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# TRANSACTIONS

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# THE DESMIDS OF THE SOUTHEASTERN COASTAL PLAIN REGION OF UNITED STATES\*

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This paper presents a list and summary of the distribution of the Desmidiaceae of the eastern and southern coastal plain of the United States. The coastal plain extends from Cape Cod southward across the Florida peninsula, and the states bordering the Gulf of Mexico as far west as Texas. This area is essentially a single ecological region although not dominated throughout by the same plant associations. From Delaware to Louisiana the region is dominated by the Southern Evergreen Forest; while the northern portion from Cape Cod to New Jersey is dominated by the conifers and oaks of the deciduous forest. Many of the higher plants peculiar to the southern coastal plain extend as far north as Cape Cod.

Of the four hundred twelve species of algae identified in the collections from this region, two hundred twenty-five belong to the family Desmidiaceae. This unusually high number of desmids indicates the region to be one of the richest regions yet worked in North America. The filamentous green forms identified in this region will be included in a later paper.

The collections, from which the systematic list was prepared, were made by Dr. E. N. Transeau from the states of Louisiana, Mississippi, Alabama and Tennessee in the spring of 1925; on Long Island, New York, in the summer of 1924; and by Dr. W. M. Barrows in Florida during February and March 1925. Thanks are due to Dr. Transeau and Dr. L. H. Tiffany for aid in checking some of the identifications.

The collections from Long Island, New York, were made in the months of July and August from acid (pH 6.2) spring bogs generally; the col-

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lections noted from Lake Ronkonkoma, Long Island, were taken from a region of acid lakes. The ones from Louisiana, Mississippi and Alabama are mostly from streams, ponds, and lakes in the flood plain region of the Mississippi river. Some of the collections, such as those from Mt. Mitchell, a few miles from Asheville, North Carolina and Montvale, Tennessee, were included because of the possibility that they were new records for the states concerned. All of the collections from the south were made in March, April and the first week of May, representing only a small part of the growing season for algae.

The American literature dealing with the algae of the Coastal Plain is very meager. The first paper by Bailey in 1850 described collections from approximately sixty different places in South Carolina, Georgia, and Florida in which he listed over one hundred desmids. Wood (1872) listed a few species from the coastal states, while Poteat (1888) named some eighty species of desmids from a small area in North Carolina. Collins (1909) gives a few localities in this region for some species. These few papers are all that have been published on this vast area. Of course, the New England states, Long Island, and New Jersey have been investigated by Cushman (1903-1905), Conn and Webber (1908), and Hylander (1928).

A list of the desmids present in the collections has been prepared, to which has been added the general distribution of the forms, as far as could be learned from the papers cited in the bibliography. Of the 238 forms in the list, 2 are described as new and forty-six have not been recorded previously from the United States. The new forms are: *Plurotaenium maximum* var. *tumidum, Micrasterias truncata* var. *major. Euastrum wollei* Lag. was found in the collections, thought at first to be a new species, but later found to agree with the rather meager descriptions of Wolle and Lagerheim (1886), a complete description and figures are here given for this species.

The 46 forms, varieties, and species which are here included but are not previously recorded for the United States, are designated with an asterisk in the systematic list at the close of this paper.

### DISTRIBUTION OF DESMIDS

**Geographical.** It is not the purpose of this paper to discuss the physiological factors controlling the distribution of algae, but merely to enlarge our knowledge of their geographical range. The abundance of desmids in this region, however has led to the inclusion of quotations from other workers as to the factors controlling the distribution of desmids in Europe and the tropics.

The idea seems to be prevalent that of all the freshwater algae, the group Desmidieae is the only one which has a distinctive geographical distribution. It appears that either this idea was advanced too soon, before representative collections had been examined from all parts of the world, or that the number of cosmopolitan desmids must be extended.

Strom (1926) observes "In the desmids, we encounter the main part of the freshwater algae which have a geographical distribution in the same sense as the higher plants. This fact has not always been clear, as the larger part of this group are cosmopolitans, perhaps two thirds of the known species, but the remaining part consists of species which have their more or less sharply limited areas of distribution, and these are especially found in the tropics." An analysis of the geographical distribution of the species listed in this paper makes it extremely difficult to apply Strom's observation to the Coastal Plain Desmids. Perhaps there would be a closer agreement if the collections had been made over a period of years, during the entire growing season of algae; such an extended investigation would greatly enlarge the number of desmid species.

Of the desmids here recorded, 55 species can be listed as cosmopolitan, i.e. occurring on every continent more or less abundantly, while 44 have been found on every continent but Australia and Africa. The latter statement may be due to the fact that the data from these continents are very meager. Of the remaining species there is a great variance as to their distribution; 10 species have been found only in Europe, Greenland and the United States (northern countries in general); 4 have been previously recorded only from Europe and Asia; 16 have been found only in Europe, United States and South America; the remaining 98 have been recorded from various continents. *Closterium turgidum* var. *giganteum* (Ehrenb.) Nordst. was noted in Brazil by Borge while *Penium minutum* var. *crassum* forma *inflata* West was recorded only from Africa. Both species occurred frequently in these collections.

The higher vegetation of the coastal plain is temperate in character but includes many subtropical species along the coast. The algal flora is similar in character. In many respects it resembles the tropical flora summarized by Fritsch (1907b). In Ceylon he noted that filamentous desmids play an important part in the algal vegetation of the lowlands. In the coastal plain collections, with few exceptions, the collections contain a large number of filaments of *Hyalotheca dissilens* (Sm.) Bréb. and *Gymnozyga moniliformis* Ehrenb. Two species of Pleurotaenium occurred as filaments of from three to sixteen individuals joined together, while *Microsterias foliaceae* Bail. (a filamentous species) occurred abundantly in the collections from Lake Ronkonkoma, New York. The large number of filamentous forms is particularly noticeable, and none of these forms were rare in the collections in which they were noted. Fritsch in explanation of the large number of filamentous desmids in the tropics says: "This phenomenon may be due to the poor aeration of the water, the presence of little dissolved oxygen appearing to encourage filament-formation. This must be left to experiment for verification, but it would certainly explain the relative abundance of desmids in tropical waters."

In the tropics Fritsch again notes that species of Spirogyra, Oedogonium, as well as Bulbochaete, were present in almost every collection. This is also true of the coastal plain. All three genera were abundant in the majority of samples, although often only in the vegetative state; but from the list of species of Oedogoniaceae and Zygnemaceae, (not here recorded), one can see that a large number were fruiting at the time the collections were made, because identifications in these two families can only be made when fruiting filaments are present.

In the above statements, it is difficult for the writer to come to any conclusions regarding the idea of a distinct geographical distribution for these species in the coastal plain region. When one finds many so-called alpine species, which as yet are not listed as cosmopolitan, and many species, here-tofore believed to be peculiar to the tropics, it is difficult to correlate the results. One hundred twenty of the same forms, which were found by Strom in the Norwegian Mountains at altitudes of not less than 2,500 feet, were also found in my collections, thus showing that the great majority of them have a wide ecological range. The "prophecy" that was made by Strom (1926 p. 45) can certainly not be verified from the species in these collections, namely "When approaching the subtropic regions a more local and genuinely geographical character may be apparent, such as for instance, in the southeastern part of the United States."

As regards the matter of distribution West in 1899 writes: "In speaking of the world-wide occurrence of the same forms as *Equastrum trigibberum* W. & G. S. West in Madagascar and the United States, there is but one conclusion to be drawn from the facts, viz., that such a species has been perpetuated by two isolated communities which were derived originally from one assemblage, and that the individuals of these communities have retained their original characters in an extraordinarily constant manner. It must be admitted in all probability that a vast period of time has elapsed since the original distribution, and that the Desmidieae have existed through a vast period of time in much the same forms as they exhibit at the present day is highly probable."

Concerning the wide distribution of the desmids, Strom (1926) says: "Many, perhaps the most, desmids cannot withstand transport when really dried up, except as zygospores and these are rare in the majority of species. Transport by wind therefore remains little probable. So much the greater am I inclined to regard the importance of swimming and wading birds as distributing agents. In the only half-dried up mud, often so plentiful on their feet the desmids may be transported for long distances. Willie (1922) also emphasizes this fact, though he doubted whether a transport over distances such as across the North Sea is generally possible. If however, only very occasionally a species succeeds in coming over, this will in the course of centuries be more than enough for the migration of the essential part of the desmid-flora."

Relation to Underlying Rocks. West (1908) in explanation of what he considers a rich Desmid-area says: "We do not apply the term 'rich' to a mere abundance of Desmids, or even to the occurrence of a great quantity of 30 to 40 species, but only to those areas in which 150 to 200 (or even 300) species can be found in more or less abundance, including many of the rare species with a restricted distribution." These collections would certainly come under this definition of "rich," as the number of species of Desmids was large and there were many forms which the writer did not feel competent to identify to species names, especially some members of the genera Staura-strum and Cosmarium.

West states further that two facts stand out clearly in an attempt to correlate the conditions of environment with the richness of the Desmid-flora: These are (1) rich desmid-areas correspond very accurately with the areas of the old geological formations and (2) these areas also correspond, but with less accuracy, to the areas of greatest rainfall.

In comparing the "richness" of desmids in the eastern and western bogs of the British Isles, where the conditions of habitat and rainfall are almost identical, the conclusion is drawn that "in the British Isles the really rich desmid-floras, containing many of the Western British types, are found in those areas which combine the most suitable habitats (such as are found on boggy hillsides with an abundant rainfall) with a drainage-water derived from geological formations older than the carboniferous." West suggests in this relation that a chemical investigation of the waters of bogs and lakes in different areas might throw further light upon the question of distribution. The absence of lime was suggested as a determining factor in the abundance of desmids and might restrict their distribution in the western part of the British Isles.

