Some Peculiarities in Spirogyra Dubia.

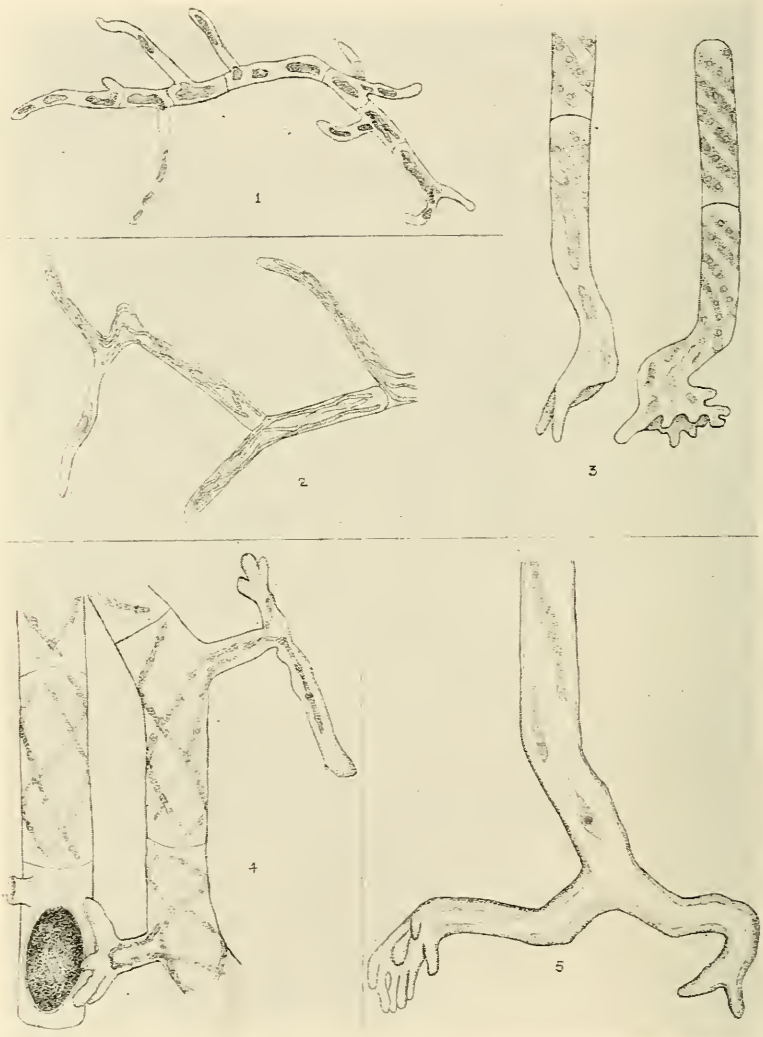
Paul Weatherwax.

A form of Spirogyra found on the campus of Indiana University early in the spring of 1913 has shown, in its natural habitat, as well as when subjected to new physiological conditions, some phenomena of growth that are not only irregular for Spirogyra but also seem to be confined rather closely to the one species.

The plant does not agree exactly with the description of any species given in the literature available, but it conforms fairly well with the description given by Wolle (1) and also the one given by Collins (2) for *S. dubia* Kg. This species, according to these descriptions, has two spirals, or "more rarely three", and the fruiting cell is described as being slightly inflated. The plant observed here had regularly three chloroplasts, and the fruiting cells were not at all swollen. Wood (3) notes this same difference in the sporangial cell and suggests other variations but concludes that these characteristics are not sufficiently different to justify the description of a new species. A form showing a physiological peculiarity similar to one shown by this plant, and probably from the same general location, is identified by Pickett (4) as *S. elongata* (Berk.) Kg.

When first found the plant formed a thin, green coating on a piece of rusty sheet iron lying in running water. Most of the filaments were only one to three cells in length and were probably developing from zygotes, but the strik'ng thing noted was the highly differentiated basal cells (Fig. 3) by which the filaments were attached to the mud on the iron, and, in many cases apparently to the rough surface of the iron itself.

Conditions were favorable for rapid growth, and ten days later the filaments were three or four inches in length and composed of many cells, but still as firmly attached as would have been filaments of Cladophora of the same size. The root-like basal cells had grown very much longer and had assumed a variety of peculiar shapes. Their walls had thickened, and their contents were just beginning to show signs of decomposition (Fig. 5).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A quantity of the material was put into a shallow dish of distilled water and placed in a north window in an attempt to cause it to conjugate, but indications of an unhealthy condition soon became apparent. As a first indication of this condition the chlorophyll bands became more slender and the pyrenoids very prominent. Soon after this the filaments began to break up by the decay of some of the cells, so that but few segments could be found that were more than seven or eight cells in length, and the majority of them were made up of but one or two cells. In the meantime these cells that seemed to have greater vitality began to develop a number of branches as shown in Figs. 1 and 2. The cytoplasm usually followed out into these branches, often taking a loop or an end of a chloroplast with it. In many filaments that showed the peculiarity the branches all arose from the same end of the cells, suggesting a continuation of the condition of base and apex that was made so evident by the highly specialized basal cells of the younger plants. So far as was observed, the branches always remained continuous with the cells from which they arose, no new cells being cut off on branches. Filaments of other species of Spirogyra often broke up into segments on being put into similar conditions, but no branching was observed.

The decay of the plant was probably started, in some instances at least, and very evidently greatly aided, as soon as the vitality of the alga had been slightly impaired, by the growth of a fungus, *Aphanomyces phycophilus* De Bary, one of the few parasitic forms of the *Saprolegniaceæ*, which has already been described (5). Other species of Spirogyra seemed immune to the attack of this fungus.

In some conjugating material of this same species of Spirogyra similar physiological peculiarities were noted. This latter material had been preserved for class use, and the exact locality of its collection is not known, but it was probably found in the same general locality as was that first mentioned. The filaments of this material showed also, but in a less marked degree, the same unhealthy condition. Some typical branches found are shown in Fig. 4. These branches seemed to serve as "holdfasts" for attaching the filament to other filaments of Spirogyra or probably to other things in the water.

Any attempt to get at the meaning of the branches found in either instance must maintain a degree of consistency with two or three prominent points observed. The branching described is associated with a pathological condition and is characteristic of this to a more marked

degree than of any other species of Spirogyra that was tested. Since the phenomenon was observed once in a physiological condition that had been made favorable for conjugation and again where conjugation was actually taking place, it was at first thought that the branches were exaggerated attempts at conjugation, and, in some instances, this may have been the case. But the filaments were usually close enough together that such long tubes would not have been necessary, and no actual union of gametes as a result of any such activity was at any time observed. Moreover, the filaments shown in Fig. 4 illustrate a condition noted in two or three cases, where filaments having mature zygotes in some of their cells were attached by these branches to others also containing zygotes. The filament shown in this figure as holding to another by means of the foot-like branch was a long one and had at another place mature zygotes that had been formed as a result of conjugation with some other filament. If these branches were modified conjugating tubes, a relation of this sort would be out of harmony with the tendency toward bisexuality that is usually exhibited by the plant.

Indiana University,

Bloomington, Indiana.

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