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TUFTS COLLEGE STUDIES, Vol. IV., No. 7
(SCIENTIFIC SERIES NO. 37)

THE GREEN ALGAE OF NORTH AMERICA,
(SECOND SUPPLEMENT.)

By FRANK S. COLLINS.

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LIST OF TUFTS COLLEGE STUDIES

(Scientific Series) previously published

1. G. A. Arnold: The Anterior Cranial Nerves of *Pipa americana* (*Bulletin of the Essex Institute*, xxvi, pp. 1–9, 1893). 1 Plate and 1 Text-figure.
2. Julia B. Platt: Ectodermic Origin of the Cartilages of the Head (*Anatomischer Anzeiger*, viii, pp. 506–509, 1893).
3. J. S. Kingsley: The Classification of the Arthropoda (*American Naturalist*, xxviii, pp. 118 and 220, 1894).
4. O. L. Simmons: Development of the Lungs of Spiders (*American Journal of Science and Arts*, 1894). 1 Plate.
5. V. L. Leighton: The Development of the Wing of *Sterna Wilsonii* (*American Naturalist*, xxviii, p. 761, 1894).
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9. A. B. Lamb: The Development of the Eye-Muscles in Acanthias (*American Journal of Anatomy*, i, pp. 185–202, 1902) 9 Text-figures.
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18. A. E. Preble: Catalogue of the Mammals in the Barnum Museum of Tufts College.

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TUFTS COLLEGE STUDIES, Vol. IV, No. 7.

THE GREEN ALGAE OF NORTH AMERICA, SECOND SUPPLEMENTARY PAPER.

By Frank S. Collins.

In the five years since the first supplement to the Green Algae of North America, Vol. III, No. 2, of this series was published, many species known from other countries have been found to occur here, while to a larger extent than in the first supplement, species and genera new to science have been discovered here. The largest contributors to this increase have been E. N. Transeau and G. M. Smith. Transeau's papers, 1913, 1914, 1915, beside a general account of the algae of the prairie regions of Illinois, give a careful study of our Zygnemaceae and Mesocarpaceae with many new species, and also a number of new species of *Oedogonium*. Transeau, 1913a, is a study of seasonal variation in algae, covering a period of five years; Transeau, 1917, reports collections in Michigan in 1915. G. M. Smith, 1916, 1916b, form a very important contribution to the knowledge of our plankton forms, giving the results of two years' exploration of the lakes of Wisconsin. Smith, 1916a, is a monograph of the genus *Scenedesmus*, intended to include all references in print, and probably coming as near to completeness as is humanly possible. Smith, 1913, describes a new and interesting genus; other papers by the same author are of special interest in other than systematic lines. It is a matter for congratulation to all interested in the study of our fresh water algae that two men whose names did not appear in the original paper or its first supplement are now doing work equal to the best anywhere. The species of Transeau and Smith have been included here as given by them; it is probable that, as in all such cases, changes will later be found necessary, but they cannot be foreseen. Börgesen, 1913, and Collins & Hervey, 1917, add a number of species from subtropical regions, the former from the Danish West Indies,* the latter from Ber-

* These islands have lately been purchased by the United States, and in the following text will be referred to by their new name, the Virgin Islands.

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muda. Other authors and contributors are recorded in their proper places.

The most important general work appearing during the past five years is Die Süsswasser-Flora Deutschlands, Oesterreichs und der Schweiz, issued by Pascher of Prag, really a series of monographs by the best specialists of continental Europe, covering all vegetation from flowering plants down, to be found in fresh water. Beside recording all, and figuring nearly all, found in the regions named, it has at least references to most species of other regions with similar conditions; it is practically indispensable to any careful student. The student will, however, regret that the condensed form, in one way an advantage, has excluded all references to original descriptions and most synonymy. As no citations are given, it is impossible to determine when a combination is used for the first time, as is certainly sometimes the case. Part V, Tetrasporales, Protococcales, Part VI, Ulothricales, Microsporales, Oedogoniales, Part IX, Zygnemales, have been issued; Parts IV, Volvocales, VII, Siphonales, XI, Heterokontæ, are still to come.