Regarding the continent of Europe, West (1909 p. 203) says that the antiquity of the geological formations is a special factor in the occurrence of desmids as a whole. "One does not expect an abundance of Desmids in the plankton of the large Swiss lakes. They are situated in poor Desmid-areas, and in North Switzerland the geological formations are for the most part too recent. Most of the Central European lakes are situated in areas relatively poor in Desmidiaceae. In Denmark the formations are Cretaceous and Jurassic, largely overlain by drift, and similarly the lakes of Northern Germany are situated on immense areas of drift, overlying comparatively recent formations. Hence the dearth of Desmids in the lakes. On the other hand the Scandinavian lakes are situated on the old formations, and contain an abundance of Desmids, many of which are identified with those of the British lake-areas."

The work which has the most direct bearing upon the conclusions of West are those of Strom, briefly stated in 1924 but greatly enlarged and extended in 1926. He realizes that the qualitative richness of the aquatic vegetation is more directly concerned with the physical and chemical properties of the freshwater medium than with the antiquity of the geological formations. From his work the facts indicate that "the hydrogen-ion concentration must be regarded as an essential factor, provided that tolerable climatic conditions exist, and it (pH) is generally but not exclusively determined by geological formations. As a whole, qualitative richness of the flora is mainly determined by the occurrence of desmids, it may in general be said that the rich flora is found chiefly on the old geological formations as well as on younger eruptives, quartzites, etc., whereas the flora on limestone is poor. Already in 1880 Wille was aware of this important fact, and later on West described in detail the conditions in the British Isles. His researches have strongly confirmed the view, though it seems that the real connections between the geological formations and the algal flora never occurred to him. This generalization, however, requires a considerable extension. In smaller bodies of water, especially, it is not exclusively the underground which determines the reaction of the water, but also the respiration and assimilation of plants and animals as well as the aeration or stagnation, and last but not least, the qualities of the soil proper."

Strom further observes that a rich flora of calciphob algae may be found among the littoral and bottom vegetation of ponds in a limestone district. That the four factors determining the alga-flora are temperature, aeration, salt contents, and contamination (organic Nitrogen). "The majority of the Desmids occur in the districts poor in lime in all localities, but most abundant in those moderately aerated with a reaction approaching the neutral. In the limerich districts they only occur in any real qualitative abundance in the localities which are more or less self-contained, and not directly influenced by the geologic strata, i.e., in the acid peaty bogs, though they are never so richly represented there as in the clear waters."

In 1926 Strom considered the Norwegian Mountain Algae in much detail in relation to meteorological, geological, and ecological data. Numerous tables are given for each habitat containing a list of algal species, the pH of the water, and the altitude of the situation. A summary of ecological data has been given for each species found and presented in a systematic account at the end of the work but no generalizations are made as to the exact relation of the hydrogen-ion concentration of the water to the desmids in general. Donat (1926) working in the northern part of Germany has devoted much space to a discussion of the various associated species which he found in a habitat, with an analysis of the water for that habitat as to pH and chemical content. Wehrle (1927) made a study of the hydrogen-ion concentration of waters in the region of Freiburg, Germany, classifying them as to pH range.

The idea that a rich desmid-flora can only be found on old geological formations does not hold good for the eastern and southern Coastal Plain of the United States. These collections, for the greater part, have been made from lakes, pools and streams on deposits of Tertiary or later origin, as can be seen from the maps by Pirsson and Schuchert.

As regards the rainfall, the supply of moisture for the southeastern states comes almost exclusively from the Gulf of Mexico. The amount of yearly rainfall varies between the extremes of 28 to 64 inches; over the greater part of this area it varies between 40 and 60 inches.

The abundance of desmids in the coastal plain seems to correlate well with the wide distribution of acid sand and clay soils. It contrasts strikingly with the paucity of desmids in the central states region from Iowa to Ohio, and is similar to the abundance in the pine barrens of northern Michigan. This distribution suggests that slightly acid waters are more important than temperature or underlying geologic formations in limiting the occurrence and distribution of desmids.

# LIST OF DESMIDACEAE WITH GEOGRAPHICAL DISTRIBUTION ARRANGED BY GENERA

Under each species is given (1) the geographical distribution in the coastal plain region of the United States as found in the collections examined by the writer, and (2) the world distribution according to the literature.

#### \*Spirotaenia minuta Thuret.

Ditch near Fourth Lake, Cold Spring, New York. Europe: British Isles, France, Germany, Austria, Norway, Sweden, Latvia.

# Spirotaenia obscura Ralfs. Pl. XI, fig. 5.

Bog south of Cold Spring Harbor, New York; also a side hill swamp near the same place.

United States: North Carolina; Europe, Spitzbergen, Nova Zembla, Brazil.

### Cylindrocystis crassa De Bary.

Ocean Springs, Mississippi.

United States: Connecticut, New Hampshire, Maine, Massachusetts; Europe, India, Madagascar, New Zealand, West and South Africa, South Orkneys, Antarctic.

#### Netrium digitus (Ehrenb.) Itzigs. and Rothe. Pl. XI, fig. 6.

Abundant in various collections. Amory, Mississippi; Aberdeen, Mississippi; S.E. of Jackson, Mississippi; Pascagoula, Mississippi; Walker Lake, West Point, Mississippi; Auburn, Alabama; Montvale, Tennessee.

United States: Connecticut, Massachusetts, New Hampshire, Maine, Rhode Island,

Ohio, Michigan, Colorado, Wisconsin; Newfoundland and Ontario, Canada. Occurs on all the continents, recently found in South Africa by Fritsch (1923).

#### Netrium interruptum (Bréb.) Lutkem.

Auburn, Alabama.

United States: Connecticut, New Hampshire, Maine, Massachusetts, North Carolina; France, Germany, Austria, Italy, Hungary, Switzerland, Norway, Sweden, Russia, Latvia, Lapland, South Africa.

#### **Netrium oblongum** (De Bary) Lutkem.

Baton Rouge, Louisiana.

United States: New Hampshire, Massachusetts, North Carolina; Germany, Austria, Hungary, Switzerland, Norway, Sweden, Lapland, Faeroes, India, West and East Africa, Somaliland, Ecuador, Brazil.

#### Netrium oblongum var. cylindricum W. and G. S. West.

Cold Spring Harbor, New York.

United States: New Hampshire; Italy, British Isles, Norway, Somaliland, South Africa.

#### \*Penium cylindrus var. subtruncatum Schmidle.

Birmingham, Alabama. Europe.

#### \*Penium libellula (Focke) Nordst.

Auburn, Alabama.

United States: New Hampshire, Ohio; Europe, Asia, Brazil, Faeroes, Greenland, Ceylon, Singapore, Java, New Zealand.

#### \*Penium libellula var. interruptum W. and G. S. West.

Sphagnum bog, Woodberry, New York. England, Scotland, Germany, France, Ceylon, Singapore.

#### Penium margaritaceum (Ehrenb.) Bréb.

Cold Spring Harbor, New York; Lake Joanna, Mt. Dora, Florida; Starkville, Mississippi; Baton Rouge, Louisiana.

United States: Connecticut, Rhode Island, Massachusetts, New Hampshire, New York, Ohio, Wisconsin, Illinois, Indiana, Michigan, Kansas, Alaska; every other continent.

# Penium minutum (Ralfs) Cleve.

Caldwell's Pond, Amory, Mississippi.

United States: Rhode Island, Massachusetts, New Hampshire, South Carolina, Florida, Wisconsin; every other continent.

#### Penium minutum var. crassum West.

Mobile, Alabama.

United States: Florida; British Isles, Lapland, West Africa, Brazil.

# \*Penium minutum var. crassum forma inflata West. Side hill spring swamp, Cold Spring Harbor, New York.

Africa.

\* Species which have not previously been recorded in the United States.

#### Penium minutum var. gracile Wille. Pl. XI, fig. 13.

Cold Spring Harbor, New York. United States, Cuba, Norway, Lapland, West Africa.

#### \*Penium minutum forma major Lund.

Lake Ronkonkoma, Long Island, New York. Scotland, Ireland, Austria, Sweden, Brazil.

#### Closterium abruptum West.

Baton Rouge, Louisiana.

United States: Connecticut, Maine, New Hampshire, Massachusetts; Germany, Austria and Galicia, Norway, Switzerland, Colombia, Brazil, Central and South Africa.

#### Closterium acerosum (Schrank) Ehrenb.

Jackson, Mississippi; Cold Spring Harbor, New York.

United States: Maine, Massachusetts, New Hampshire, New York, Connecticut, Pennsylvania, Ohio, Michigan, Illinois, Indiana, North Carolina, South Carolina, Georgia, Florida, Missouri, Kansas, Arizona, Colorado, Alaska; on every other continent.

#### Closterium acerosum var. elongatum Bréb.

Road to West Point, Mississippi; Auburn, Alabama.

United States: Massachusetts, Missouri; England, France, Germany, Switzerland, Ceylon, Mexico.

#### Closterium cornu Ehrenb.

Ocean Springs, Mississippi.

United States: Connecticut; widely distributed on the other continents.

#### **Closterium costatum** Corda.

Pond west of Woodberry, New York; Lake Ronkonkoma, Long Island, New York. United States: Connecticut, Massachusetts, Maine, New Hampshire; Canada, British Isles, France, Germany, Austria, Hungary, Italy, Switzerland, Norway, Sweden, Denmark, North and South Russia, Faeroes, Carolien Islands (Pacific), Burma, Greenland.

