Cylindrocapsa are more primitive in their organisation and the individual cells retain the power of independent growth and development not only in a straight linear direction, but also laterally so that the filaments become bi-seriate at places (Fig. 2). This behaviour results in the production of hormogone-like filaments which remain glued together for some time and ultimately dissociate (Fig. 3).

In *C. œdogonioides* usually cogonia develop by the enlargement of ordinary vegetative cells, singly or in pairs as in species of *Œdogonium*. On reading Iyengar's account of the life-history of *C. geminella* Wolle (= *C. scytonemoides*), which strikes at once as very unusual and unique among algæ, the present author re-examined his material. On certain filaments of *Œdogonium*, found mixed with *C. œdogonioides*, he discovered certain *detached oogonia* also, similar to those figured by Iyengar, but with ripe thick-walled oospores (Fig. 5). Though such detached oogonia were seen before also, but their significance was missed and their detached position was thought to be due to accidental dissociation from some filaments. These detached oogonia seem to point out that in *C. œdogonioides* also quadriciliate female macro-zoospores are produced, which after a period of swarming, settle down, secrete a cell-wall which becomes the loose sheath of the ocgonium, while protoplasmic contents round off and produce an oosphere. It is likely that even the oospheres in the oogonia found in the filaments have also an abbreviated, flagellate-free-swimming phase.

The life-cycle of *C. scytonemoides* as observed by Iyengar is unique among green algæ. A certain parallelism is seen between the dwarf males of *Œdogonium* and those of *C. scytonemoides*; but there is no structure in *Œdogonium* comparable with the detached oogonia of the latter, which Iyengar calls dwarf female plants.

The quadriciliate macro-zoospores of *C. scytonemoides* with female potentialities show certain resemblances with quadriciliate macro- and micro-zoospores of *Ulothrix*. While in *Ulothrix* the macro- and micro-zoospores serve the purpose of vegetative multiplication only and sexual fusion is seen only among isogamous biciliate gametes, in the case of *C. scytonemoides* sexuality is evolved in the macro- and microzocspores as well, the former producing a non-motile ocsphere or macro-gamete and the latter producing two to four micro-gametes or antherozoida.

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OBSERVATIONS ON *BALANTIDIUM COLI* (MALMSTEN)

EXTENSIVE work has been done in different parts of the world on *Balantidium coli* (Malm.) which has been reported from the intestine of pigs, monkeys and man. We had the opportunity of examining the gut contents of the gibbon, *Hylobates hoolock* (Harlan) which died in the Zoological Gardens, Calcutta. We found it heavily infected with *B. coli*. A remark on its morphology together with the boring apparatus is described here.

The ciliate in this host measures 40–70μ in length and 35–50μ in breadth. They are more or less ovoid in shape with the anterior extremity narrower than the posterior. The macronucleus varies from 14–26μ in size and is either straight or in the form of a horse-shoe shape, while the micronucleus, which varies from 3–5μ in diameter, is subspherical in shape and lies in a notch near the middle region of the macronucleus. In the majority of the specimens there are two contractile vacuoles, one situated at the posterior end and the other near the middle of the body close to the macronucleus.

In the region of the peristome in *B. coli* and *B. suis* existence of a definite system of intracytoplasmic fibres termed as 'neuromotor apparatus' was shown by McDonald.[1] It included a J-shaped motorium in the ectoplasm close to the œsophagus in addition to the fibres, which

are directly or indirectly connected with it. McDonald[1] considers that the thickened ectoplasm and the movement of the cilia of the peristomial region are correlated with their feeding and also with their ability to penetrate into the mucosa of the intestine. He points out that the pellicle and the ectoplasm of the

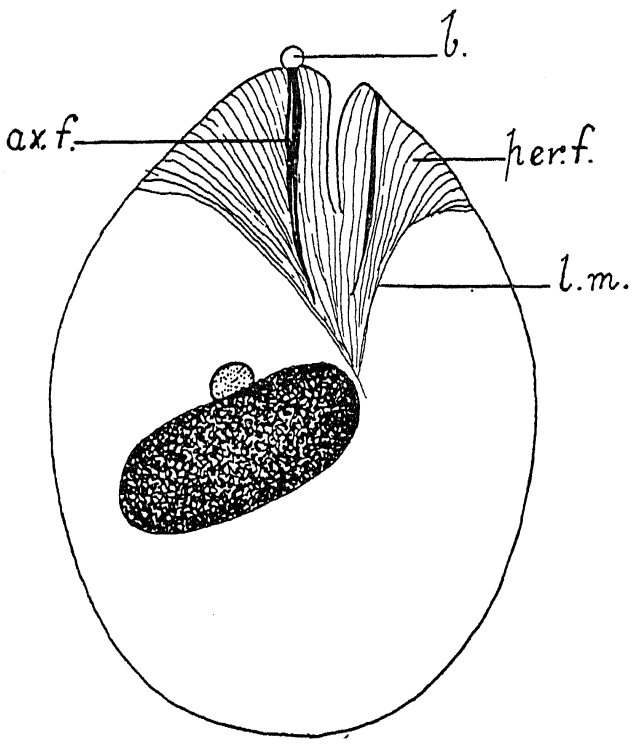

FIG. 1

B. coli from *H. hoolock*. × 1666. *ax. f.*–axial system of fibres; *b.*–borer; *l.m.*–limiting membrane; *per. f.*–peripheral system of fibres.

anterior region of the ciliates are thicker than any other part of the body and the cilia of this region beat spirally producing a boring action. Ray[2] also observed in *B. sushilii* in the region of the peristome, a system of fibres, which he described under two heads: the axial and the peripheral system of fibres. According to him the former, together with a knob-like structure at its anterior end, called the borer, constitutes the boring apparatus, since by means of this the parasites bore their way into the intestinal epithelium.

This same boring apparatus was also found by one of us (Chakravarty[3,4]) in *B. elongatum*, *B. helenæ*, *B. rotundum*, and *B. depressum*. We have examined the condition of the apparatus in the ciliate under report and give below the description of its component fibres and its bearing on the boring mechanism.

A group of fibres (*per f*), which corresponds to the longitudinal and peripheral fibres of McDonald[1] and Ray[2] respectively, is seen in this species on both the sides of the peristome arranged more or less obliquely. These fibres converge mesially towards the centre of the longitudinal axis of the body so as to form a sort of limiting membrane (*l.m.*) and in no case they pass beyond the centre of the body length. Schneider,[5] Ten Kate[6] and Ray[2] hold that these fibres have a supporting function lending rigidity to the body. We could not find here the J-shaped motorium described by McDonald in this species as well as in *B. suis*.

Besides the peripheral fibres there are two or three fibres on the left-hand side of the peristome comparable to the axial system of fibres of Ray.[2] The fibres arise from the base of a knob-like structure termed 'borer' by Ray[2] and pass posteriorly to meet the limiting membrane. They are spirally wound together forming a stout cord. The borer is situated just outside the pellicle but can be partially retracted within a notch in the pellicle. We also find a few fibres attached beneath the pellicle similar to those found by Chakravarty[4] in *B. depressum*. These should also be included under the axial system of fibres.

Since we fail to find any neuromotor apparatus as reported by McDonald[1] and the ciliates actually bore through the epithelium of the intestine we are in favour of regarding the knob and the associated fibres both of peripheral and axial system as forming together the boring apparatus.

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