West, 1916, contains a system of classification of all the green algae, with characters of genera and higher divisions; it differs considerably in details from previous classifications. Attention has been given to it in cases where genera not before known in North America are now reported, but no attempt has been made to rearrange genera already known here. In general, specific names have not been changed from those used in 1909 and 1912, when the change was due to the discovery of an older name than the one hitherto prevailing; nor has record been made of extensions of range.

Citations have been made in the same manner as in the original paper and the first supplement; all works not already included in the lists given with those papers will be found in the list at the end of this paper. In general the second supplement follows the plan of the first, as stated on p. 76 of the latter. No attempt has been made to revise the keys to the genera, as a paper by the writer will soon be issued in the Tufts College Studies, giving a general key to the genera of North

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American algae. The plates, illustrating all but one of the new genera, are the work of Professor F. D. Lambert, with the exception of the plate of *Oedocladium*, which is by Professor I. F. Lewis.

Page 94, for Key to the Species of Ophiocytium, substitute,

1. Attached.	2.
1. Free.	3.
2. Cells 5-7 μ diam., stipe 10-14 μ long.	6. *O. gracilipes.*
2. Cells 3-5 μ diam., stipe 2-3.5 μ long.	5. *O. arbuscula.*
3. Bearing a stipe or spine.	4.
3. Without stipe or spine.	7.
4. Stipe with capitate end.	1. *O. majus.*
4. Stipe or spine acute.	5.
5. Spine at one end.	2. *O. cochleare.*
5. Spine at each end.	6.
6. Cells 12-15 μ diam.	7. *O. bicuspidatum.*
6. Cells 10 μ diam. or less.	3. *O. capitatum.*
7. Cell rounded at both ends.	4. *O. parvulum.*
7. Cell rounded at one end, sharply truncate at the other.	8 *O. truncatum.*

After the description of O. CAPITATUM, add,

Var. LONGISPINUM (Möb.) Lemmermann, 1899, p. 32, Pl. IV, figs. 21-25; *Reinschiella longispina* Möbius, 1894, p. 331, Pl. I, figs. 31-33. Cells 6-7 μ diam., 3-4 diam. long, at first straight, then curved, finally convolute, spine 16-50 μ long at each end. Wis., G. M. Smith. *Europe.*

Page 95, after description of O. GRACILIPES, add,

7. O. BICUSPIDATUM (Borge) Lemmermann, 1899, p. 31, Pl. III, figs. 13-15; *O. majus* var. *bicuspidatum* Borge, 1894, p. 10, Pl. I, fig. 3. Cells solitary, 12-15 μ diam., arched or spiral, with spine 5-7 μ long at each end. Fla., Borge. *Europe.*

8. O. TRUNCATUM Lemmermann, 1899, p. 33, Pl. IV, figs. 26-29. Cells solitary, 5-6 μ diam., straight, arched or spiral, one end rounded, the other sharply truncate. Harpswell, Maine, Lambert. *Europe.*

Page 95, TRIBONEMA Derbès & Solier is now generally accepted in place of CONFERVA Linnaeus.

Page 99, under CHLOROTHECIACEAE, cancel "Only one genus represented here," also everything referring to CHARACIOPSIS, and substitute as follows:

CHARACIOPSIS Borzi, 1894, p. 151.

Cells lanceolate, cylindrical, pyriform or ovoid, solitary or gregarious, attached to plants or crustaceans by a stipe, usually with basal disk; chromatophores one to several, parietal, disk-shape; asexual reproduction by uniciliate zoospores with lateral stigma; in one species macro- and microzoospores; also by aplanospores; sexual reproduction by zoogonidia formed 1-4 in an aplanospore, the zygote developing 1-2 zoospores.

In habit the species of this genus closely resemble species of CHARACIUM, but possess asexual reproduction, have zoospores with only one cilium or with merely the rudiment of a second cilium, and have no pyrenoid. Lemmermann, 1914, is a monograph of the genus, and is here followed.

KEY TO THE SPECIES OF CHARACIOPSIS.