#### Closterium cynthia DeNot.

Ocean Springs, Mississippi.

United States: Connecticut, New Hampshire, Massachusetts, North Carolina; New-foundland and all the other continents.

#### Closterium decorum Bréb. Pl. XI, fig. 14.

Lake Ronkonkoma, Long Island, New York.

United States: Connecticut, Maine, New Hampshire, Massachusetts, Ohio, Michigan, Wisconsin; Europe, Ceylon, Sumatra, Java, Australia, New Zealand.

#### **Closterium dianae** Ehrenb.

Pascagoula, Mississippi.

United States: Connecticut, Maine, New Hampshire, Massachusetts, Rhode Island, New York, Georgia, Florida, North Carolina, Ohio, Michigan, Indiana, North Dakota; widely distributed in other parts of the world.

#### Closterium didymotocum Corda.

Cold Spring Harbor, New York.

United States: Connecticut, New Hampshire, Maine, Massachusetts, Rhode Island, Michigan, Illinois, Kansas; Europe, Faeroes, India, Singapore, East Africa, Colombia.

#### Closterium ehrenbergii Menegh. Pl. XI, fig. 8.

Cold Spring Harbor, New York. Cosmopolitan.

#### Closterium gracile Bréb.

Auburn, Alabama.

United States: Maine, Massachusetts, Rhode Island, Connecticut, North Carolina, Wisconsin, Arizona; from every other continent.

#### \*Closterium intermedium var. hibernicum West. Pl. XI, fig. 16. Lake Ronkonkoma, Long Island, New York.

Great Britain.

#### Closterium juncidum var. elongatum (Ralfs) Roy and Biss.

Belmont pond near Babylon, New York. United States: Massachusetts; Scotland.

#### Closterium kutzingii Bréb. Pl. XI, fig. 15.

Ocean Springs, Mississippi.

United States: Connecticut, New Hampshire, Ohio, Michigan, Minnesota; reported from all other continents.

#### Closterium lanceolatum Kutz.

Cocoa, Florida; artesian well, Durant, Mississippi.

United States: Connecticut, Rhode Island, Vermont, Massachusetts, Ohio, Indiana, Kansas, North Dakota; Europe, Greenland, China, Turkestan, South Tibet, Central, East and Southwest Africa, Madagascar, Patagonia, West Indies.

#### Closterium leibleinii Kutz. Pl. XI, fig. 11.

City Park, New Orleans, Louisiana; sphagnum bog, Woodberry, New York.

United States: Maine, Connecticut, Rhode Island, Massachusetts, Georgia, Pennsylvania, North Carolina, Ohio, Indiana, Illinois, Michigan, Kansas, North Dakota, Colorado; widely distributed on other continents.

#### Closterium lineatum Ehrenb.

Swamp south of Starkville, Mississippi; Auburn, Alabama; St. James Pond, Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, Michigan, Ohio, North Carolina, Kansas; now recorded from all other continents.

#### Closterium macilentum Bréb.

#### Jackson, Mississippi.

United States: New Hampshire, Connecticut, Massachusetts, New York, Michigan, Kansas, Minnesota; British Isles, France, Austria, North Germany, Latvia, Switzerland, Norway, Faeroes, India, Japan, Brazil.

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# Closterium moniliferum (Bory) Ehrenb.

Baton Rouge, Louisiana; swamp south of Starkville, Mississippi; Auburn, Alabama; Cold Spring Harbor, New York.

United States: Connecticut, New Hampshire, Maine, Massachusetts, Rhode Island, Georgia, North Carolina, Ohio, Indiana, Illinois, Missouri, Wisconsin, Colorado; Europe, China, Japan, Siberia, Central and South Africa, India, Ceylon, New Zealand, West Indies, New Caledonia, Brazil, Argentina, Colombia, Uruguay, Patagonia.

#### Closterium parvulum Nag.

Baton Rouge, Louisiana; sphagnum bog, Woodberry, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Pennsylvania, Ohio, Illinois, Colorado, Minnesota, Alaska; all other continents.

#### Closterium regulare Bréb.

Birmingham, Alabama.

United States: New Hampshire, Massachusetts, Connecticut, Rhode Island; now recorded from every continent.

#### Closterium rostratum Ehrenb.

Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Connecticut, North Carolina, Michigan, Kansas; recorded from all the continents but Australia.

#### \*Closterium siliqua W. and G. S. West.

Starkville, Mississippi. England, Siberia, Latvia.

#### **Closterium striolatum** Ehrenb.

Auburn, Alabama; Fishing Club, Smithtown, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Pennsylvania, Michigan, Florida, Colorado, Arizona, Oregon, Alaska; recorded from every continent.

### **Closterium toxon** West.

Ocean Springs, Mississippi.

United States: Connecticut, Florida; British Isles, North Germany, Latvia, Newfoundland, Singapore.

#### \*Closterium turgidum var. giganteum (Ehrenb.) Nordst.

Length,  $869\mu$ , breadth  $100\mu$ , breadth of apice  $18.5\mu$ . Baton Rouge, Louisiana. The form reported by Nordst from Brazil was over  $1,300\mu$  in length. This specimen was larger than the dimensions of *Cl. turgidum* so was listed as the variety. South America: Brazil, Paraguay.

#### Closterium ulna Focke.

Mobile, Alabama.

United States: Connecticut, Massachusetts; Great Britain, France, Austria, Germany, Switzerland, Latvia, Norway, Finland, Denmark, Russia, Poland, Greenland, India, Colombia.

#### Pleurotaenium coronatum (Bréb.) Rabenh.

Caldwell's Pond, Amory, Mississippi.

United States: Maine, New Hampshire, Connecticut, Massachusetts, Ohio, Michigan, Illinois; Newfoundland, Europe, Central and East Africa, Greenland, Brazil.

#### Pleurotaenium coronatum var. fluctuatum West.

Lake Ronkonkoma, Long Island, New York.

United States: New Hampshire, Massachusetts, Connecticut, Illinois; Ireland, Scotland.

#### Pleurotaenium coronatum var. nodulosum (Bréb) West.

Baton Rouge, Louisiana; Belmont Pond, Babylon, New York; Lake Ronkonkoma, Long Island, New York.

United States: Massachusetts, Rhode Island, Ohio; recorded from all continents but Australia.

# Pleurotaenium ehrenbergii (Bréb.) DeBary. Pl. XI, fig.4.

Auburn, Alabama; Starkville, Mississippi; Durant, Mississippi; in cold water stream, Fourth Lake, Cold Spring Harbor, New York.

United States: Massachusetts, New York, Michigan, Illinois, Wisconsin, Arizona; Newfoundland, Ontario, Canada; all other continents.

#### Pleurotaenium ehrenbergii var. elongatum West.

Baton Rouge, Louisiana.

United States: New Hampshire, Massachusetts, Michigan, Wisconsin; Ireland, Wales.

#### **Pleurotaenium maximum** (Reinsch) Lund.

Auburn, Alabama; one specimen was 930µ long, 39µ broad, Castalian Lake, Durant, Mississippi; another was 1,120µ long, 64µ broad, Cold Spring Harbor, New York.
United States: Maine, Massachusetts, Ohio; Ontario, Canada; Europe, Ceylon, Malay, Siam, Brazil, Colombia, New Caledonia.

#### Pleurotaenium maximum var. tumidum nov. var. Pl. XI, fig. 1.

Undulations throughout the cell, the cell wall may or may not be granulate. Length 750-950 $\mu$ , breadth at base of semicell 65 $\mu$ , largest breadth 70 $\mu$ . Cold spring Harbor, New York.

# Pleurotaenium nodosum (Bailey) Lund. Pl. XI, fig. 17.

Mobile, Alabama; occurred in long filaments, from 3-16 cells in some cases, joined end to end, Lake Ronkonkoma, Long Island, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Florida, Michigan, Wisconsin, Alaska; Europe, Asia, Java, New Zealand, Brazil, Colombia, Paraguay.

#### \*Pleurotaenium subcornulatum (Turner) W. and G. S. West.

Cold Spring Harbor, New York.

United States: Wisconsin; Madagascar.

# Pleurotaenium subcornulatum var. detum W. and G. S. West. Pl. XI, fig. 2.

In filaments, usually four or five joined end to end, semicells with only one undulation, Cold Spring Harbor, New York.

United States: New York, Wisconsin; Colombia.

#### Pleurotaenium trabecula (Ehrenb.) Nag.

Jackson, Mississippi; Durant, Mississippi; Starkville, Mississippi; Pascagoula, Mississippi; Baton Rouge, Louisiana.

United States: Maine, New Hampshire, Massachusetts, Connecticut, South Carolina, Georgia, Florida, Pennsylvania, Michigan, Ohio, Illinois, Minnesota, Missouri, Kansas, Colorado; recorded from all other continents.

# Pleurotaenium trabecula forma clavata (Kutz.) W. and G. S. West.

Castalian Lake, Durant, Mississippi.

United States: Massachusetts; British Isles, France, Germany, Italy, Sweden, Switzerland, India.

#### Pleurotaenium trabecula forma granulata G. S. West. Royal Palm Park, Florida.

United States: New Hampshire, Missouri; England, Norway.

# Pleurotaenium trochiscum W. and G. S. West. Pl. XIV, fig. 8.

Cold Spring Harbor, New York.

Identified as a new species by West in paper of North American Desmidieae (1896).

