sparseness of feathers was independent of stigmatic length relatively to stylar length.[3]

Thus bushy feathered stigmas and sparse feathered stigmas have a monogenic difference, the former being dominant. Concurrently with the segregation for bushy and sparse distribution of stigmatic feathers, the respective homologous awns have close set and sparse barbs (*vide* illustration). A gene designated SB is responsible for the normal bushy stigma. Gene sb gives a sparse feathered stigma.

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[1] *Ind. Jour. Agric. Sci.*, 1936, **6**, (6) 1314.
[2] *Curr. Sci.*, 1935, **3**, 540–42.
[3] *Ibid.*, 1935, **4**, 176–77.
[4] *Ibid.*, 1936, **4**, 817–20.
[5] *Mad. Agric. Jour.*, 1938, **26**, 123–26.

On the Life-History of *Cylindrocapsa geminella* Wolle[1]

THE author followed the life-history of a *Cylindrocapsa*, which was found in Madras and which agreed in several respects with the description of *Cylindrocapsa geminella* Wolle.[2] The alga is filamentous and unbranched and its cells are ellipsoid to sub-rectangular in shape. Each cell has a large stellate chloroplast in the centre of which is imbedded a large pyrenoid (Fig. 1). A single nucleus is situated close to the pyrenoid. The chloroplasts of *Cylindrocapsa* have been variously described in text-books on Algæ as a massive chloroplast or as a massive parietal chlroplast or as a parietal, massive, often ill-defined chloroplast, but a careful examination of the living material shows very clearly that the chloroplast is definitely stellate. During cell division, the pyrenoid first divides into two and then the nucleus divides into two. The nuclear division is very interesting in being amitotic.

Sexual reproduction was observed during two successive years (1938 and 1939). The contents of some cells of the filament escape cut as large, quadri-ciliate motile spores. One spore is formed from each cell. These spores, after swimming for a time, settle down on the filaments of *Cylindrocapsa* or of other algæ in the water and then each one of them immediately surrounds itself with a firm wall. Soon after this, further cell-wall layers are secreted by the protoplast. And the wall becomes lamellate and soon enlarges as a loose envelope round the protoplast which becomes rounded and lies loose in the centre (Fig. 2). This is the oogonium of the alga and the rounded protoplast inside is the single oosphere. The outer gelatinous envelope soon forms a beak-like opening on one side (Fig. 3). In this condition the egg is ready for fertilization.