1. Cell with obtuse apex.	2.
1. Cell with acute or subulate apex.	6.
2. Mature cell of uniform diam. most of its length.	5. *C. cylindrica.*
2. Mature cell of various shape, not cylindrical.	3.
3. Cell ovoid or ellipsoid, subequally rounded above and below.	4.
3. Cell rounded above, tapering below.	5.
4. Stipe slender, with basal disk.	1. *C. Naegelii.*
4. Stipe stout, without basal disk.	2. *C. ellipsoidea.*
5. Epiphytic, 15-25 μ long.	3. *C. pyriformis.*
5. Epizoic, 50-150 μ long.	4. *C. groenlandica.*
6. Cell more or less falcate.	8. *C. subulata.*
6. Cell not falcate.	7.
7. Stipe half to twice as long as cell.	9. *C. longipes.*
7. Stipe less than half as long as cell.	8.
8. Cell short-acuminate, straight at both ends.	6. *C. acuta.*
8. Cell long-acuminate at both ends, more or less oblique.	7. *C. minuta.*

1. C. NAEGELII (A. Br.) Lemmermann, 1914, p. 253, figs. 10, 14; *Characium Naegelii* A. Braun in Nägeli, 1849, p. 87, Pl. III, D, a-m; Collins, 1909, p. 150; Phyk. Univ., No. 492. Cells ovoid or ellipsoid, broadly rounded at each end, 20-42 × 7-18 μ, stipe 3-4 μ long, with capitate base but no disk; chromatophore single; zoospores numerous, escaping laterally. Mass., Pa., Neb. *Europe.*

2. C. ELLIPSOIDEA G. S. West, 1905, p. 288, Pl. CCCCLXIV, fig. 8, a-c; Collins, 1909, p. 100; Lemmermann, 1914, p. 253. Cells narrowly ellipsoid, obtusely rounded at each end, 15-22 × 8-10 μ; stipe very short and straight, not capitate; chromatophores 2-4. Barbados.

3. C. PYRIFORMIS (A. Br.) Borzi, 1894, p. 153; G. M. Smith, 1916b, p. 563; *Characium pyriforme* A. Braun, 1855, p. 40, Pl. V. B. Cells obovoid with broadly rounded apex, base attenuate into a capitate stipe, 9-13 μ long; total length of cell 18-25 μ, width 5-12 μ; chromatophores 1-4. Wis. *Europe*, *Africa*.

Var. SUBSESSILIS Lemmermann, 1914, p. 254, fig. 11. *C. minuta* P. B.-A., No. 1369. Smaller, cell 13-16 × 4-5 μ; stipe very short, 1.5-2 μ; chromatophore single. Cal. *Europe*.

4. C. GROENLANDICA (P. Richter) Lemmermann, 1914, p. 255; *Characium groenlandicum* P. Richter, 1897, p. 6. Cell claviform or subfusiform, apex straight or more often slightly curved, rounded, base gradually attenuate into non-capitate stipe. Cells 50-150 × 7-25 μ, stipe about 12 μ long; chromatophore single; zoospores numerous. On crustaceans. Greenland.

5. C. CYLINDRICA (Lambert) Lemmermann, 1914, p. 256; *Characium cylindricum* Lambert, 1909, p. 65, Pl. LXXIX, figs. 1, 2, 7, 8, 10-13, 23-25; Collins, 1909, p. 151; P. B.-A., No. 1269. Cell cylindrical with rounded apex and tapering base, 24-430 × 10-20 μ, stipe short, without basal disk; chromatophores two; macrozoospores 8-16, escaping by a lateral opening, microzoospores numerous, escaping by an apical opening. Mass.

6. C. ACUTA (A. Br.) Borzi, 1894, p. 153; Collins, 1909, p. 99; Lemmermann, 1914, p. 257; *Characicum acutum* A. Braun, 1855, p. 41, Pl. V. C.; Wolle, 1887, p. 177, Pl. CLIX, fig. 2; Wittr. & Nordst., No. 1236. Cell ovoid or broadly fusiform, short-acuminate at each end, 20-38 × 6-10 μ, stipe 3-4 μ long, with basal disk; chromatophores 1-2; zoospores escaping by apical opening. Pa. *Europe*.

