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4. The Cleavage of the Ovum in Crepidula fornicata.

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eingeg. 7. März 1892.

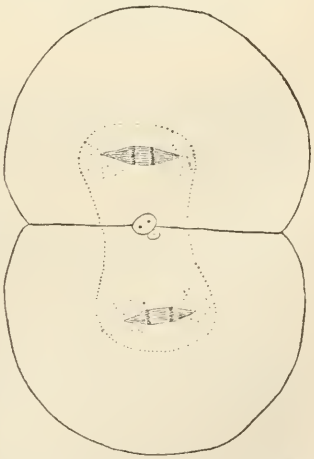
A preliminary note on the embryology of *Crepidula* was published in the Johns Hopkins University Circulars No. 88. The present paper sets forth a few facts which are not mentioned in that article or were but briefly alluded to. It will be followed shortly by a more extended paper on this subject.

This work was conducted during two summers (1890—91) at the laboratory of the U. S. Fish Commission at Wood's Holl, Mass., and during the intervening winter in Prof. Brooks' laboratory at the Johns Hopkins University.

The adult *Crepidula* is fastened to a shell or stone or some other object by its broad flat foot which is slightly concave and forms a powerful sucker. It never moves about upon this object but remains its whole life long in the same position. If forcibly removed from its support it is helpless and dies apparently without making an effort to again attach itself. Young Crepidulas however move about quite freely and if detached can easily attach themselves again.

The eggs are laid in pouches which are fastened together and attached to the object upon which the parent lives just in front of the foot and under the shelter of the shell. Here they are aërated by currents of water which are swept into and out of the branchial chamber. About 50 eggs are laid in each pouch almost all of which develope normally, only a few developing into abnormal embryos, the so called »cosmellae«.

Fig. 1.



The method of determining the relation of the first cleavage furrow to the axes of the embryo is so far as I know a novel one and I shall therefore describe it at some length. After the appearance of the first furrow the ovum when seen from the animal pole appears as in Fig. 1 the cleavage furrow being a straight line. As the second furrow begins to appear the two blastomeres become indented at their outer sides and at the same time the first furrow is bent at its middle toward the right, Fig. 2 (the first furrow being in the line of vision). Then as the second furrow approaches completion this bend in the middle of the first furrow increases and the two

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halves of the second furrow unite with the angles which this bent portion makes with the rest of the first furrow (Fig. 3).

In this way the »Querfurche« of Rabl or the »Brechungslinie« of Rauber is formed. It will be observed that this »cross furrow« always bends to the right when the first furrow is in the line of vision and to the left when the second furrow is in that position. Since these relation do not change in the course of development and since the first two furrows with the »cross furrow« are visible until near the closure of the blastopore it becomes easy to orient these furrows with reference to the axes of the embryo. In this way it is found that the first furrow is transverse to the long axis of the embryo and divides the egg into an anterior and a posterior half, while the second furrow lies in the

Fig. 2.

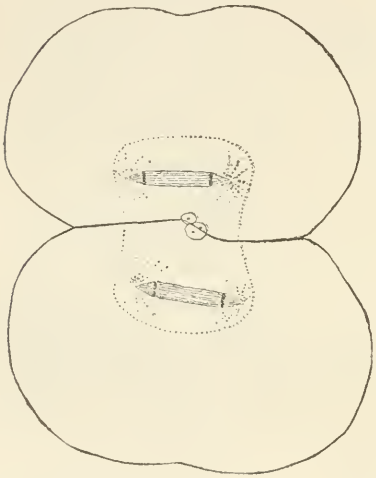
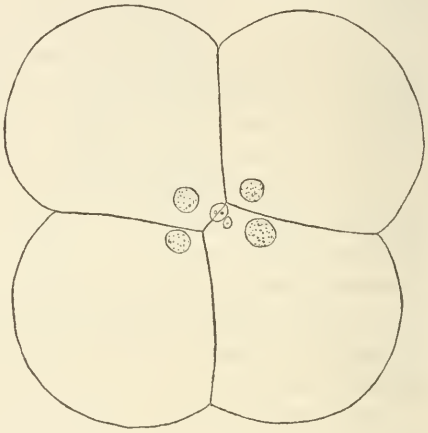


Fig. 3.



long axis and divides the egg into right and left moieties. (In a former communication already referred to a view the reverse of this was expressed the error having arisen from mistaking the vegetative for the animal pole.)

Each of the four macromeres formed by the first two cleavages contains the elements of both ectoderm and endoderm altough only the left posterior macromere contains mesoderm.

The whole of the ectoderm is separated from the macromeres in three divisions of four cells each. Soon after the ectoderm has been thus separated and at the stage when there are 20 ectoderm cells the left posterior macromere divides forming a primary mesoblast which comes to lie at the posterior end of the second furrow and from which all the middle layer is derived. The residue of the four macromeres

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forms the whole of the endoderm. Each of these macromeres save the left posterior one gives rise to a smaller endoderm cell one of which comes to lie at the anterior end of the median furrow while the other two lie at both ends of the transverse furrow. These cells correspond in origin and position to the primary mesoblast; the latter however unlike the smaller endoderm cells divides into a right and a left half and each moiety proliferates cells forming a short mesoblastic band (Figs. 4 and 5).

