HOLDFAST CELLS IN SPIROGYRA.

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In the summer of 1925 Doctor Land of the Department of Botany, University of Chicago, was collecting for Ulothrix in the lagoon in Jackson Park. Growing on the rocks in the place where he was accustomed to find Ulothrix was some Spirogyra which he took to the laboratory and turned over to the writer. Upon examination the Spirogyra was found to have well developed holdfast cells by means of which it was quite firmly attached to the rocks.

The material was scraped from the rock, killed in chromo-acetic acid, stained in Haidenhain's iron-alum haematoxylin and run up into Venitian turpentine from which it was mounted. A subsequent examination of the mounts revealed slight variations in the holdfast cells and some interesting abnormalities in the structure and character of the chloroplasts.

As a rule the holdfast cells are longer than the ordinary vegetative cells of the filament. From the basal end extend rhizoid or haustoria-like appendages; these structures seem to originate from the peripheral region of the cell rather than from the end and are somewhat contorted and twisted but in general spread out over the rock. They vary in number and in length and they may or may not be branched. Figure 1, A, B, and C, gives an idea of the size of these rhizoid-like structures as compared with the rest of the cell.

The four chloroplasts have almost lost their spiral character: on the contrary they extend more nearly as straight ribbons down through the center of the cell as if they had been stretched and pulled out of shape. In some cases portions of the chloroplasts may be found down in the rhizoids.

In one filament there were two holdfasts; not only the basal cell but the one adjacent as well had developed rhizoids. The rhizoids in the latter apparently developed after those in the lower cell as a result of the stimulus furnished by coming in contact with the substratum or any resisting substance. Such a contact was made by the bending of the filament. Figure 1, D is a diagram of this filament and E and F are drawings showing the holdfasts and the character of the chloroplasts in these two cells.

Since finding the material described above, other collections of Spirogyra have been made which showed holdfast cells. These collections were made at different seasons of the year and taken both from running water and quiet ponds. Therefore it seems quite evident that the formation of such cells is not dependent on the habitat. It may be that the lower cell, resulting from the first division of the zoospore, develops into a holdfast and the filament later breaks away and becomes

"Proc. Ind. Acad. Sci., vol. 37, 1927 (1928)."

a free-floating form. This would account for the fact that we do not ordinarily find them. Or, again, it may be that the development of the holdfast is a response to an external stimulus such as proximity to some resisting substance. The fact that cells other than the basal one may develop rhizoids would support this latter view. In any event this Spirogyra illustrates two fundamental principles; first, the cells are all morphologically and potentially alike in the beginning, and have plasticity which gives them the ability to respond to stimuli; and, second, diversion of tissue, represented by cell elongation and the abnormal position of the chloroplasts, is apparently due in this instance to a mechanical stress and strain exerted by the constant buoyancy of the water.

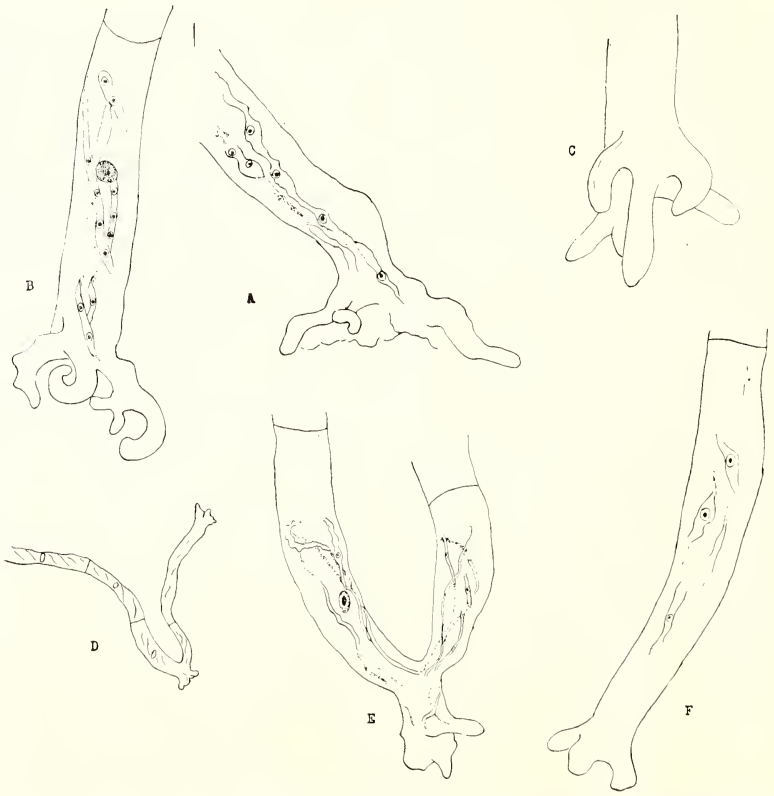

Fig. 1—A, B, and C, typical basal cells showing twisted and branched rhizoids and the almost straight bands of chloroplasts. D, diagram of filament with two holdfast cells. E and F, two holdfast cells shown in D.