7. C. MINUTA (A. Br.) Borzi, 1894, p. 152 (as to name only); Collins, 1909, p. 99; Lemmermann, 1914, p. 257, figs. 4-5; *Characium minutum* A. Braun in Kützing, 1849, p. 892; 1855, p. 46, Pl. V. F.; P. B.-A., No. 1221. Cell lanceolate, straight or very slightly curved, ending in a short, curved apiculum, base gradually attenuate into a short stipe with disk; cells 12-38 × 3-8 μ; chromatophore single; zoospores 4-8, escaping by an apical opening. Mass., Cal.
Europe, *So. America*, *Australia*, *etc.*

Collins, 1900, fig. 6, does not represent this species, but *C. turgida* W. & G. S. West, which has not yet been found in this country. Borzi having first used the binominal *Characiopsis minuta*, his name must be retained as author, although the plant described and figured by him, 1894, p. 152, Pl. XIV, figs.

1-12, is not, as he supposed, *Characium minutum* A. Braun, but a then undescribed species, now *Characiopsis Borziana* Lemmermann, 1914, p. 256.

8. C. SUBULATA (A. Br.) Borzi, 1894, p. 152; Collins, 1909, p. 100; Lemmermann, 1914, p. 258, fig. 3; P. B.-A., No. 1370; *Characium subulatum* A. Braun, 1855, p. 41, Pl. V. C. Cell of oblique lanceolate or falcate outline, gradually attenuate from near the base to the acute apex, shortly attenuate to the very short, capitate stipe, 10-20 × 4-6 μ; chromatophore single; zoospores 2-4. Cal. *Europe.*

P. B.-A., No. 1370, contains, along with this species, some *C. minuta* (A. Br.) Borzi.

9. C. LONGIPES (Rab.) Borzi, 1894, p. 152; Lemmermann, 1914, p. 259; *Characium longipes* Rabenhorst, Dec. 18, No. 171, 1852; in A. Braun, 1855, p. 42, Pl. V. D. Cell suberect or inclined, narrowly or broadly lanceolate, ending in a somewhat oblique apiculum; stipe from half to twice as long as the cell, with basal disk. Wis., G. M. Smith. *Europe.*

PERONIELLA Gobi, 1887, p. 244.

Cell ovoid, pyriform or subglobose at maturity, living in the gelatinous coating of filamentous desmids, attached to the cells by a slender stipe with basal disk. Asexual reproduction by (uniciliate ?) zoospores.

P. PLANCTONICA G. M. Smith, 1916, p. 476, Pl. XXV, fig. 15. Cells ovoid-pyriform, 6-9.5 μ long, stipe 8-10 μ long, zoospores 2-4 in a cell. In coating of *Sphaerozosma*. Fig. 1. Wis., G. M. Smith.

P. Hyalothecae Gobi, inhabiting *Hyalotheca mucosa* in Europe, is to be looked for on the same host here. It is somewhat larger, 7-10 μ diam., stipe 13-15 μ long, and has usually 8 zoospores in a cell.

MISCHOCOCCUS Nägeli, 1849, p. 82.

Cells globular, united by thick tubular gelatinous sheaths to form branched colonies; cells only at ends of sheaths; each cell with 1-4 chromatophores; sexual reproduction by isogamous gametes, the zygospore dividing to form an epiphytic cushion; asexual reproduction by zoospores germinating directly. Only one species.

