cells are formed (Figs. 6, 7). In the mature stage the original boundary lines of an epidermal cell will be very sinuous, while those division lines which are formed within an epidermal cell will take a much less sinuous appearance (Figs. 5, 8-10).

Occasionally in the above described three-celled stage, one of the marginal cells, instead of the central one, becomes a stoma-mother-cell. In this case, an

FIG. 8. A mature stoma with divided subsidiary cells. $\times 450$.

Fig. 9.

Fig. 10.

FIGS. 9, 10. 'Twin stomata'; Fig. 9 being not quite typical. $\times 450$.

epidermal cell or a division of an epidermal cell abutting on the stoma would take the place of a subsidiary cell. It often happens, in such a case, that the other part of the epidermal cell further divides once or twice and forms another stoma, so that a 'twin-stoma' results (Figs. 9, 10). Except in rare cases, it has been observed that a perfect 'twin-stoma' is not formed from one single epidermal cell, but usually one of the neighbouring epidermal cells will join as a subsidiary cell (Figs. 9, 10).

Very seldom a stoma is formed diagonally to the epidermal cell, as has also been observed in the cotyledon and bract of *Welwitschia*.

H. TAKEDA.

THE ROYAL COLLEGE OF SCIENCE,
LONDON.

NOTE ON AN ATTACHED SPECIES OF SPIROGYRA.—It is well known that members of the Zygnemaceae do not, as a rule, form attaching organs, the filaments being commonly found floating freely in still or slowly running fresh water. There are, however, species of *Spirogyra* on record which are frequently attached to some substratum: such are *S. adnata* and *S. fluviatilis*, which are often found anchored to submerged stones, and *S. setiformis*, which according to Kny may occasionally be attached by rhizoids, but is more often found in freely floating masses. Rhizoids have also been observed in other species of *Spirogyra*, and in species of *Zygnema* and *Mougeotia*, but only under special conditions, either in culture solution, or during conjugation as irregular outgrowths from a conjugating tube. We have

but little knowledge of the manner in which these rhizoids are produced, and of the conditions which determine their formation.

The present note relates to a specimen of *Spirogyra* which has not yet been observed in a fertile condition, but which closely resembles *S. adnata*, and which will be provisionally referred to that species. The material was found as small tufts of bright green filaments attached to a log, which was completely submerged in the running water of a chain of ponds in the neighbourhood of Hampstead Heath. The sterile filaments appeared in July, 1912, and persisted until late in January, 1913, with somewhat variable algal associates, consisting of *Vaucheria* and *Cladophora* in the summer and autumn, and of *Draparnaldia* during the winter months.

FIG. 1. *Spirogyra adnata* (?). A. Typical assimilating cell with three chromatophores: pyrenoids only shown as seen at upper focus: position of lower chromatophores indicated by dotted lines: nucleus omitted. B. Lower part of filament dissected from log, showing assimilating cell (a), basal cells (b), with rhizoids (r) bearing haptophores (h), of which the broken ends only are seen: cell-contents omitted.

No conjugation has been seen, although the spot has been under constant observation.

The cells of the filaments vary from about 40 to 45 μ in diameter, and are from one to three times as long as they are broad. The longest cells are those which are about to undergo division, in the upper part, or which bear rhizoids, in the lower part of the filaments. There are usually three chromatophores, with a slightly crenate edge, and with very small distant pyrenoids; but four or even five may occur. In the assimilating cells, the chromatophores are closely set, each one making three or four turns (Fig. 1 A), but in the basal and attaching cells they are loosely arranged, or nearly straight, especially in the neighbourhood of the rhizoids (Fig. 2). The cell-walls are stout and often distinctly lamellose in the lower cells (Fig. 1 B).

By teasing out the filaments from their woody base, it may be seen that the lower cells are elongated, with irregular and often nearly colourless plastids. They

may be attached directly by a spreading disc-like group of haptophores, borne on a short stout rhizoid, or they may extend for some distance horizontally, below the surface of the woody matrix, and then may produce assimilating branches as well as rhizoid-bearing cells. It is very difficult to demonstrate the behaviour of this rhizome-like basal region owing to the fragile nature of the material.

The rhizoids are rarely septate, and appear to be enucleate. Ends of one or two chromatophores, however, elongate, and extend into the first-formed protuberance.

FIG. 2. *Spirogyra adnata* (?), showing basal cell which had attached itself to a glass dish by means of three rhizoids, into each of which chromatophores have penetrated.

These appear to keep pace for a time with the growth of the tube, but they may fragment into small pieces, which may be seen either isolated, or connected only by an attenuated thread of granules, at intervals along the length of the tubes: these fragmented pieces appear to always contain at least one pyrenoid.

The rhizoids may be formed either as lateral or terminal protuberances; and in cells with lamellose walls, the inner cellulose lining of the walls appears to break through the outer gelatinous layers. The initial outgrowth may either branch and give rise to other more slender tubes (Fig. 2), or it may at once form a bunch of outspread haptophores with thick gelatinous walls (Fig. 1 B). It seems probable that, as in the cases described by Borge, the rhizoids are formed primarily as the result of contact stimulus, but further observations are needed on this and other points.

E. M. DELF.

WESTFIELD COLLEGE LABORATORY

Delf, Ellen Marion. 1913. "Note on an attached species of Spirogyrta." *Annals of botany* 27, 366–368. <https://doi.org/10.1093/oxfordjournals.aob.a089465>.

View This Item Online: <https://www.biodiversitylibrary.org/item/237410>

DOI: <https://doi.org/10.1093/oxfordjournals.aob.a089465>

Permalink: <https://www.biodiversitylibrary.org/partpdf/319978>

Holding Institution

Smithsonian Libraries

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: Not in copyright. The BHL knows of no copyright restrictions on this item.

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.