#### Triploceros gracile Bailey. Pl. XI, fig. 7.

Ocean' Springs, Mississippi; Marcus Creek, Pensacola, Florida; Belmont Pond, Babylon, New York.

United States: New Hampshire, Massachusetts, Rhode Island, Connecticut, New Jersey, Georgia, Florida, Wisconsin, Minnesota; Ontario, Canada; Cuba, New Zealand, Australia, India, China, Burma, Java, Brazil.

#### Triploceros verticillatum Bailey.

Ocean Springs, Mississippi; Mobile, Alabama; Belmont Pond, Babylon, New York. United States: New Hampshire, Rhode Island, Massachusetts, New Jersey, Connecticut, Florida, Georgia, Wisconsin; Cuba, Brazil.

#### Tetmemorus brebissonii (Menegh.) Ralfs. Pl. XI, fig. 10.

Cold Spring Harbor, New York. Cosmopolitan.

#### Tetmemorus granulatus var. attenuatus (Ralfs.) West.

Ocean Springs, Mississippi. United States, British Isles, North Germany, Norway, Sweden.

#### Tetmemorus laevis (Kutz.) Ralfs. Pl. XI, fig. 9.

Side hill spring swamp, Cold Spring Harbor, New York. United States: Maine, Massachusetts, Connecticut, Pennsylvania, Ohio, Colorado,

Alaska; world-wide in its distribution.

# Euastrum affine Ralfs. Pl. XIII, figs. 51-52.

Ocean Springs, Mississippi.

United States: Connecticut, Massachusetts, South Carolina, Georgia, Alaska; British Isles, France, Germany, Switzerland, Norway, Sweden, Denmark, Russia, Latvia, India.

#### Euastrum ansatum Ralfs. Pl. XIII, fig. 54.

- Castalian Lake, Durant, Mississippi; found specimens with smooth cell wall and same as West's description that had a length of  $149\mu$ , breadth  $77\mu$ , breadth of isthmus  $22\mu$ , Auburn, Alabama.
- United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Michigan, Indiana, Colorado, Alaska; world-wide in distribution.

#### Euastrum bidentatum Nag. Pl. XIII, fig. 56.

Castalian Lake, Durant, Mississippi.

United States: Connecticut, Michigan, Colorado; British Isles, France, Germany, Switzerland, Norway, Sweden, Denmark, Iceland, Bornholm, Greenland, Latvia, Russia, Brazil.

# \*Euastrum binale forma hians (Turp.) West.

Pascagoula, Mississippi.

England, Ireland, Germany, Norway, Ceylon.

# Euastrum denticulatum (Kirchn.) Gay.

Miller's Pond, Smithtown, New York. United States: Michigan, New Hampshire; reported from every continent.

#### Euastrum didelta (Turp.) Ralfs. Pl. XIII, fig. 50.

Lake Ronkonkoma, Long Island, New York; Gainesville, Florida.

United States: Maine, Connecticut, Rhode Island, Massachusetts, New Hampshire, Pennsylvania, South Carolina, Georgia, Michigan, Indiana, Wisconsin, Colorado, Alaska; Ontario, Canada; Europe, Asia, India, Ceylon, Azores, Australia.

#### \*Euastrum dubium Nag.

Castalian Lake, Durant, Mississippi ; side hill spring swamp, Cold Spring Harbor, New York.

British Isles, France, Germany, Norway, Sweden, Denmark, Switzerland, Latvia, Siberia, Italy, Greenland.

#### \*Euastrum dubium var. cambrense (Turner) West.

Castalian Lake, Durant, Mississippi. Wales.

#### Euastrum elegans (Bréb.) Kutz.

Mobile, Alabama.

United States: Massachusetts, New Hampshire, Rhode Island, Connecticut, Ohio, North Carolina, South Carolina, Georgia, Florida, Vermont, Wisconsin, Alaska; recorded from every continent but Australia.

Euastrum elegans var. pseudoelegans (Turner) W. and G. S. West. Cocoa, Florida; Cold Spring Harbor, New York. United States, Wales.

#### \*Euastrum elegans var. Novae Semiliae Wille.

Royal Palm Park, Florida. Ireland, Scotland, Nova Zembla. Euastrum evolutum var. integrius W. and G. S. West. Pl. XIII, fig. 57. Cold Spring Harbor, New York. Identified by Wests in (1896).

# Euastrum gemmatum Bréb. Pl. XIII, fig. 55.

Auburn, Alabama; Castalian Lake, Durant, Mississippi.

United States: New Hampshire, Massachusetts, Rhode Island, Connecticut, Michigan, Wisconsin, Washington, Alaska; British Isles, France, Belgium, Germany, Switzerland, Norway, Sweden, Denmark, Latvia, Bornholm, Poland, South Russia, Faeroes, Greenland, India, West Indies, Brazil, Paraguay.

# Euastrum oblongum (Grev.) Ralfs. Pl. XIII, fig. 67.

Bog south of Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Rhode Island, Connecticut, North Carolina, Wisconsin, Alaska; Europe, Siberia, Faeroes, Greenland, Japan, Brazil.

#### Euastrum pictum Borge.

Lake Ronkonkoma, Long Island, New York. United States: Connecticut; Norway, Brazil, Colombia.

#### Euastrum pinnatum Ralfs. Pl. XIII, fig. 65.

Starkville, Mississippi; Mobile, Alabama; bog south of Cold Spring Harbor, New York.

United States: Connecticut, Massachusetts, New Hampshire, New York, Florida, Michigan, Wisconsin, North Carolina; Newfoundland, British Isles, France, Germany, Latvia, Austria, Norway, Sweden, Finland, Faeroes, Colombia.

#### Euastrum pulchellum Bréb.

- Two specimens were somewhat larger than the dimensions of West but with the same shape and markings, length  $50\mu$ , breadth  $40.7\mu$ , isthmus  $6.8\mu$ , Castalian Lake, Durant, Mississippi.
- United States: Connecticut, Wisconsin, New York, Illinois; Ontario, Canada; British Isles, France, Norway, Sweden, Finland, North Germany, Switzerland.

#### Euastrum rostratum Ralfs.

High Hill, Long Island, New York.

United States, Europe, Faeroes, Spitzbergen, Greenland, India, Ceylon, Burma (Var.), Australia (Var.), New Zealand (Var.), Madagascar (Var.).

#### Euastrum sinuosum Lenorm.

Ocean Springs, Mississippi.

United States: Connecticut, Florida; Europe, Faeroes, India, Siam, Burma, Singapore, Java, Australia, Central Africa, New Zealand, Sandwich Islands, Caroline Islands, Guiana, Brazil.

# Euastrum sinuosum var. reductum W. and G. S. West.

Pond west of Woodberry, New York.

United States: Connecticut; British Isles, Norway, Switzerland, Singapore, West Africa.

#### Euastrum sublobatum Bréb.

Baton Rouge, Louisiana.

United States, France, Switzerland, Germany, Austria, Hungary, Italy, Norway, Poland, South Russia, Greenland, New Zealand, West Indies, Paraguay.

#### \*Euastrum turnerii West.

Lake Ronkonkoma, Long Island, New York. British Isles, North Germany, Finland, Australia, Columbia.

#### Euastrum verrucosum Ehrenb. Pl. XIII, figs. 58-59.

Lake Ronkonkoma, Long Island, New York. Cosmopolitan.

Euastrum verrucosum var. alatum (Ehrenb.) Wolle. Pl. XIII, fig. 34. Durant, Mississippi; Cold Spring Harbor, New York.

United States: Maine, Massachusetts, North Carolina, Louisiana; Ontario, Canada; Scotland, Ireland, Austria, North Germany, Latvia, Norway, Sweden, Switzerland, North Russia, Greenland, Finland.

\*Euastrum verrucosum var. coarctatum (Ehrenb.) Delp. Pl. XIII, fig. 33.

Ocean Springs, Mississippi; side hill spring swamp, Cold Spring Harbor, New York. Ireland, Norway, Austria, Poland, Italy.

\*Euastrum verrucosum var. planctonicum W. and G. S. West. Cold Spring Harbor, New York. Scotland.

#### Euastrum verrucosum var. reductum (Ehrenb.) Nordst.

Baton Rouge, Louisiana; Lake Ronkonkoma, Long Island, New York.

United States: Maine, North Carolina, Colorado; Ontario, Canada; Scotland, Ireland, Norway, Sweden, North Russia, Uruguay, Argentine.

#### Euastrum wollei Lag. Pl. XIII, figs. 31-32.

- Cells large, more than one and one-half times as long as broad; deeply constricted, sinus very open; semicells two-lobed, the interlobular incision deep but open; polar lobe widely cuneate with two prominent protuberances, angles rounded and granulate, apical incision not so prominent and closed; lateral lobes wider than polar lobe, slightly rounded and granulate with three large protuberances across the broadest part, each protuberance furnished with large wart-like granules arranged in concentric circles; cell wall granulate, very evident especially at the angles. Length of cell 172µ, breadth 108-112µ, breadth between polar and lateral lobes 38µ, thickness 72µ, breadth of isthmus 24µ. Found at Mobile, Alabama; abundant in the one collection in which it was found.
- Without doubt, the specimens found in my collections are the same as the one originally called *E. intermedium* by Wolle but changed to *E. wollei* by Lagerheim in his paper of 1886. In some respects the specimen resembles the figure which Wolle describes as the var. *cuspidatum* but the dimensions and exact description were not given.

#### Micrasterias americana (Ehrenb.) Ralfs.

Baton Rouge, Louisiana; Cold Spring Harbor, New York. United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, North Carolina, South Carolina, Florida, Michigan, Ohio, Illinois, Missouri; Montreal, Canada; Europe, Greenland, North India, East Africa, Brazil, Colombia.