M. CONFERVICOLA Nägeli, 1849, p. 82, Pl. II. D. Cells 3.5-5.5 μ diam. Fig. 2. Wis., G. M. Smith. *Europe.*

Page 102, for Key to the Species of Zygnema substitute,

1. Spore formed in the tube. Sect. PECTINATA. 2.
1. Spore usually formed in one of the cells. 6.
2. Spore with thick, lamellate membrane. 2. *Z. pachydermum.*
2. Spore without thick, lamellate membrane. 3.
3. Spore bluish. 3. *Z. cyanospermum.*
3. Spore brownish. 4.
4. Spore smooth. 14. *Z. ericetorum.*
4. Spore pitted. 5.
5. Cells 30-50 μ diam. 1. *Z. pectinatum.*
5. Cells 18-25 μ diam. 9. *Z. decussatum.*
6. Spore with smooth median membrane. Sect. LEIOSPERMA. 7.
6. Spore with pitted median membrane. Sect. SCROBICULATA. 10.
7. Vegetative filaments 20-22 μ diam. 5. *Z. leiospermum.*
7. Vegetative filaments over 26 μ diam. 8.
8. Vegetative filaments 35-54 μ diam. 7. *Z. cruciatum* forma *leiospermum.*
8. Vegetative filaments 26-33 μ diam. 9.
9. Zygospores unknown; aplanospores cylindric, filling the cell. 11. *Z. cylindricum.*
9. Zygospores globose or broadly ovoid, 30-32 μ diam. 6. *Z. insigne.*
10. Spore bluish. 11.
10. Spore brown. 13.
11. Fertile cells not swollen. 7. *Z. cruciatum* var. *coeruleum.*
11. Fertile cells swollen on the inner side. 12.
12. Spore globose to oblong, 26-40 μ diam. and length; aplanospores cylindric-oblong, 18-24 μ diam.; both with large pits. 13. *Z. Collinsianum.*
12. Spore subglobose, 33 μ diam., no aplanospores; spore finely scrobiculate. 10. *Z. peliosporum.*
13. Vegetative cells 35-54 μ diam. 7. *Z. cruciatum.*
13. Vegetative cells 22-36 μ diam. 14.
14. Spore produced by union of contiguous cells in a filament through the partition wall. 12. *Z. rhynchonema.*
14. Conjugation scalariform. 8. *Z. stellinum.*

Page 103, after description of Z. PECTINATUM, insert,

Var. CRASSUM Transeau, 1915, p. 2:. Vegetative cells 30-40 μ diam., spores 40-55 × 50-60 μ. Ill.

Var. CONSPICUUM (Hass.) Kirchner, 1878, p. 127; *Tyndaridea conspicua* Hassall, 1845, p. 164, Pl. XXXIX, figs. 1-2. Vegetative cells 18-27 μ diam; membrane thick and lamellose. Ill.

Page 104, cancel No. 4, Z. CHALYBEOSPERMUM.

After description of Z. CRUCIATUM, insert, Var. COERULEUM Transeau, 1915, p. 22. Median membrane of spores steel-blue. Ill.

Under Z. INSIGNE, cancel, P. B.-A., No. 457.

Page 103, cancel var. DECUSSATUM.

Page 105, after first three lines, add,

9. Z. DECUSSATUM (Vauch.) Agardh, 1817, p. XXXII; Transeau, 1914, p. 290; *Z. pectinatum var. decussatum* Collins, 1909, p. 103; *Conjugata decussata* Vaucher, 1803, p. 76, Pl. VII, fig. 3. Vegetative cells 18-20 μ diam., cells 3-5 diam. long, membrane not specially thickened; spores 27-30 μ diam. Mass., Ill. *Europe*.

10. Z. PELIOSPORUM Wittrock, 1868, p. 188; Transeau, 1915, p. 21. Vegetative cells 24 μ diam., 1-3 diam. long; fertile cells swollen on the inner side; spores subglobose, 33 μ diam., dark blue, median membrane scrobiculate. Cal., Colo., Vancouver. *Europe*.

P. B.-A., No. 808; Tilden, Amer. Algae, Nos. 156, 392, all distributed as *Z. chalybeospermum*, belong to this species. There seems to be no certain record for *Z. chalybeospermum* in this country.

11. Z. CYLINDRICUM Transeau, 1915, p. 22. Vegetative cells 28-33 μ diam., 1-2 diam. long; zygospores unknown; aplanospores cylindric or tumid-cylindric, filling the cell, 30-33 × 24-58 μ, median membrane brown, scrobiculate. Ill.

12. Z. RHYNCHONEMA Hansgirg, 1888a, p. 257; Transeau, 1915, p. 22. Vegetative cells usually 12 μ, sometimes 16-20 μ diam., cells 2-6 diam. long; conjugation always lateral, spores subglobose, about 33 μ diam.

The dimensions given above are for the European, typical, form; the specimens from Vancouver, attributed to this species, have cells 22-28 μ diam., 1-2 diam. long; the zygospores are ovoid, 24-28 × 36-44 μ, and the conjugation took place through the partition wall. Aplanospores also occurred, globose, 24-26 μ diam.

13. Z. COLLINSIANUM Transeau, 1914, p. 289, Pl. XXV, figs. 1-3. Vegetative cells 18-24 μ diam., 2-3 diam. long, fertile cells swollen on the inner side; zygospores globose, 26-40 μ diam., or oblong, 26-40 × 30-47 μ, median membrane blue, with large pits; aplanospores cylindrical-oblong, 18-24 × 40-76 μ, scattered among the vegetative cells, color and markings as in the zygospores. Ill.