Four characteristically arranged ectoderm cells occupy the center of the ectodermic area and when 36 ectoderm cells have been formed these four central cells form the center of a cross of ectoderm cells. One arm of the cross is anterior, one posterior, one right and one left. In further development all the arms lengthen and all save the posterior divide longitudinally into two parallel rows of cells (Fig. 5).

Fig. 4.

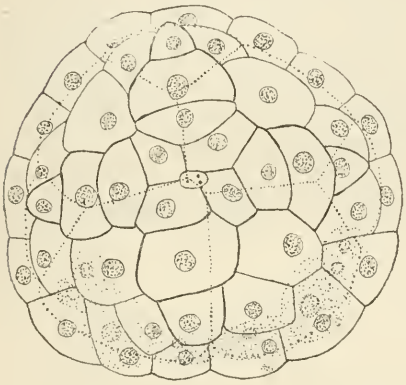
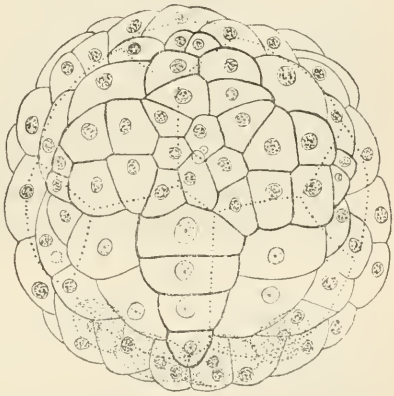


Fig. 5.



The cells of the posterior arm enlarge greatly and are carried forward until they lie over or even anterior to the cross furrow while the point at which the polar bodies are attached (the center of the cross) is carried forward through an angle of about 90° so that it finally lies at the anterior end of the long axis of the embryo. The position which the polar bodies first occupied (immediately over the cross furrow) coincides with the middle of the dorsal area while the ectoderm cells which immediately surround the ectoderm pole are carried forward until they lie at the cephalic pole of the embryo. The endoderm seems to take no part in this shifting and the ectoderm on the posterior side of the ovum is not shifted forward but grows around in the opposite direction. There is thus a stationary point in the ectoderm on the

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posterior side of the ovum in front of which the ectoderm cells are shoved forward, and back of which they are shoved backward and downward. This stationary point coincides very nearly with what is later the region of the shell gland.

An elongated blastopore is formed on the ventral side. It closes posteriorly more rapidly than anteriorly, though later it closes entirely leaving only a small depression where finally the mouth is formed.

5. Ein neuer Pleuroxus.

Von Ed. Klocke, Münster i. W.

eingeg. 10. März 1892.

Nachdem ich die Cladoceren Westfalens in faunistischer Hinsicht bearbeitet habe [1], beabsichtige ich dieselben noch systematisch geordnet darzustellen. Ein hauptsächliches Gewicht werde ich dabei auf die Abbildungen legen und keine Art beschreiben, ohne ihr Bild und das ihrer Varietäten zu bringen. Als Vorläufer der Arbeit sei der vorliegende Aufsatz vorausgeschickt, in dem ich die Beschreibung eines neuen *Pleuroxus* gebe. Im letzten Theil habe ich noch Einiges über Varietätenbildung im Allgemeinen erwähnt, wodurch sich vielleicht einige der Herren Fachgenossen veranlaßt sehen, auch ihrerseits derselben bei Cladoceren etwas Aufmerksamkeit zu widmen.

Im December 1891 erbeutete ich in dem Graben, welcher sich um das Schloß Wilkinghege unweit Münster hinzieht, leider nur in

Fig. 1.

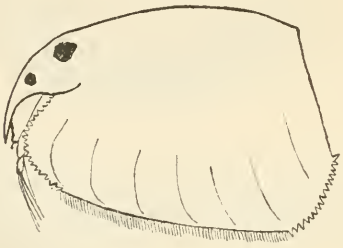
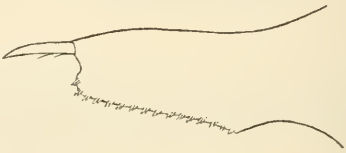


Fig. 2.



einem Exemplare eine Cladocere von so eigenthümlicher Gestalt, daß es sich wohl verlohnt, dieselbe näher zu betrachten.

Auf den ersten Blick sieht man, daß die neue Form dem *Pleuroxus truncatus* O. F. Müller sehr nahe steht und eine genaue Untersuchung zeigt uns sogar, daß wir es, trotz der auffälligen äußeren Verschiedenheit, nur mit einer Varietät dieser Art zu thun haben. Wie die Ab-

[1] Jahresbericht der zoologischen Section des Westfälischen Provinzial-Vereins für Wissenschaft und Kunst für das Etatsjahr 1891—92. Münster i. W. 1892. (Erscheint im Juni 1892.)

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