and the structure of the parts of the mouth and the limbs, as well as the relative number of the segments, may have been very different (leaving quite out of consideration the very different form of the extremity of the abdomen).—*Anzeiger d. k. Akad. Wiss. Wien*, December 13, 1888, p. 247.

On the Formation of the Antherozoids of the Characeæ.

By M. LÉON GUIGNARD.

The antherozoids of the Characeæ, Muscineæ, and vascular Cryptogamia have the form of a spiral filament furnished with cilia, originating by special metamorphosis of the contents of the mother-cell. In its formation the nucleus of the mother-cell plays an essential part; it does not dissolve, as was at first supposed, but concurs directly in furnishing the body of the antherozoid, while the cilia proceed solely from the protoplasm.

But is the body of the antherozoid solely derived from the nucleus or both from the nucleus and the protoplasm? If it is furnished by the nucleus alone, nourished by all the portion of the protoplasm which is not employed in the formation of the cilia, how is this metamorphosis effected? If, on the contrary, the protoplasm furnishes a portion of the body, does the differentiation of the spiral filament commence at the expense of the protoplasm and not of the nucleus, as has recently been asserted? Lastly, how and at what moment do the cilia originate? These are so many general questions upon which the extant data are insufficient or contradictory.

By a comparative study of the various groups of Cryptogamia the author has been enabled to clear up the doubtful points, and has arrived at results the agreement and generality of which render them interesting. In the present note he deals with the Characeæ.

In these plants the antheridian filaments are formed of superposed discoidal joints, which represent the mother-cells of the antherozoids. To ascertain the parts played by the nucleus and protoplasm in the formation of the latter these cells must be dissociated and their contents carefully isolated after fixation and hardening. By various methods of double coloration the substance of the nucleus may be very clearly distinguished from that of the protoplasm, and all stages of the development may be followed step by step.

At the moment when the antherozoid is about to originate the nucleus moves to the side of the mother-cell, so that its outer surface is only covered by a very thin layer of hyaline protoplasm. On this outer surface a small thickening-band afterwards appears, more refractive than the rest of the nucleus which produces it by a special metamorphosis of its substance. This band forms part of the nucleus without producing a salient crest on its outer surface, and following its contour it resembles a short and very open crescent.

One of its extremities soon becomes elongated and touches on the surface of the protoplasm; the nucleus then seems to be provided with a sort of beak, which is really the anterior extremity of the body of the antherozoids.

When this sketch of the body appears the two cilia with which it will be provided are differentiated close to the anterior extremity in the thin layer of hyaline protoplasm which covered the outer surface of the nucleus, and which, to form them, is continued all round the granular protoplasm situated at the inner surface. They at once acquire their definitive length, which is equal to that of the adult body. Soon after their formation they become detached from the granular protoplasm and separate more or less from each other in the free space situated between the wall of the mother-cell and the contents.

While the anterior extremity of the antherozoid begins to turn round the surface of the granular protoplasm the posterior extremity, by the elongation of the thickening-band, grows in the opposite direction and soon becomes juxtaposed with the former, giving a first turn of the spiral. The nucleus then shows a progressive diminution of volume and becomes more and more homogeneous; then, the growth continuing, it becomes gradually stretched between the two extremities of the body, so that the swelling which it formed in the course of the elongating spiral disappears when the latter includes about two turns.

During this time the protoplasm is insensibly digested and employed in the nutrition of the antherozoid. Much reduced towards the end of the development it adheres only to the inner surface of the posterior extremity of the body; and when the latter has reached its full length it disappears without leaving a vesicle, as in other Cryptogamia. Nevertheless, even in the adult stage the antherozoid still presents some protoplasmic granules upon this inner face of its posterior extremity. It then forms (*e. g.* in *Chara fragilis*) rather more than three turns of the spiral. It presents all the reactions of nucleine, and on its surface there is an excessively thin hyaline envelope.

Thus, from the morphological point of view, it is the nucleus, and the nucleus alone, that is directly transformed, without breaking up into a spiral, to form the body of the antherozoid, the formation of which therefore does not commence in the protoplasm. The cilia are indeed of protoplasmic origin; carried on by the anterior extremity upon which they are inserted, they must necessarily acquire their definitive length from the first phase of development.—*Comptes Rendus*, January 7, 1889, p. 71.

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