#### Micrasterias apiculata (Ehrenb.) Menegh.

Baton Rouge, Louisiana.

United States : Maine, New Hampshire, Massachusetts, Connecticut, New York, Florida, Michigan, Wisconsin; Europe, Japan, India, Burma, Brazil.

#### Micrasterias apiculata var. fimbriata (Ralfs) Nordst.

Mobile, Alabama.

United States: Maine, Massachusetts, New Hampshire, Connecticut, New York, Wisconsin; Ontario, Canada; British Isles, France, Belgium, Germany, Austria, Switzerland, Norway, Sweden, Denmark, North and South Russia, Latvia.

#### Micrasterias arcuata Bailey.

Mobile, Alabama. United States: Florida, Massachusetts; Newfoundland, Cuba, West Africa.

# Micrasterias arcuata var. gracilis (Bail.) W. and G. S. West. Pl. XII,

fig. 22.

Mobile, Alabama. United States: Pennsylvania, Florida.

#### Micrasterias conferta var. hamata (Lund.) Wolle.

Gainesville, Florida. United States: Wisconsin; Scotland.

#### Micrasterias crenata Bréb.

Cold Spring Harbor, New York. United States: New Hampshire, Massachusetts, Connecticut, North Carolina; Europe, West Africa, Brazil.

#### Micrasterias crux-melitensis (Ehrenb.) Hass. Pl. XII, fig. 26.

St. James Pond, Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Connecticut, Ohio, Michigan; Europe, Japan, India, Ceylon, Burma, Celebes, Central and East Africa, Brazil.

#### Micrasterias denticulata Bréb.

Auburn, Alabama.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Pennsylvania, Florida, North Carolina, Colorado, Alaska; now reported from every continent since Fritsch found it in South Africa.

# Micrasterias denticulata var. angulosa (Hantzsch) W. and G. S. West.

Marcus Creek, Pensacola, Florida.

United States: New Hampshire, Massachusetts, Michigan; Ontario, Canada; Europe, Bornholm, Greenland, Newfoundland, New Zealand, Brazil.

#### Micrasterias foliaceae Bail. Pl. XII, fig. 19.

Auburn, Alabama; Belmont Pond, Babylon, New York.

United States: New Hampshire, Massachusetts, Rhode Island, New York, Wisconsin; Brazil, Bengal, Lower Burma, Siam, India, Ceylon, Java, Australia.

#### Micrasterias furcata Ralfs.

Fishing Club, Smithtown, New York.

United States: Maine, New Hampshire, Rhode Island, New Jersey, New York, South Carolina, North Carolina, Georgia, Florida, Kansas, Washington; Brazil, Paraguay, Europe.

#### Micrasterias laticeps Nordst. Pl. XII, fig. 20.

Cold Spring Harbor, New York; Wisconsin.

United States: Wisconsin; Europe.

#### Micrasterias mahabuleshwarensis Hobson. Pl. XII, fig. 27.

Lake Ronkonkoma, Long Island, New York.

United States: New Hampshire, Massachusetts, Connecticut, New York; Europe, East Africa, India, Siam, Burma, Java, New Zealand, Australia, Brazil, Colombia, British Guiana.

#### Micrasterias muricata (Bail.) Ralfs.

Lake Ronkonkoma, Long Island, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, Wisconsin; Ontario, Canada.

#### Micrasterias oscitans var. mucronata (Dixon) Wille.

Ditch near Fourth Lake, Cold Spring Harbor, New York.

United States: Michigan; British Isles, France, North Germany, Norway, Faeroes, India.

#### Micrasterias papillifera Bréb.

Fishing Club, Smithtown, New York.

United States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, Florida, Michigan, Indiana; Europe, Greenland, New Zealand, Brazil.

#### Micrasterias pinnatifida (Kutz.) Ralfs. Pl. XII, figs. 24-25.

Castalian Lake, Durant, Mississippi; Lake Ronkonkoma, Long Island, New York. United States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, Michigan, Wisconsin, Washington; Ontario, Newfoundland, Europe, Faeroes, India, Burma, Ceylon, West Indies, Central Africa (Var.), Brazil.

#### Micrasterias radiata Hass. Pl. XI, fig. 30.

Cold Spring Harbor, New York. Cosmopolitan.

#### Micrasterias rotata (Grev.) Ralfs.

Lake Ronkonkoma, Long Island, New York; side hill spring swamp, Cold Spring Harbor, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Kansas, Colorado, Michigan, North Carolina, Alaska; Europe, Japan, India, Siam, Singapore, Madagascar, Brazil, Colombia.

#### Micrasterias sol (Ehrenb.) Kutz. Pl. XII, fig. 6.

Baton Rouge, Louisiana; Birmingham, Alabama; Auburn, Alabama; Castalian Lake. Durant, Mississippi; Starkville, Mississippi; bog south of Cold Spring Harbor, New York.

- United States: New Hampshire, Massachusetts, Connecticut, Rhode Island, Ohio; Ontario, Canada; British Isles, France, Italy, Norway, Sweden, Denmark, Latvia, Jamaica, Brazil.
- Micrasterias sol var. ornata Nordst. Pl. XII, fig. 21.

High Hill, Long Island, New York.

- United States: Massachusetts; Ontario, Canada; Wales, Scotland, Norway, Sweden, Brazil, Colombia.
- Micrasterias truncata (Corda) Bréb. Pl. XII, figs. 18, 28-29.
  - Auburn, Alabama; Mobile, Alabama; Lake Ronkonkoma, Long Island, New York; bog south of Cold Spring Harbor, New York.
  - United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Georgia, Florida, Pennsylvania, Michigan, Ohio, Indiana, Illinois, Wisconsin, Kansas, Minnesota, Alaska; Newfoundland, Cuba, Europe, Siberia, Faeroes, North India, Sandwich Islands, Madagascar, Brazil, Bolivia.

#### Micrasterias truncata var. major nov. var.

So much larger than the dimensions given by West, otherwise in agreement with the description and figure. Length 210µ, breadth 185µ, breadth of isthmus 37.4µ. Side hill spring swamp, Cold Spring Harbor, New York.

#### \*Micrasterias truncata var. granulata Racib.

Larger than the dimensions by West. Bog south of Cold Spring Harbor, New York. England, Ireland, Austria.

\*Cosmarium abbreviatum var. planctonicum W. and G. S. West.

Auburn, Alabama.

British Isles, Norway, Sweden, North Germany, Portugal.

#### \*Cosmarium alpestre Roy and Biss. Pl. XIII, fig. 36.

Lake Ronkonkoma, Long Island, New York. Scotland.

#### Cosmarium anceps Lund.

According to West this is a very characteristic alpine and subalpine species. Side hill spring swamp, Cold Spring Harbor, New York. United States, Europe, Faeroes, Nova Zembla, Spitzbergen, Greenland.

#### **Cosmarium angulosum** Bréb.

Baton Rouge, Louisiana. Cosmopolitan.

## \*Cosmarium bipunctatum Borge.

Auburn, Alabama. British Isles, Brazil.

#### Cosmarium blytii Wille.

Auburn, Alabama.

United States: Maine; Europe, West, Central and East Africa, Madagascar, Ceylon, Central China, New Zealand, Australia, Brazil, Colombia.

# Cosmarium botrytis Menegh.

Smithtown, New York.

United States: Massachusetts, Connecticut, North Carolina, Pennsylvania, Michigan, Ohio, Illinois, Wisconsin, Missouri, Kansas, Colorado, Alaska; Montreal, Canada; all other continents.

#### \*Cosmarium botrytis var. subtumidum Wittr.

Natchez, Mississippi.

Germany, Galicia in Austria, Norway, Sweden, North Russia, Greenland, Siberia.

#### Cosmarium connatum Bréb.

#### Mobile, Alabama.

United States: Massachusetts, New Hampshire, Rhode Island, Florida; Newfoundland, Europe, Japan, India, Burma, Siberia, Singapore, Java, Central Africa, Sandwich Islands, Greenland, British Guiana, Brazil.

#### Cosmarium conspersum var. latum (Bréb.) W. and G. S. West.

Auburn, Alabama.

United States, Europe, Siberia, Greenland, China, Celebes, Patagonia, Brazil.

# \*Cosmarium contractum var. ellipsoideum (Elfv.) W. and G. S. West.

Ocean Springs, Mississippi.

Europe: British Isles, Sweden, Norway, North Germany, Latvia, Finland, Iceland, Australia, Newfoundland.

#### Cosmarium costatum Nordst.

Montvale, Tennessee.

West considers this a rare alpine and arctic Desmid which exhibits considerable variation in size.

United States: North Carolina; Northern Europe, Greenland, Spitzbergen.

# Cosmarium cucumis (Corda) Ralfs.

Sphagnum bog northwest of Woodberry, New York.

United States: North Carolina, South Carolina, Georgia, Florida, Connecticut, Massachusetts, Pennsylvania, Indiana; Newfoundland, Greenland, Spitzbergen, Nova Zembla, Siberia, Iceland, Faeroes, Azores, Burma, Porto Rico, Brazil, Uruguay, Patagonia, Europe.

#### Cosmarium cucurbita Bréb.

#### Auburn, Alabama.

United States: Connecticut; Europe, Faeroes, Greenland, Singapore, Australia, West Africa, West Indies, Brazil, New Caledonia.

#### Cosmarium formosulum Hoff. Pl. XIII, fig. 49.

Cold Spring Harbor, New York.

