places, one transverse and the other somewhat oblique. $\times \frac{50}{1}$.

4 *e*. One of the bristles of the embryo, highly magnified.

Fig. 5. *Hormurus australasiæ.*

5 *a*. Ventral view of anterior part of embryo. The cheliceræ are concealed by the large chelæ. $\times \frac{30}{1}$.

5 *b*. Transverse section through distal part of chelæ and the secreting cells (*sc*) surrounding them. *sc'*, dorsal secreting cells. $\times \frac{125}{1}$.

Fig. 6. *Palamnæus Thorellii.* Dorsal view of embryo $\times \frac{10}{1}$.

XVIII.—*On the Synascidia of the Genus* Colella *and the Polymorphism of their Buds.* By M. Maurice Caullery*.

The genus *Colella*, created by Herdmann for the Synascidia collected by the 'Challenger' expedition, belongs to the family of the Distomidæ, and is very nearly related to *Distaplia*.

Among the compound Ascidians in the Museum, the study of which has been entrusted to me by M. Edm. Perrier, there are a certain number of representatives of this genus, some of them from Australia ('Astrolabe' expedition), others from Cape Horn. Thanks to this material, I have been able to obtain a certain number of facts connected with the anatomy, relationships, and blastogenesis of these animals, which I shall set out later in detail. Here I shall only point out the following:—

(1) The species which I have had under examination present all four rows of pores. A specially characteristic arrangement is to be noticed: the second and the third row separate one from the other in the portion near to the endostyle in such a manner as to leave between them a triangular space, not perforated by pores. The pores are not divided into two halves by a transverse band, as in the *Distaplia*. These two characters appear to me to be very suitable as a definition of the genus *Colella*.

(2) The examples of Corms which I have examined are unisexual, a fact already determined by Herdmann for several species; further, in a female Corm the buds only present ovules, in a male Corm only spermatic vesicles; so that, so far as the material at my disposal would allow me to do so, I conclude that there is for each Corm a defined sexuality,

* From the 'Comptes Rendus,' tome cxxii. 1896, pp. 1066-1069.

persistent at least during a certain number of blastogenetic generations, as I have already noticed in *Distaplia magnilarva*.

(3) The facts observed lead me to consider the origin of the buds as identical with that described by Kovalewsky, Della Valle, and Salensky in *Distaplia*. I have seen nothing which can allow one to admit a budding at the expense of the inferior ectodermic prolongation of individuals, as Herdmann believed to be the case.

But I wish to insist especially upon a curious peculiarity of the buds in a group of species. They are those in which the Corm is composed of a more or less globular head, borne upon a long peduncle, in such a way that the whole reminds one somewhat of a mushroom.

On studying the peduncle it is seen that at the periphery the cell-structure of the tunic is compact and resistant, whilst in the central region it is composed of large vesicular cells, so common in other Tunicata. It is this central region which contains the buds, often packed in great numbers and pressed one against the other. It would appear that, when the evolution of a generation is ended, the globular terminal portion of the Corm where it occurs may be cut off, and that the peduncle regenerates a new head by the development of the buds which it contains. An examination of the buds in different portions *of the same* Corm reveals the following facts :—

(*a*) In the immediate neighbourhood of the head of the Corm buds are to be found in every stage of development, recalling very much by their structure those of *Distaplia* and containing no reserve material. The external vesicle of these buds is formed by an epithelium, which is very flat and thin. The oldest of these buds penetrate into the head of the Corm.

(*b*) On the contrary, in the parts of the peduncle distant from the head of the Corm the buds, at the beginning of their development, have the appearance externally of eggs rich in vitellus. On studying them one observes that at the centre a group of cells, deprived of reserve material, is to be found, corresponding with the internal vesicle and the mesenchymatous cells of the buds *a*, and that all the reserve material, the appearance and reaction of which are those of vitellus, is accumulated in the cells of the external vesicle. The relations of size of the central mass and of the ectodermic layer so modified are often those of the germinative vesicle and the entire egg in a compound Ascidian at the moment when the germinative vesicle is most developed. These buds very

probably remain for a very long and variable time before evolution takes place. In the development all the organs are formed at the expense of the internal cells, the ectoderm charged with reserve material being a simple envelope, of which the thickness diminishes gradually.