14. Z. ERICETORUM (Kütz.) Hansgirg, 1886, p. 155; *Zygogonium ericetorum* Collins, 1909, p. 120, with description. Recent investigations have shown that the distinction between *Zygnema* and *Zygogonium* cannot be maintained. Var. TERRESTRE becomes ZYGNEMA ERICETORUM var. TERRESTRE Kirchner, 1878, p. 127.

Page 105, for Key to the Species of Spirogyra, substitute,

1. Cell conjugating directly, not by a tube. 2.
1. Cell emitting a tube. 4.
 2. Filaments 38-54 μ diam., spore up to 60 μ. 58. *S. stictica.*
 2. Filaments 56-85 μ diam., spore 75-115 μ. 3.
3. Fertile cells much inflated, up to 135 μ. 55. *S. floridana.*
3. Fertile cells only slightly inflated. 54. *S. illinoisensis.*
 4. Dissepiments plane. 5.
 4. Dissepiments largely replicate. 48.
5. Chromatophore mostly single. 6.
5. Chromatophores two or more. 27.
 6. Spore membrane punctate. 7.
 6. Spore membrane smooth. 11.
7. Fertile cells not distinctly swollen. 41. *S. daedalea.*
7. Fertile cells distinctly swollen. 8.
 8. Conjugating tube from both cells. 5. *S. varians* var. *scrobiculata.*
 8. Conjugating tube always or usually from male cell. 9.
9. Fertile cells inflated on tube side only. 56. *S. micropunctata.*
9. Fertile cells inflated on both sides. 10.
 10. Spore about 36 μ diam. 27. *S. punctata.*
 10. Spore 40-48 μ diam. 50. *S. punctiformis.*
11. Fertile cells not distinctly swollen. 12.
11. Fertile cells distinctly swollen. 17.
 12. Cells less than 30 μ diam. 13.
 12. Cells 30 μ diam. or more. 15.
13. Spore ovoid, slightly longer than the diam.; cells 22-25 μ diam. 9. *S. subsalsa.*
13. Spore ellipsoid, 2-3 times longer than the diam. 14.
 14. Chromatophore slender, with inconspicuous pyrenoids. 7. *S. communis.*
 14. Chromatophore broad. 1. *S. longata.*
 14. Chromatophore slender, with many large, distinct pyrenoids. 3. *S. Juergensii.*
15. Cells 30-48 μ diam. 16.
15. Cells 48-70 μ diam. 8. *S. condensata.*
 16. Cells seldom reaching 35 μ diam.; chromatophore slender. 38a. *S. Lagerheimii.*
 16. Cells 40-48 μ diam.; chromatophore broad, dentate. 2. *S. porticalis.*

17. Fertile cells swollen on one side only. 18.
17. Fertile cells swollen on both sides. 21.
18. Cells less than 25 μ diam. 21. *S. gracilis.*
18. Cells over 30 μ diam. 19.
19. Cells 40-48 μ diam.; spores marked with a longitudinal line. 39. *S. circumlineata.*
19. Cells under 40 μ diam.; spore without line. 20.
20. Fertile cells swollen on the tube side. 5. *S. varians.*
20. Fertile cells swollen on the outer side. 40. *S. Borgeana.*
21. Fertile cell reflexed. 57. *S. reflexa.*
21 Fertile cell not reflexed. 22.
22. Chromatophore slender. 23.
22. Chromatophore broad. 24.
23. Cells 27-30 μ diam., spore 30-33 × 33-45 μ. 18. *S. affinis.*
23. Cells 40-45 μ diam., spore about 47 μ diam., of varying shape. 6. *S. fusco-atra.*
24. Cells under 15 μ diam. 20. *S. flavescens.*
24. Cells over 17 μ diam. 25.
25. Cells with two chromatophores frequent; sterile cells often inflated. 47. *S. pratensis.*
25. Chromatophore always single. 26.
26. No zygospores; aplanospores 24-26 × 38-50μ. 19. *S. mirabilis.*
26. Zygospores regularly produced. 4. *S. catenaeformis.*
27. Chromatophores two, rarely three. 28.
27. Chromatophores regularly three or more. 30.
28. Spore membrane scrobiculate. 42. *S. velata.*
28. Spore membrane smooth. 29.
29. Cells 21-40 μ diam. 66.
29. Cells 43-50 μ diam. 26. *S. dubia.*
30. Spore lenticular. 31.
30. Spore ovoid, ellipsoid or subglobose. 35.
31. Cells 120 μ diam. or more. 16. *S. maxima.*
31. Cells 110 μ or less. 32.
32. Spore membrane pitted. 58. *S. hydrodictya.*
32. Spore membrane smooth. 33.
33. Fertile cells little or not swollen. 34.
33. Fertile cells distinctly swollen. 25. *S. bellis.*
34. Spore about 72 μ diam., 48 μ thick. 15. *S. orthospira.*
34. Spore 70-110 μ diam., 50-75 μ thick. 45. *S. submaxima.*
35. Cells 90-160 μ diam. 36.
35. Cells 80 μ diam. or less. 41.
36. Cells over 125 μ diam. 37.
36. Cells 110 μ diam. or less. 39.
37. Spore compressed. 38.
37. Spore not compressed. 46. *S. ellipsospora.*