United States: Illinois, North Dakota, Colorado, Arizona; Europe, Bornholm, Faeroes, Iceland, Siberia, West Indies, Southwest Africa.

#### **Cosmarium formosulum** var. **nathorstii** (Boldt) W. and G. S. West.

City Park, New Orleans, Louisiana.

United States: North Dakota; England, Austria, Latvia, Norway, Faeroes, Greenland.

- Cosmarium isthmium West. Pl. XIII, fig. 47. Sphagnum bog, northwest of Woodberry, New York. United States, British Isles.
- \*Cosmarium isthmium vai hibernica West. Auburn, Alabama; Baton Rouge, Louisiana. Found only in Ireland.

#### \*Cosmarium logiense Bissett. Pl. XIII, fig. 35. Amory, Mississippi; Miller's Pond, Smithtown, New York. England, Austria, Norway, West Indies, Southwest Africa.

Cosmarium margaritatum (Lund.) Roy and Biss.

Amory, Mississippi.

United States: Maine, New Hampshire, Connecticut; British Isles, France, Germany, Austria, Latvia, Norway, Sweden, North Finmark, Greenland, Siberia, India, Ceylon, Singapore, West and Central Africa, West Indies, Brazil.

# \*Cosmarium margaritatum forma subrotundata W. and G. S. West. Pl. XIII, fig. 42.

Lake Ronkonkoma, Long Island, New York. Recorded only from Wales and Scotland.

#### Cosmarium meneghinii Bréb.

Royal Palm Park, Florida. United States: Massachusetts, Connecticut, Georgia, Pennsylvania, Ohio, North Dakota, Nebraska; cosmopolitan.

#### Cosmarium microsphinctum Nordst.

Pascagoula, Mississippi. United States, Europe, Greenland, Nova Zembla, Franz Josef Land.

#### \*Cosmarium ochthodes var. amoebum West. Pl. XIII, fig. 46.

Terry, Mississippi.

British Isles, Austria, Switzerland, Latvia, Lapland, Spitzbergen.

#### **Cosmarium orbiculatum** forma major (Ralfs) W. and G. S. West.

Mobile, Alabama. Found only in Wales.

#### Cosmarium ornatum Ralfs.

Mobile, Alabama. United States: Massachusetts, New Hampshire, Connecticut, Wisconsin, Kansas, Alaska; Ontario, Canada; Europe, Iceland, Brazil, Paraguay.

#### Cosmarium orthogonum Delp.

Mobile, Alabama. United States, Scotland, Italy, Austria.

#### Cosmarium orthostichum var. pumilum Lund.

Baton Rouge, Louisiana.

United States: Colorado; British Isles, Galicia in Austria, North Germany, Switzerland, Norway, Sweden.

# Cosmarium ovale Ralfs. Pl. XIII, fig. 41.

- Baton Rouge, Louisiana; Lake Ronkonkoma, Long Island, New York; Miller's Pond, Smithtown, New York.
- United States: Connecticut, Rhode Island, New York, Pennsylvania, North Carolina, South Carolina, Wisconsin; British Isles, France, Galicia, Switzerland, North Germany, Italy, Scandanavia, Finland, Brazil.

**Cosmarium ovale** var. **subglabrum** W. and G. S. West. Bog south of Cold Spring Harbor, New York. United States, England.

- \*Cosmarium pachydermum var. aethiopicum W. and G. S. West. Lake Ronkonkoma, Long Island, New York. Norway, Latvia, India, West Africa.
- \*Cosmarium plicatum var. major Reinsch. Pl. XIII, fig. 45. Royal Palm Park, Florida. Scotland, Germany.

#### Cosmarium portianum Archer. Pl. XIII, fig. 37.

Aberdeen, Mississippi; Castalian Lake, Durant, Mississippi; Auburn, Alabama; Cold Spring Harbor, New York.

United States: Maine, Connecticut, North Carolina, Michigan, Illinois, Kansas, Wisconsin; Europe, Spitzbergen, Nova Zembla, Siberia, Central China, India, Burma, Ceylon, Australia, Japan, Azores, Brazil.

### Cosmarium pseudomoenum Wille. Pl. XIII, fig. 40.

Auburn, Alabama.

United States, Europe, Central China, New Zealand, East Africa, Madagascar, Brazil, Colombia.

\*Cosmarium pseudoconnatum var. ellipsoideum W. and G. S. West. Castalian Lake, Durant, Mississippi.

Known only to occur in Indo-Malayan region.

# Cosmarium pseudonitidulum Nordst.

Gainesville, Florida.

United States: Maine; Newfoundland, Norway, France, Pyrenees Mountains, Poland, Siam, Central China, Turkestan, Colombia.

# Cosmarium pseudonitidulum var. validum W. and G. S. West. Pl. XIII, fig. 39.

Mobile, Alabama.

United States: Connecticut; British Isles, Norway, India, Azores, West and South Africa.

#### Cosmarium pseudoprotuberans Kirchn.

Castalian Lake, Durant, Mississippi. United States: Maine, Michigan; cosmopolitan.

#### Cosmarium pseudopyramidatum Lund.

Mobile, Alabama.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Ohio; widely distributed.

#### Cosmarium pseudopyramidatum var. stenonotum Nordst.

Cocoa, Florida.

United States: Maine; Europe, Bornholm, Japan, Australia, West Indies, Paraguay.

#### \*Cosmarium punctulatum var. rotundatum (Bréb.) Klebs.

Auburn, Alabama. Wales, India.

# Cosmarium punctulatum var. subpunctulatum (Nordst.) Borge. Pl. XIII, fig. 48.

Auburn, Alabama; Lake Ronkonkoma, Long Island, New York.

United States: Wisconsin; British Isles, Germany, Austria, Switzerland, Norway, Sweden, Latvia, Bornholm, Bosnia, Faeroes, Siberia, New Zealand, South Africa, Brazil, Patagonia.

### Cosmarium pyramidatum Bréb. Pl. XIII, fig. 44.

Pascagoula, Mississippi; Cold Spring Harbor, New York.

United States: New Hampshire, Massachusetts, Connecticut, North Carolina, Georgia, Florida, Pennsylvania, Alaska; cosmopolitan.

#### Cosmarium rectangulare Grun.

Sphagnum bog, Woodberry, New York.

United States: New Hampshire, Kansas; Europe, Bornholm, Greenland, Siberia, Japan, Central and South Africa, West Indies.

# Cosmarium reniforme (Ralfs) Archer.

Aberdeen, Mississippi; City Park, New Orleans, Louisiana; side hill spring swamp, Cold Spring Harbor, New York.

United States: New Hampshire, Massachusetts, Illinois, Michigan, Ohio, Wisconsin; Europe, Faeroes, Greenland, Spitzbergen, Australia, Turkestan, Caucasus, Siberia, Brazil, Argentina.

#### Cosmarium reniforme var. compressum Nordst.

#### Montvale, Tennessee.

United States: New Hampshire; British Isles, Norway, Latvia, India, New Zealand, Australia, British Guiana.

#### Cosmarium sexangulare Lund. Pl. XIII, fig. 43.

Cold Spring Harbor, New York. United States, Europe, Japan, Australia, East Africa.

### \*Cosmarium simii Roy and Biss.

Auburn, Alabama.

Found previously only in Scotland.

#### \*Cosmarium subarctoum (Lagerh.) Racib.

Cocoa, Florida.

British Isles, Sweden, North Russia, Norway, Greenland, Australia, Argentina.

#### Cosmarium subcucumis Schmidle.

Auburn, Alabama.

United States: Connecticut; England, France, Germany, Switzerland, Austria, and Galicia, Portugal, Norway, Sweden.

#### Cosmarium subtumidum Nordst.

Montvale, Tennessee.

United States: Connecticut; Europe, Greenland, Asia, Java, Australia, Africa, West Indies, Brazil.

#### Cosmarium taxichondrum Lund.

Cold Spring Harbor, New York.

United States: Massachusetts, New Hampshire, Michigan; Europe, Siberia, China, Japan, India, Ceylon, Java, Madagascar, Abyssinia, Central Africa.

#### Cosmarium tetraophthalmum Bréb.

Castalian Lake, Durant, Mississippi.

United States: Massachusetts, Connecticut, New Jersey, Ohio, Colorado; widely distributed but not reported from Africa.

#### Cosmarium thwaitesii Ralfs.

Cold Spring Harbor, New York.

United States: New Hampshire, Connecticut, Florida; Europe, New Zealand, Abyssinia.

# \*Cosmarium trachypleurum var. minus Racib Pl. XIII, fig. 38.

Mobile, Alabama.

Ireland, Scotland, Austria, Galicia, North Germany, Poland, North Russia, Switzerland, Sweden, Australia.

#### Cosmarium tumens Nordst.

Side hill spring swamp, Cold Spring Harbor, New York.

United States: Pennsylvania; Germany, England, Switzerland, Austria, Spitzbergen, China.

#### \*Cosmarium viride var. glabra (Josh.) W. and G. S. West.

Bog south Cold Spring Harbor, New York. Scotland, Germany.

#### Xanthidium aculeatum Ehrenb.

Lake Joanna, Mt. Dora, Florida. United States, Europe, Faeroes.

#### Xanthidium antilopaeum (Bréb.) Kutz. Pl. XIII, fig. 66.

Castalian Lake, Durant, Mississippi.

United States: New Hampshire, Massachusetts, Connecticut, Ohio, Michigan, Wisconsin, Kansas; Newfoundland, Europe, Faeroes, Siberia, Mongolia, Japan, India, Java, Central Africa, West Indies, Brazil, Paraguay.

