

hours, some did not germinate but others began to germinate in 5 to 10 hours. As usual one or two tubes were produced. In some other cases three or four tubes were produced, but in one spore, five tubes, normal in all respects, were sent out.

The chloroplasts of *V. aversa* were unusually numerous. Those filaments on the upper side of the clumps were crowded with chloroplasts. Frequently the ends of the filaments which are often more or less clear were very densely crowded with chloroplasts to the very tip. The filaments near or on the under side of the mass of *V. aversa*, showed about one-fourth the number of chloroplasts of the filaments on the upper side. An estimate of a piece of a crowded filament, exposed to light from the top side of a mass, showed about 12,000 chloroplasts, while a similar piece of a filament from the under or shaded side was estimated to have only about 3,000. This recalls the considerable difference between the number of chloroplasts in palisade cells which is often more than four times those of the spongy parenchyma of the same organ, as shown by Haberlandt. A comparison often shows 10 to 12 times the chloroplast surface exposure for *V. aversa* as for *Spirogyra longata*, which has but one chloroplast. This difference, however, would not be so great in a multi-chloroplast cell of *Spirogyra*.

A LIST OF ALGAE OF MONROE COUNTY, INDIANA II.

F. M. ANDREWS, Indiana University.

In the 1909 "Proceedings of the Indiana Academy of Science" the writer¹ published "A List of Algae" most of which were found in Monroe County, Indiana. At that time 187 species were recorded. Since 1909 the writer has recorded other species of algae from Monroe County, Indiana, that has come to his attention, and append them in the following list.

It is clear that no complete list of algae, or other plants, may be made by the observations of a single year. The varying conditions of moisture, light, nutrition, temperature and other factors render it possible or impossible for the various types to appear. The different combinations of these conditions cause, at times, the meager development of only a few species or a prolific growth. Or, these conditions may cause repetition of the appearance or disappearance of the various forms in the same year or part of a year. *Vaucheria aversa*, which has occurred only once in the immediate vicinity of Bloomington in the last few years, constitutes a striking example of an algal form illustrating the influence of the untenable conditions that have prevailed over the greater part of a series of years. The same is true of other forms not mentioned heretofore for this county.

¹ Andrews, F. M. Proc. Acad. Sci. 1909 : 375-380.

In order to procure some of the small forms for convenient observation, it is necessary to filter large amounts of the water containing them. This is best accomplished by using a very large funnel having a stem about one cm. long. The diameter of the funnel stem may be reduced by means of a drawn out, closely fitting, short glass tube attached by rubber tubing. The filter paper should be placed on the lower end of this tube, and supported on the outside by a small meshed copper wire gauze-thimble. This thimble, if loose, may be held to the tube, by means of a rubber band. Gentle agitation of the water in the upper part of the funnel, by means of an electric stirring apparatus, is advisable to prevent considerable settling of small specimens on the sides of the funnel. This occurs to a very noticeable degree even on the smooth glass sides of a 60° funnel when stirring is not used. If filter paper is used in the funnel in the usual way, many specimens will be lost even with stirring, and practically all, if the water is left unstirred, and few specimens are present.

Careful centrifuging of a quantity of water containing small specimens usually gives favorable results. The force applied need not be intense, but should be continued over a considerable period of time. A slightly conical and rather thin-walled oscillating glass tube of 10 to 15 cc. capacity should be used. When the centrifuging is complete, the specimens will be in the narrow end of the tube whose internal diameter should be about .5 cm. This end can then be cut off rendering easy access. A glass tube of not too large bore, which is held in sections by rubber tubing and can be quickly lengthened or shortened, is convenient for either shallow or rather deep water. It can be operated either as an open end tube above the water or by means of a rubber bulb. It has the additional advantage, namely that the collector is able to make collections from definite areas or spots in clear water.

The writer has scarcely paid any attention to varieties, since the species determinations are sufficiently accurate and are not so likely to lead to doubtful enumeration as may easily occur in a genus, for example, like *Xanthidium*. Only two extra species of diatoms has been recorded, but a considerable number of desmids not mentioned in his former list are included in this paper. The total number of species recorded in this contribution number 88. This together with the number of his former list makes 275 thus far found by the writer for the territory mentioned.