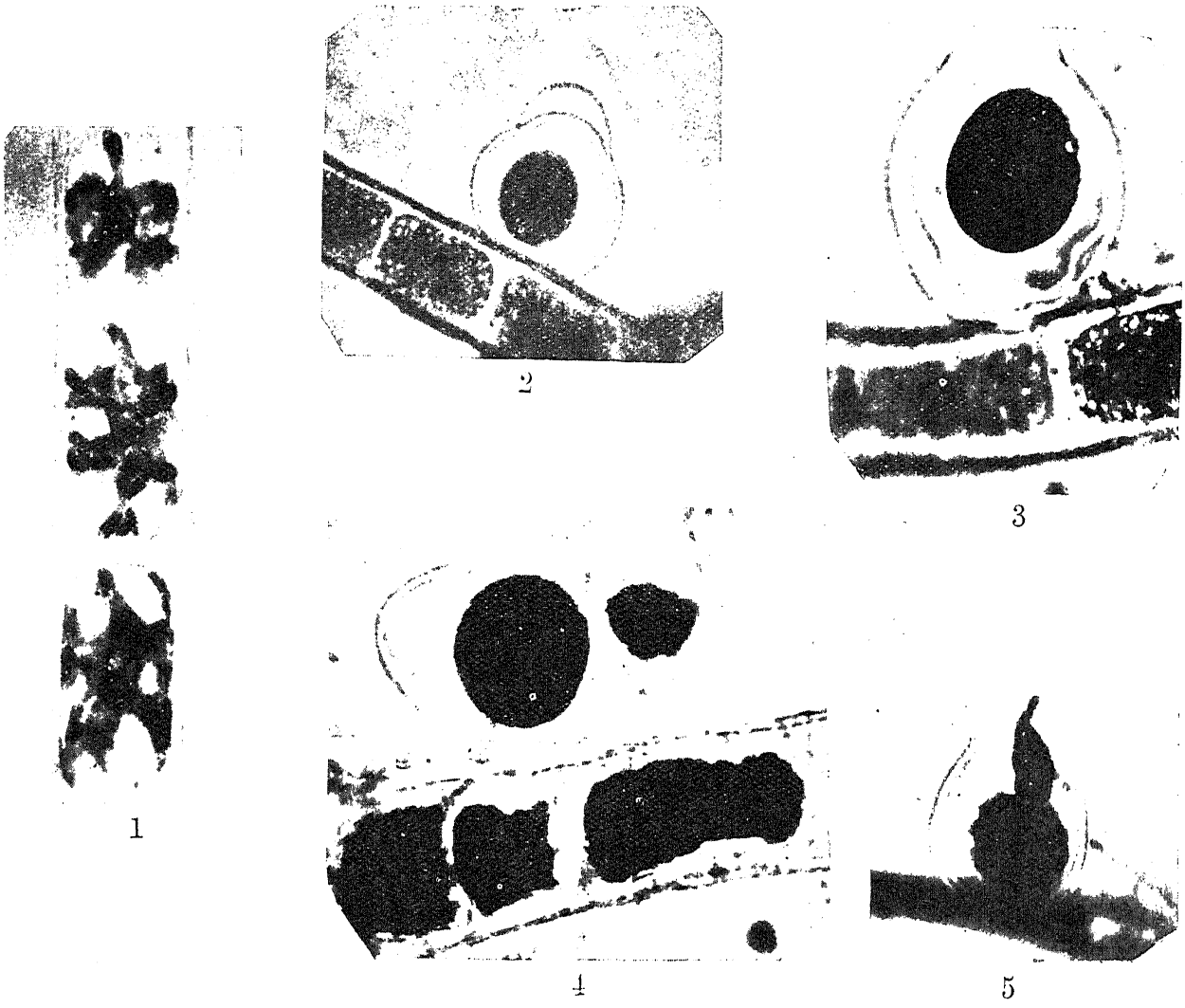
From some smaller cells of the filament smaller swarm-spores are formed. These, except for their smaller size, are quite similar to the previous swarm spore. These also, after swarming, settle down on the filaments of *Cylindrocapsa* or of other algæ in the water and soon each one of them surrounds itself with a definite wall. The contents of this cell then divides into two or four protoplasts which soon escape out as small four-ciliated antherozoids. The antherozoid swims for a time and finally reaches an oogonium and enters through the aperture in the oogonial wall and fuses with the egg (Figs. 4 and 5). Soon after fusion, the egg surrounds itself with a wall.

This type of sexual reproduction was observed repeatedly in the living material. The formation of an oogonium and an antheridium outside the plant by means of motile spores formed from the vegetative cells of the alga is something very unique and not known in any other green alga. The oogonium and the

[1] This paper was read before the Annual Meeting of the Indian Academy of Sciences at Madras, on 20th December 1938.

[2] The alga in its life-history differs in several respects from *C. involuta* and also from *C. geminella*. These points will be described in the fuller paper. The author, however, has tentatively referred the alga to *Cylindrocapsa geminella* Wolle in this note.

antheridium formed by the motile spores must be considered as single-celled female and male plants, respectively. In the case of the male plant there is a certain amount of resemblance to the dwarf males of *Oedogonium*, but there has been no instance of any dwarf female plants so far similar to the one seen here. A certain amount of resemblance is, however, seen in the behaviour of the large ciliated oosphere of *Aphanochœte*. In the case of *Aphanochœte* an oosphere is formed inside the oogonium. This escapes from the oogonium as a large, quadri-ciliated gamete which soon comes to rest somewhere outside the plant. It is then fertilised by a quadri-ciliated antherozoid. The interesting feature here is that the egg is fertilized outside the oogonium. But, in the case of the Madras *Cylindrocapsa*, the motile spore which escapes from the ordinary plant is not the oosphere of the alga, but is merely a spore which forms the single-celled female plant which ultimately becomes the oogonium. So the resemblance between *Aphanochœte* and the present alga does not extend beyond the fact that the egg is fertilized outside the main plant in both the algæ, but the structures that are concerned in the process are not the same in the two algæ. The significance of this will be further discussed in detail in the full paper.



Cylindrocapsa geminella Wolle

FIG. 1.—Cells of the filament showing the stellate chloroplast and the pyrenoid. × 337.
FIG. 2.—Oogonium formed by a motile spore outside the plant. × 205·3.
FIG. 3.—Oogonium before fertilization with the oogonia wall opened at the top. × 1001·5.
FIG. 4.—Oogonium with an antherozoid close to the egg (four cilia seen on the antherozoid). × 819·5.
FIG. 5.—The antherozoid fusing with the egg. × 1001·5.

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