It would be very interesting to study minutely the organogenesis in these buds *b*, and to compare it with that of the buds *a*. I have not been able to carry it out so fully as I desired, the presence of the vitellus rendering it difficult to prepare sections of material already stale and not preserved in the special manner required for histological investigation. Nevertheless, from the facts observed I can conclude with all but perfect certainty that the organogenesis is the same in the two cases. Further, there exist between the extreme types of bud transitional forms in which the reserve material is more or less abundant.

This example of the polymorphism of buds appears to me to be very interesting for the following reasons :—

1. It is the property of a special form of Corm ; I have not observed it in the species in which the peduncle is not sharply separated from the part which contains the adult ascidiozooids. The buds loaded with reserve material are those which, by their position, do not develop immediately. It appears that they can pass through their various stages by themselves ; now it is probable that they regenerate the colony when the head is amputated, and it would be very curious to produce wounds upon these forms in the living state *—to destroy the head, for example, and study the subsequent behaviour of the peduncle. I would also recall the fact that this tendency is analogous to others presented by certain compound Ascidians at the time of hibernation.

2. These facts seem to me to be specially important in the general history of budding in the Ascidians. The external wall of the bud arises always from the ectoderm of the parent, and the internal vesicle is in general of endodermic origin. A study of the blastogenesis shows, however, that it is this internal vesicle which furnishes all the organs of the blastozooid, even those, such as the peribranchial cavity and the nervous system, which, in the oozooid, were ectodermic. The external vesicle is reduced to the *rôle* of integument. Here we see it charged with reserve material—a remarkable fact, seeing that in general the reserves localize themselves in the endodermic and mesodermic tissues. But this new function

* Unfortunately, so far as at present known, they are confined to the seas south of the Equator.

appears to me to be further in accord with the fact that this tissue has, in the allied forms, lost all organogenetic power, this having passed entirely to the internal vesicle. The accumulation of vitelline reserve in the cells of this wall would be a new step in this modification of the ectodermic layer in the phylogenic series of blastogenesis.

3. This variability in the bud, lastly, recalls, without being identical, the phenomena classed by Giard under the name *pœcilogony*.

XIX.—*Budding in* Perophora. By W. K. Brooks and George Lefevre *.

(Abstract of a paper presented to the National Academy of Sciences, April 23rd, 1896.)

In the 'Johns Hopkins University Circulars,' no. 119, June 1895 †, the junior author of this paper published a short note on the budding of *Perophora viridis*, Verrill. From a further and more exhaustive study of the subject we have since arrived at fuller and more detailed results than those obtained at that time, and now give in brief a summary of the chief points in the budding of this Ascidian, in anticipation of the complete paper, which will appear shortly.

The material which has been at our disposal was obtained at Beaufort, N. C., and at Woods Holl, Mass., and contained an unlimited supply of buds. The results are based on a study of an uninterrupted series of stages of both serial sections and buds mounted as total preparations.

The buds are formed in a single row on one side of the branching stolons, and always arise in the plane of the stolonic double-walled partition, which divides the cavity of the stolon longitudinally into two compartments or sinuses. The latter contain the free cells of the blood and are in open communication at all times with the body-cavities of the buds, so that a free circulation of blood is kept up from the one to the other.

The definitive median sagittal plane of the bud coincides with the plane of the stolonic partition, and therefore the latter structure divides the stolon into a right and left half in reference to the parts of the bud.

* From the 'Johns Hopkins University Circulars' for June 1896, pp. 79–81.

† Reprinted in the 'Annals' for 1895, vol. xvi. p. 213.