The following species were found:

Docidium Trabecula, *D. verticillatum*, *D. truncatum*, *D. Woodii*, *D. tridentulum*, *Closterium nasutum*, *C. decussatum*, *C. parvulum*, *C. Moniliferum*, *C. Dianae*, *Penium closteriodes*, *P. spirostriolatum*, *P. navicula*, *Sphaerosoma filiforme*, *S. excavatum*, *Tetmemorus giganteus*, *Calocylindrus curtus*, *Cosmarium Botrytis*, *C. pyramidatum*, *C. moniliforme*, *C. Meneghinii*, *C. biretum*, *C. coelatum*, *C. speciosum*, *Xanthidium fasciculatum*, *Euastrum ansatum*, *E. Pokornyanum*, *E. ventricosum*, *E. circulare*, *E. Elagans*, *E. multilobatum*, *Micrasterias fimbriata*, *M. pseudofurcata*, *M. muricata*, *Staurastrum aristiferum*, *S. avicula*, *S. crenulatum*, *S. punctulatum*, *S. pentacladum*, *Pediastrum angulosum*, *P. sim-*

plex, *P. Strumii*, *Arthrodesmus incus*, *A. octocornis*, *Hyalotheca mucosa*, *H. undulata*, *Gonatozygon asperum*, *Spirotaenia obscura*, *S. bryophila*, *Mesotaenium micrococcum*, *M. Clepsydra*, *Glœocapsa magma*, *Chroococcus turgidus*, *Calathrix gypsophila*, *C. orsiniana*, *Tolypothrix rupestris*, *T. flaccida*, *T. pulchra*, *Scytonema calotrichoides*, *S. gracile*, *S. turfosum*, *S. cortex Sirostiphon compactus*, *Hapalosiphon Braunii*, *H. tenuissimus*, *Nostoc rupestere*, *N. coeruleum*, *N. muscorum*, *Anabaena stagnalis*, *A. variabilis*, *Spirogyra Elongata*, *S. inflata*, *S. quadrata*, *S. dubia*, *S. adnata*, *S. rivularis*, *Zygnema stellium*, *Z. cruciatum*, *Zygogonium parvulum*, *Z. pectinatum*, *Scenedesmus rotundatus*, *Ulothrix Zonata*, *U. aequalis*, *Cladophora fluitans*, *Oedogonium undulatum*, *O. irregulare*, *Bulbochaete crenulata*, *Stigeoclonium Thermale*, *Oscillaria major*, *O. imperator*, *O. Elegans*, *O. natans*, *O. nigra*, *Conferva punctalis*, *Vaucheria aversa*, *Chroolepus aureus*, *Rhizoclonium fontinali*, *Polyedrium minimum*, *Porphyridium cruentum*, *Synedra valens*, *Cocconeis pinnularia*.

REVERSION IN TRILLIUM.

F. M. ANDREWS, Indiana University.

It has long been well known that the genus *Trillium* frequently shows monstrosities of various kinds and degrees. The writer, among others, has called attention, on several occasions, to some of these variations and has cited the chief literature on the subject. It is therefore not the object of this paper to call special attention to these well known deviations, but to indicate the character and time of reversion to the normal condition.

Of the species of *Trillium* with which this paper is concerned, the writer has observed least tendency to deviation from the normal, in *T. nivale*. This fact was confirmed by an observation extending over a period of 23 years in undisturbed conditions, where only one case of pyllody was produced. During that period, however, a considerable number of variations in *T. sessile*, *T. recurvatum* and *T. erectum* were observed in the vicinity of the cultivated and uncultivated specimens of *T. nivale*.

It is comparatively rare, under ordinary conditions, that plants in the wild or uncultivated state are apt to be left undisturbed over a period of years sufficient for continuous observation and termination of an experiment, such as this one. However, this was done in an adequate number of specimens in the natural habitat, to establish the points at issue. More convenient and continuous observation of these points were also attained by transplanting a considerable number of specimens representative of the facts here involved. The conditions under which the transferred specimens of the species of *Trillium* were grown were normal, and in one case, has extended over a long enough period to be convincing.