38. Spore compressed oval. 17. *S. crassa.*
38. Spore compressed ellipsoid; ends pointed in edge view. 46. *S. ellipsospora* var. *crassoidea.*
39. Spore compressed. 17. *S. crassa* var. *formosa.*
39. Spore not compressed. 40.
40. Cells 100-110 μ diam.; chromatophores 4-8. 13. *S. setiformis.*
40. Cells 90-100 μ diam.; chromatophores 3-4. 12. *S. jugalis.*
41. Cells less than 40 μ diam. 42.
41. Cells 50-80 μ diam. 43.
42. Chromatophores four. 24. *S. fluviatilis.*
42. Chromatophores 3, rarely 2; of brackish water. 10. *S. submarina.*
43. Spore punctate or scrobiculate. 44.
43. Spore smooth. 45.
44. 3 chromatophores, making half to one turn. 48. *S. propia.*
44. 3-5 chromatophores, making two and a half to four turns. 49. *S. novae-angliae.*
45. Cells 50-65 u diam. 23. *S. neglecta.*
45. Cells 70-78 μ diam. 46.
46. Spore 60-72 μ diam. 47.
46. Spore about 50 μ diam. 14. *S. parvispora.*
47. Spore verrucose, ovoid. 44. *S. dilula.*
47. Spore smooth, ellipsoid and tapering. 11. *S. nitida.*
48. Replicate and plain walls about equal in number. 61. *S. fallax.*
48. Plain walls rare and exceptional. 49.
49. Replication an entire ring. 50.
49. Replication forming half a ring. 51. *S. narcissana.*
50. Chromatophore single, rarely two. 52.
50. Chromatophores two or more. 51.
51. Membrane reticulate. 59. *S. reticulata.*
51. Membrane smooth. 64.
52. Membrane punctate or areolate. 53.
52. Membrane smooth. 57.
53. Cells 30 μ diam. or more. 54.
53. Cells 24 μ diam. or less. 55.
54. Membrane areolate. 60. *S. areolata.*
54. Membrane punctate. 37. *S. protecta.*
55. Chromatophores slender; cells 12 μ diam. or less. 28. *S. tenuissima* var. *rugosa.*
55. Chromatophores broad; cells 15 μ diam. or more. 56.
56. Cells 15-18 μ diam.; spores scrobiculate. 29. *S. inflata* var. *foveolata.*
56. Cells 22-24 μ diam.; spores punctate or granulate. 43. *S. Goetzii.*