#### Xanthidium antilopaeum var. depauperatum W. and G. S. West.

Marcus Creek, Pensacola, Florida.

United States: Wisconsin; British Isles.

Xanthidium antilopaeum var. hebridarum W. and G. S. West. Cold Spring Harbor, New York. United States: Connecticut; Scotland, Ireland, Finland, Norway, Siberia.

Xanthidium armatum (Bréb.) Rabenh. Pl. XIII, fig. 53.

Sphagnum bog south of Woodberry, New York.

United States: Massachusetts, South Carolina, Florida, Pennsylvania, Indiana, Wisconsin; Newfoundland, Europe, Faeroes, North India, Burma, New Zealand, Cuba, Colombia.

# Xanthidium controversum W. and G. S. West. Pl. XIII, fig. 60. Miller's Pond, Smithtown, New York. United States: New Hampshire; Norway, Colombia.

# Xanthidium cristatum Bréb. Pl. XIII, fig. 61.

Castalian Lake, Durant, Mississippi.

United States: New Hampshire, Connecticut, New York, South Carolina, Georgia, Florida, Wisconsin, Colorado; Newfoundland, Europe, Greenland, North India, East Africa, Brazil.

Xanthidium cristatum var. leiodermum (Roy and Biss.) Turner. Castalian Lake, Durant, Mississippi. United States, England, India, Japan.

Xanthidium tetracentrotum Wolle. Pl. XIII, fig. 62.

Mobile, Alabama. Found in the United States by Wolle and Cushman.

#### Arthrodesmus convergens Ehrenb. Pl. XIII, fig. 63.

Castalian Lake, Durant, Mississippi.

United States: New Hampshire, Connecticut, Massachusetts, Rhode Island, South Carolina, Georgia, Florida, Michigan, Ohio, Indiana, Wisconsin, Kansas, Washington; widely distributed.

### Arthrodesmus incus (Bréb.) Hass.

Mobile, Alabama.

United States: Massachusetts, Connecticut, Rhode Island, Georgia, South Carolina, Florida, Wisconsin, Minnesota; widely distributed.

# Arthrodesmus incus var. validus W. and G. S. West. Pl. XIII, fig. 64. Lake Ronkonkoma, Long Island, New York. United States, Scotland, Ireland, Ceylon, Brazil.

#### Arthrodesmus octocornis Ehrenb.

Fourth Lake, Cold Spring Harbor, New York.

United States: Connecticut, Massachusetts, New Hampshire, Rhode Island, Florida, Georgia; Europe, Faeroes, Iceland, Siberia, Greenland, Mongolia, Japan, Burma, Ceylon, Australia, Cuba, Brazil.

#### Staurastrum aculeatum (Ehrenb.) Menegh.

Castalian Lake, Durant, Mississippi.

United States: Maine; Europe, Nova Zembla, Greenland, Siberia, Japan, Burma, Australia, New Zealand, Patagonia, Antarctic.

#### Staurastrum anatinum Cooke and Wills. Pl. XIV, fig. 91.

Belmont Pond, Babylon, New York.

United States: Maine, Massachusetts, Wisconsin; Ontario, Canada; Norway, Sweden, Finland, Latvia, Denmark.

#### Staurastrum anatinum var. longibrachiatum W. and G. S. West.

Fishing Club, Smithtown, New York.

United States: Wisconsin; Ontario, Canada; Scotland, Latvia.

#### Staurastrum artiscon (Ehrenb.) Lund.

Starkville, Mississippi.

United States: Connecticut, New Hampshire, New York, North Carolina, Michigan, Indiana, Kansas, Wisconsin, Colorado, Alaska; Newfoundland, Ontario, British Isles, France, Belgium, Latvia, Finland, North Germany, Norway, Sweden, Greenland, Brazil.

#### \*Staurastrum bifidum (Ehrenb.) Bréb.

Castalian Lake, Durant, Mississippi.

Europe, Central China, Japan, India, Ceylon, Burma, Siam, Java.

#### Staurastrum brasiliense Nordst.

Mobile, Alabama.

United States: New Hampshire, Florida; Cuba, Norway, France, Burma, Abyssinia, Brazil, Paraguay.

# Staurastrum brasiliense var. lundellii W. and G. S. West. Pl. XIV, fig. 90.

Mobile, Alabama.

United States: New York, Wisconsin; British Isles, Norway, Sweden, North Germany, Finland, Paraguay.

### Staurastrum cerastes Lund. Pl. XIV, figs. 76-77.

Cocoa, Florida.

United States: New Hampshire, Connecticut, New York, Florida, Wisconsin; Ontario, Canada; British Isles, Norway, Sweden, Finland, Ceylon.

#### \*Staurastrum conspicuum W. and G. S. West.

Sphagnum bog, northwest of Woodberry, New York. Found in Scotland.

#### Staurastrum coronulatum Wolle.

Shallow stream, Gainesville, Florida. Found previously in De Land, Florida, by West.

#### \*Staurastrum cornutum Arch.

Auburn, Alabama. Found only in Scotland, Ireland, Finland.

#### Staurastrum dejectum Bréb.

Mobile, Alabama. United States: Connecticut, Georgia, Wisconsin, Indiana, Alaska; widely distributed.

#### Staurastrum gladiosum Turner. Pl. XIV, figs. 84-85.

Lake Ronkonkoma, Long Island, New York. United States: Connecticut; England, Wales, Latvia, India.

# Staurastrum grallatorium Nordst.

Baton Rouge, Louisiana. United States: Wisconsin; Europe.

#### Staurastrum hirsutum (Ehrenb.) Bréb.

Auburn, Alabama.

United States: Maine, Massachusetts, Connecticut, Rhode Island, North Carolina, Florida, Ohio, Indiana, Minnesota; Europe, Spitzbergen, Greenland, Colombia.

#### \*Staurastrum inconspicuum var. crassum Gay. Pl. XIII, fig. 87.

Lake Ronkonkoma, Long Island, New York. Found in Ireland, France, Latvia.

#### Staurastrum macrocerum Wolle.

Mobile, Alabama; Pascagoula, Mississippi. United States: Massachusetts; Newfoundland, Norway.

#### Staurastrum megalonotum Nordst.

Cold Spring Harbor, New York. United States: New Hampshire; England, Germany, Austria, Greenland, Spitzbergen.

#### Staurastrum natator West.

"This rare and beautiful Desmid is only found in bogs in the region of older paleozoic rocks." Mobile, Alabama. United States: Wisconsin; British Isles, Scandinavia, Finland.

#### \*Staurastrum oligacanthum Bréb. Pl. XIV, fig. 89.

Cold Spring Harbor, New York. France, Switzerland, Austria, Norway, Spitzbergen, Greenland.

# \*Staurastrum ophiura var. cambricum (Lund.) W. and G. S. West. Pl. XIV, fig. 82.

Mobile, Alabama. Reported previously from Wales.

#### \*Staurastrum oxyacanthum Archer. Pl. XIV, fig. 86.

Auburn, Alabama. Europe, Faeroes, Greenland, Siberia, Mongolia, Patagonia.

#### Staurastrum pseudosebaldi Wille.

Aberdeen, Mississippi.

United States: Massachusetts; Ontario, Canada; Europe, Asia, New Zealand, Greenland, Brazil, Colombia.

Staurastrum punctulatum var. pygmaeum (Bréb.) W. and G. S. West. Baton Rouge, Louisiana; Fishing Club, Smithtown, New York. Cosmopolitan.

#### Staurastrum setigerum Cleve.

Lake Joanna, Mt. Dora, Florida. United States: Connecticut, Wisconsin; Europe, Africa, Brazil, Paraguay.

#### Staurastrum tetracerum Ralfs.

Castalian Lake, Durant, Mississippi. United States: Maine, Connecticut; cosmopolitan.

#### Staurastrum tohopekaligense Wolle. Pl. XIV, fig. 83.

Lake Ronkonkoma, Long Island, New York. United States: New York, Wisconsin; Ontario, Canada.

#### Staurastrum vestitum Ralfs. Pl. XIV, fig. 93.

Mobile, Alabama. United States: Maine, Connecticut, Indiana, Wisconsin; Ontario, Canada; Europe,

# \*Staurastrum vestitum var. semivestitum West. Pl. XIV, fig. 88.

Found in England, Latavia.

# Cosmocladium pulchellum Bréb. Pl. XIV, fig. 74.

Royal Palm Park, Florida. United States: Michigan; Scotland, France, Germany.

#### Sphaerozosma pulchrum Bail.

Caldwell's Pond, Armory, Mississippi; Aberdeen, Mississippi; Lake Ronkonkoma, Long Island, New York. United States, Brazil, British Guiana.

#### Sphaerozosma retangulare (Corda) Wolle.

Starkville, Mississippi; Amory, Mississippi; Cocoa, Florida; Raymond, Mississippi. Found in New Jersey, U.S.A.

### **Spondylosium papillosum** W. and G. S. West. Sphagnum bog, Woodberry, New York. United States: Connecticut, Ohio; British Isles, Germany, Australia, Madagascar,

Africa.

# Spondylosium planum (Wolle) W. and G. S. West. Pl. XIV, fig. 73. Mobile, Alabama; Lake Ronkonkoma, Long Island, New York.

United States: Connecticut, Wisconsin; Ontario, Canada; British Isles, Norway, Finmark, Latvia, Alaska.

#### Spondylosium pulchrum (Bail.) Archer. Pl. XIV, fig. 68.

Cold Spring Harbor, New York. United States, Wisconsin; Europe.

