

Clay near Chippenham, and is described in the Ann. & Mag. Nat. Hist. (ser. 2, vol. iv. p. 172), having been previously named by Mr. Pearce *Ammonicolax longimanus*, and considered by him to belong to the hermit-crabs. The specimen figured on plate 204 is the *Meyeria vectensis*, Bell (Pal. Soc. 1862, pl. x.), the *Meyeria magna*, M'Coy. Without any pretensions to be a scientific treatise, the 'Note-Book of an Amateur Geologist' must be regarded as a useful, if not a necessary, appendage to other geological works, in affording a series of accurate sketches of the more interesting geological facts and phenomena collected by the author during many years of travel, and which, with the accompanying descriptive notes, may be considered worthy of being permanently recorded.

MISCELLANEOUS.

On the Embryogeny of the Ascidians of the Genus Lithonephria.

By M. A. GIARD.

The Ascidian that forms the subject of this note is very common at Wimereux on the lower surface of stones. It is very nearly allied to *Lithonephria complanata*, Alder and Hancock, and *L. decipiens*, Giard, but differs from the latter in its tadpole, which never presents prolongations similar to those of the embryos of the *Molgulæ*. I believe it to be identical with *L. eugyranda* (*Ctenicella*), Lac. Duth. The study of its embryogeny is facilitated by a physiological peculiarity which is rare in the simple Ascidians: the ova are incubated in the progenitive organism; so that we find a great number of different stages of evolution in a single individual.

I have resumed upon this species the investigation of the singular productions which issue from the ovum before the segmentation, and have received the name of *cells of the green layer*, or *granulosa-cells*. These observations absolutely confirm those I made some years ago upon the ovarian ova of *Molgula socialis* and several other simple Ascidians*.

The *granulosa-cells*, without any possible doubt, have an origin exterior to the ovule; they have emigrated from the follicle, or even from some other part of the ovary, and penetrated very early into the vitellus; they are by no means derived from the germinal vesicle, which takes no part in this process. The migratory cells bury themselves deeply in the vitellus, and may even apply themselves to the germinal vesicle; they are always easily discovered by means of very dilute acetic acid. These cells soon become inflated, present a distinct wall, and their contents divide into two, four, and six protoplasmic masses; then the wall disappears, and these masses are by degrees expelled at the surface of the ovum at the moment when, the latter being mature, we see the contractions of the vitellus commence. The action of acids forwards the expulsion of

* Association Française, Montpellier, 1879, p. 768.

the nuclei and the formation of the *granulosa*. I can only compare this series of phenomena to the migrations observed by Pflüger and Lindgren in the cells of the *granulosa* of the higher Vertebrata.

The presence of an abundant nutritive vitellus (of an orange colour) gives rise in our *Lithonephria* to a remarkable condensation of the embryogeny. I shall indicate only two particularly interesting stages.

At the stage VIII. the ovum presents four coloured endodermic cells and four colourless exodermic cells, arranged as in typical cases of epibolism.

At the stage XXXII., and even earlier, the ovum clearly displays the bilateral symmetry of the adult; at the nutritive pole we see six endodermic blastomeres, two large and four smaller ones. At the base of the two large ones six mesodermic blastomeres form a half-equator: three mesodermic spheres are situated to the right of the plane of symmetry, and three to the left; the spheres increase in size from this plane.

At the formative pole twenty cells constitute an exodermic hemisphere: twelve are arranged in two series of six on either hand of the meridian of symmetry; the others form two groups of four cells each, occupying the free space to the right and left between the endoderm and the exoderm.

The study of the segmentation shows that the six mesodermic blastomeres are derived from two spheres which themselves issue from the endoderm, and are situated symmetrically with relation to the median plane at the point of junction of the endoderm and exoderm.

The six mesodermic cells are afterwards covered by the exodermic cells in consequence of the progress of the epibolism; they also become more numerous; the half circlet contracts and acquires the form of a horseshoe. This is the rudiment of the chorda, so characteristic that it has struck all the authors who have paid attention to the embryogeny of the Ascidians; but in the ova with equal segmentation this rudiment appears much later.

I have often insisted upon the point that, in unequal segmentation from the stage IV., the ovum at the stage VIII., which is *physiologically* a *morula*, *morphologically* represents a *gastrula*. In the case now before us the ovum at the stage XXXII. is still *physiologically* a *morula*; *morphologically* it already possesses a middle layer (solid mesoderm), and represents a much more advanced stage of the Ascidians with dilated embryogeny. The embryogenetic condensation might therefore be defined *an advance of the morphological upon the physiological state of the embryo*.

Here, as in all known cases, the *solid mesoderm* produced by two cells derived from the endoderm at the periphery of the prostoma (circle of contact of the exoderm and endoderm) appears before the cavitary mesoderm (enterocœle, cœloma, &c.). The former gives origin to the skeletal and muscular organs; the other forms principally the hæmatic apparatus and the serous membranes properly so called.

As I have indicated elsewhere, striated muscular fibre cannot suffice to characterize either mesoderm, since, in the Tunicata, this element is met with at the same time in the tail of the tadpole and in the cardiac muscular layer (*Perophora*, *Phallusia*, *Ciona*).—*Comptes Rendus*, June 6, 1881, p. 1350.

North-Atlantic Echinodermata.

By MM. D. C. DANIELSSEN and J. KOREN.

MM. Danielssen and Koren describe some Starfishes collected in the late Norwegian expedition for the exploration of the North Atlantic.

1. *Asterias spitsbergensis* is a new species, of which several specimens were taken in Magdalena Bay, Spitzbergen, at a depth of 61 fathoms, on a bottom of dark grey clay, at a temperature of $2^{\circ}\cdot 1$ C. ($=35^{\circ}\cdot 8$ F.). At the first glance it resembles *Stichaster roseus*; and in the structure of the dermal skeleton it presents characters approaching both *Stichaster* and *Asterias*, so that the authors were in some doubt to which of these genera it should be referred.

Asterias spitsbergensis has five arms; and the smaller is to the greater radius as $1:4\frac{1}{3}$. The arms are rather thick, not much constricted towards the base, somewhat obtuse at the apex, very convex on the back and sides, where they are beset with spines, which form regular longitudinal series on the sides, and irregular transverse rows on the back. Between the spines, both on the disk and arms, the skin is naked and occupied by tentacular pores. The lower surface is flat. The spines on the disk are larger and smaller; in the middle they are grouped circularly round the central anal aperture. The madreporic plate is oblong, very small, placed immediately above the angle of the arms, immersed in the skin and surrounded with spines. Ambulacral furrows bounded by three rows of strong spines, one turned in towards the furrow, another turned outwards, while the middle row has fewer spines, the ambulacral plates bearing alternately two and three. Outside the outer row is another series of spines, nearly as large as those of the furrow. These are surrounded by pedicellariæ on the outside of the base, while the innermost row has them on the inside; and beyond the outer row, more towards the dorsal surface, there are two rows of small spines also surrounded by pedicellariæ. The disk has no pedicellariæ; but the arms are covered with such organs of different forms. Towards the ambulacral furrows the calcareous pieces of the dermal skeleton become more regular in form and arrangement than elsewhere; they form two distinct longitudinal rows, and are imbricated. Those of the inner row are triangular, and have their inner margin in contact with two ambulacral and two adambulacral plates; their outer surface bears the spines forming the first row outside the furrow. They may be regarded as ventral marginal plates. The outer row are nearly T-shaped; their broad part is in contact with the ventral marginal plates, which they partly cover. They may be regarded as dorsal marginal plates, and bear two



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