by allowing it to pass up through a peculiarly constructed passageway between two plates to the epibranchial chamber, whence it is carried from the body by the stream of water continually being discharged through the epibranchial chamber.

This mechanism is very different in different forms, due to structural peculiarities of regions bearing cilia, and to the habits and needs of various species. We have facts sufficient to show that, without hindrance to the respiratory processes, Pelecypods have the power of collecting food by means of a very complex mechanism; or at will, through the muscular movement of certain ciliated surfaces, of removing any material which it may be desirable to prevent from entering the digestive tract. Data is being collected for a description of this mechanism in as many species as possible.

Observations upon the development of Phascolosoma. J. H. GEROULD.

The forms that were used for investigation were *Phascolosma gouldii*, *Ph. vulgare* (Blainv.) and *Ph. elongatum* (Keferst.) The ova which are ready for maturation are swept into the nephridia by the action of the cilia of nephrostome and of the internal surface of the nephridium. The eggs that are found within the nephridia, prior to their ejection through the nephridiopore, have the spindle of the first polar globule with ten rod-shaped chromosomes already formed. The astrosphere of the male pronucleus precedes the nucleus in the migration of both toward the center of the cytoplasm; it usually divides before the union of the two pronuclei. The segmentation nucleus contains twenty chromatic filaments which split longitudinally.

The alternating directions of the cleavage planes as far as forty-eight cells are identical with those in corresponding stages in the eggs of annelids, most molluscs, etc. The most striking peculiarity in *Phascolosoma* is the large size of the first set of 'micromeres,' which in quadrants *A*, *B* and *C* are distinctly larger than their sister cells at the vegetative pole. The 'macromeres' throughout the course of cleavage are of small size.

The mesoderm is derived from d^4, which in the one instance observed divided in harmony with the regular alternation in direction; its posterior derivative divided immediately to form a second mesoblast. In the divisions of the cells of the somatic plate deviations from the rule of alternation in the direction of cleavage were observed.

The rosette, cross and intermediate cells

are established when the egg has only forty-eight cells. The rosette cells are very large; and the ciliated prototroch, which consists of sixteen cells, derived from the first set of 'micromeres,' forms a complete girdle around the egg.

A typical trochophore is formed, of which the plane of bilateral symmetry corresponds to a vertical plane bisecting *B* and *D* of the four-celled stage. A postoral circlet of strong cilia appear at a short interval behind the prototroch, and a long tuft of flagella is still earlier developed upon the apical plate. There is no true paratroch. Eye spots are present, and trochophores and larvæ are positively phototactic.

No traces of metameric segmentation manifest themselves throughout the course of development, which was observed continuously until the young worms had reached the age of seven weeks. This and certain other embryological facts seem to indicate that the *Gephyrea* are somewhat more closely related to the *Platyhelminthes* than to the *Annelida*.

Notes on the structure of Alma nilotica, a gilled earthworm from Egypt: P. M. Rea.

Alma nilotica Grube, has been known since 1855, but has never been thoroughly investigated. Its systematic position is uncertain, but the present research shows conclusively that it is an Oligochaete having many of the characteristics of the Geoscolicidae. The possibility of the identity of this form with the genus *Siphonogaster* of Levinsen increases the interest of this remarkable worm. The material available at present is sexually immature, but it is hoped that specimens collected in the spring will determine this point. A pair of ovaries has been demonstrated in segment 13 and testes in 10 and 11, but no evidence of the enormous penial processes of *Siphonogaster*.

The gills, which are the most characteristic feature of the worm, are out-pocketings of the body wall, taking with them the layer of circular muscles but leaving the longitudinal muscles behind. They are provided with afferent and efferent blood vessels. The epithelium of the gills and whole body surface is highly vascular. The dorsal blood vessel extends no farther forward than the seventh segment, where it ends abruptly in the most anterior pair of hearts. There is a supra-œsophageal vessel and two remarkable lateral vessels which will be more fully discussed in a later paper. Connected with the lateral vessels are numerous spherical acini, closely approximated to the inner surface of the body-wall, which appear to be identical with the structures figured by Perrier as occurring on the walls of the œsophagus in Perichaeta.

On the life history of Autolytus cornutus and alternate generation in annelids: P. C. Mensch.

The claim for alternate generation in annelids arises from investigation on the Syllidians, chiefly *Autolytus*. It was first suggested by Quatrefages and Krohn, but for the first time fully described by A. Agassiz for *Autolytus cornutus*. Agassiz regarded the parent stock as distinctly asexual and in this manner described a true alternate generation—the asexual parent stock alternating with sexual stolons.

The asexual condition of the parent stock is, however, not constant and the percentage of parent stocks with sexual products is sufficiently great to strongly indicate that the presence of reproductive products toward the close of the phenomenon of budding is a constant stage in the life-history of this Syllid. This being the case there would be, not an alternation of generation but at most only a sexual dimorphism.

Another aspect of this question is presented by the morphological characters of the stolon itself, in that the stolon does not