Asia, Azores, South America. Sphagnum bog, Woodberry, New York.

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#### **Spondylosium pygmaeum** (Cooke) West.

St. James Pond, Cold Spring Harbor, New York.

United States: Connecticut; British Isles, Germany, Switzerland, Roumania, Norway, South Africa, Azores.

#### Hyalotheca dissilens (Sm.) Bréb. Pl. XIV fig. 71.

Found abundantly in all the collections examined. It is one of the most common of Desmids and has been reported from every continent.

United States: New Hampshire, Massachusetts, Rhode Island, Connecticut, North Carolina, South Carolina, Georgia, Florida, Pennsylvania, Michigan, Ohio, Indiana, Illinois, Wisconsin, Colorado, Kansas.

#### \*Hyalotheca dissilens var. bidentula Nordst.

Castalian Lake, Durant, Mississippi. Europe, Asia, New Zealand, Spitzbergen, Greenland, Cuba, Brazil.

#### Hyalotheca dissilens var. hians Wolle.

Crystal Springs, Mississippi. United States, British Isles, Norway, Russia, Ceylon, New Zealand, West Indies, Brazil.

#### Hyalotheca dissilens var. minor Delp.

Pond near Mayhew, Mississippi. United States: New Hampshire; Wales.

#### Hyalotheca mucosa (Mert.) Ehrenb. Pl. XIV, fig. 70.

Lake Ronkonkoma, Long Island, New York. United States: Maine, Massachusetts, Connecticut, Rhode Island, North Carolina, Georgia, Wisconsin; widely distributed.

#### Desmidium aptogonum Breb. Pl. XIV, fig. 92.

Pond southwest of Starkville, Mississippi; Terry, Mississippi; Cocoa, Florida; High Hill, New York.

United States: New Hampshire, Massachusetts, Connecticut, North Carolina, South Carolina, Georgia, Florida, Wisconsin; recorded from all continents but Africa.

#### Desmidium aptogonum var. ehrenbergii Kutz. Lake Ronkonkoma, Long Island, New York.

United States, Europe.

#### Desmidium baileyii (Ralfs) Nordst. Pl. XIV, fig. 80.

Baton Rouge, Louisiana; Auburn, Alabama; Gainesville, Florida; Lake Ronkonkoma, Long Island, New York.

United States: New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, Michigan, Minnesota, Wisconsin; Ontario, Newfoundland, India, France, Australia, Central Africa, Porto Rico, Brazil, Colombia.

#### Desmidium coarctatum Nordst. Pl. XIV, fig. 79.

Mobile, Alabama; Fishing Club, Smithtown, New York.

United States: New Hampshire, Florida; Newfoundland, Finland, Ceylon, Australia, New Zealand, Madagascar.

#### \*Desmidium coarctatum var. cambricum West. Pl. XIV, fig. 78.

Ocean Springs, Mississippi.

Found only in Wales and Scotland.

#### Desmidium cylindricum Grev.

Castalian Lake, Durant, Mississippi.

United States: New Hampshire, Massachusetts, Connecticut, New York, Michigan, Colorado; Ontario, Canada; Europe, India, Ceylon, Australia, British Guiana, Brazil, Colombia, Paraguay.

#### \*Desmidium occidentale W. and G. S. West

Mobile, Alabama.

Found previously in Scotland and Brazil.

# Desmidium quadratum Nordst.

Gainesville, Florida; Cocoa, Florida; Mobile, Alabama; Birmingham, Alabama; Ocean Springs, Mississippi; Cold Spring Harbor, New York.

United States: New Hampshire, Louisiana; Europe, Newfoundland, Asia, Brazil, Australia.

#### Desmidium swartzii Agardh. Pl. XIV, fig. 69.

Pond west of Starkville, Mississippi; Baton Rouge, Louisiana; Birmingham, Alabama; Auburn, Alabama.

United States: New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, North Carolina, South Carolina, Georgia, Florida, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, Colorado, Alaska; widely distributed on other continents.

#### Gymnozyga moniliformis (Ehrenb.) Pl. XIV, fig. 81.

Starkville, Mississippi; Mobile, Alabama; Marcus Creek, Pensacola, Florida; sphagnum bog northwest of Woodberry, New York.

Cosmopolitan.

#### Gymnozyga moniliformis var. gracilens Nordst.

Mobile, Alabama.

Every continent but Africa.

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# PLATE XI

- 1. Pleurotaenium maximum var. tumidum nov. var. (2x scale)
- 2. Pleurotaenium subcornulatum var. detum W. and G. S. West
- 3. Pleurotaenium nodosum (Bail.) Lund.
- 4. Pleurotaenium ehrenbergii (Bréb.) DeBary
- 5. Spirotaenia obscura Ralfs
- 6. Netrium digitus (Ehrenb.) Itzigs and Rothe
- 7. Triploceros gracile Bailey
- 8. Closterium ehrenbergii Menegh.
- 9. Tetmemorus laevis (Kutz.) Ralfs.
- 10. Tetmemorus brebissonii (Menegh.) Ralfs
- 11. Closterium leibleinii Kutz.
- 12. Micrasterias radiata Hass.
- 13. Penium minutum var. gracile Wille.
- 14. Closterium decorum Bréb.
- 15. Closterium kutzingii Bréb.
- 16. Closterium intermedium var. hibernicum West
- 17. Pleurotaenium nodosum (Bail.) Lund.



Plate XI

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# PLATE XII

- 18. Micrasterias truncata (Corda) Bréb.
- 19. Micrasterias foliaceae Bail.
- 20. Micrasterias laticeps Nordst.
- 21. Micrasterias sol var. ornata Nordst.
- 22. Micrasterias arcuata var. gracilis (Bail.) W. and G. S. West
- 23. Micrasterias sol (Ehrenb.) Kutz.
- 24-25. Micrasterias pinnatifida (Kutz.) Ralfs.
- 26. Micrasterias crux-melitensis (Ehrenb.) Hass.
- 27. Micrasterias mahabuleshwarensis Hobson.
- 28-29. Micrasterias truncata (Corda) Bréb.
- 30. Micrasterias radiata Hass.



Plate XII

# PLATE XIII

31-32. Euastrum wollei Lag.

- 33. Euastrum verrucosum var. coarctatum (Ehrenb.) Delp
- 34. Euastrum verrucosum var. alatum (Ehrenb.) Wolle
- 35. Cosmarium logiense Bissett
- 36. Cosmarium alpestre Roy and Biss.
- 37. Cosmarium portianum Archer
- 38. Cosmarium trachypleurum var. minus Racib.
- 39. Cosmarium pseudonitidula var. validum W. and G. S. West
- 40. Cosmarium pseudomoenum Wille
- 41. Cosmarium ovale Ralfs
- 42. Cosmarium margaritatum forma subrotundata W. and G. S. West
- 43. Cosmarium sexangulare Lund.
- 44. Cosmarium pyramidatum Bréb.
- 45. Cosmarium plicatum var. major Reinsch.
- 46. Cosmarium ochthodes var. amoebum West
- 47. Cosmarium isthmium West
- 48. Cosmarium punctulatum var. subpunctulatum (Nordst.) Borge
- 49. Cosmarium formosulum Hoff
- 50. Euastrum didelta (Turp.) Ralfs
- 51-52. Euastrum affine Ralfs
- 53. Xanthidium armatum (Bréb.) Rabenh.
- 54. Euastrum ansatum Ralfs
- 55. Euastrum gemmatum Bréb.
- 56. Euastrum bidentatum Nag.
- 57. Euastrum evolutum var. integrius W. and G. S. West
- 58-59. Euastrum verrucosum Ehrenb.
- 60. Xanthidium controversum W. and G. S. West
- 61. Xanthidium cristatum Bréb.
- 62. Xanthidium tetracentrotum Wolle
- 63. Arthrodesmus convergens Ehrenb.
- 64. Arthrodesmus incus var. validus W. and G. S. West
- 65. Euastrum pinnatum Ralfs.
- 66. Xanthidium antilopaeum (Bréb.) Kutz.
- 67. Euastrum oblongum (Grev.) Ralfs



Plate XIII

# PLATE XIV

- 68. Spondylosium pulchrum (Bail.) Archer
- 69. Desmidium swartzii Agardh.
- 70. Hyalotheca mucosa (Mert.) Ehrenb.
- 71. Hyalotheca dissiliens (Sm.) Bréb.
- 72. Desmidium aptogonum Bréb.
- 73. Spondylosium planum (Wolle) W. and G. S. West
- 74. Cosmocladium pulchellum Bréb.
- 75. Pleurotaenium trochiscum W. and G. S. West

76-77. Staurastrum cerastes Lund.

78. Desmidium coarctatum var. cambricum West

- 79. Desmidium coarctatum Nordst.
- 80. Desmidium baileyii (Ralfs) Nordst.

81. Gymnozyga moniliformis Ehrenb.

- 82. Staurastrum ophiura var. cambricum (Lund.) W. and G. S. West
- 83. Staurastrum tohopekaligense Wolle
- 84-85. Staurastrum gladiosum Turner
- 86. Staurastrum oxyacanthum Archer
- 87. Staurastrum inconspicuum var. crassum Gay
- 88. Staurastrum vestitum var. semivestitum West
- 89. Staurastrum oligacanthum Bréb.
- 90. Staurastrum brasiliense var. lundellii W. and G. S. West
- 91. Staurastrum anatinum Cooke and Wills
- 92. Pleurotaenium coronatum var. fluctuatum West
- 93. Staurastrum vestitum Ralfs



PLATE XIV