57. Fertile cells little if any swollen.	32. *S. Weberi.*
57. Fertile cells distinctly swollen.	58.
58. Cells 9-23 μ diam.	59.
58. Cells 24-33 μ diam.	62.
59. Inflation cylindrical.	34. *S. groenlandica.*
59. Inflation rounded or tapering at the ends.	60.
60. Cells 12 μ diam. or less.	28. *S. tenuissima.*
60. Cells 15 μ diam. or more.	61.
61. Chromatophore broad; cells 3-8 diam. long.	29. *S. inflata.*
61. Chromatophore slender; cells 10-25 diam. long.	30. *S. Spreeiana.*
62. Fertile cells with quadrate swelling.	31. *S. quadrata.*
62. Fertile cells with rounded swelling.	63.
63. Spore ovoid, 30-36 μ diam.	33. *S. Grevilleana.*
63. Spore ellipsoid, ends more or less pointed, 32-45 μ diam.	53. *S. Farlowii.*
64. Cells 35 μ diam. or less.	35. *S. Hassallii.*
64. Cells 39-42 μ diam.	65.
65. Fertile cells shortened and swollen.	36. *S. insignis.*
65. Fertile cells with quadrate swelling.	52. S. *rectangularis.*
66. Chromatophores quite broad.	10. *S decimina.*
66. Chromatophores very slender.	63. *S. irregularis.*

Page 71 of supplement, cancel beginning, "Page 107, for No. 34" and all of page 72 to line ending "23. S. NEGLECTA."

Page 107, under S. LONGATA, cancel P. B.-A., No. 510.

Page 108, under S. PORTICALIS, cancel P. B.-A., No. 365.

After description of S. CATENAEFORMIS, add,

Var. PARVULA Transeau, 1914, p. 292, Pl. XXVI, figs. 3-4. Filaments usually scattered; vegetative cells 20-24 × 50-105 μ, chromatophore single, making 1-6 turns; fertile cells inflated, up to 37 μ; conjugation mostly lateral, sometimes scalariform; spores yellow, elliptical, 20-27 × 40-60 μ. Ill.

Page 109, after description of S. VARIANS, add,

Var. MINOR Teodoresco, 1908, p. 188; Transeau, 1915, p. 23. Cells 28-30 μ diam.; spores 26-33 μ diam. Mass., Ill. *Europe.*

Var. SCROBICULATA Stockmayer, fide Transeau, 1915, p. 23. Spores scrobiculate. Ill.

Under S. COMMUNIS, cancel P. B.-A., No. 1416.

Under S. CONDENSATA, add, The typical form occurs in Mass.

Page 110, change S. DECIMINA var. SUBMARINA to S. SUBMARINA (Collins) Transeau, 1915, p. 25.

Under S. NITIDA, cancel P. B.-A., No. 513.

Page 111, cancel reference to S. *diluta* Wood.

Page 113, after description of S. CRASSA, add,

Var. FORMOSA Transeau, 1915, p. 27. Slender, cells 80-95 × 80-270 μ, spores 88-110 × 120-150 × 70-90 μ. Ill.

Page 114. The specimens from Mass. and Washington referred to S. LUTETIANA seem rather to belong to S. FALLAX (Hansg.) Wille. Wolle's somewhat doubtful record is now the only one for America.

Under S. FLUVIATILIS, add, spores brown, scrobiculate.

Page 115, under S. DUBIA var. LONGIARTICULATA, cancel P. B.-A., No. 961.

Under S. TENUISSIMA, cancel, P. B.-A., No. 456.

Page 116, after description of S. TENUISSIMA, add,

Var. RUGOSA Transeau, 1914, p. 291; P. B.-A., No. 456. Cells 11-13 μ diam.; spores 28-32 × 55-64 μ, membrane minutely pitted. Mass., R. I., N. J., Ill.

Under S. INFLATA, cancel P. B.-A., No. 363. Add,

Var. FOVEOLATA Transeau, 1914, p. 291. Spore membrane scrobiculate. Ill.

P. 117, under S. GREVILLEANA, cancel P. B.-A., No. 362.

P. 119, after paragraph on S. ELONGATA, add,

38a. S. LAGERHEIMII Wittrock in Wittrock & Nordstedt, Alg. Exsicc., No. 961, 1889, with figure; *S. porticalis* var. *tenuispora* Collins, 1912, p. 72. Cells 27-33 μ diam., 3-5 diam. long; dissepiments not replicate; chromatophore single, 2.5-3.5 turns; vegetative cells among fertile cells more or less swollen, fertile cells slightly swollen on tube side; spores ellipsoid with pointed ends, 25-31 × 48-66 μ, light brown; membrane finely punctate. Mass., N. H., Ill. *Europe.*

39. S. CIRCUMLINEATA Transeau, 1914, p. 293, Pl. XXVI, figs. 5-6. Cells 40-48 μ diam., 120-240 μ long; dissepiments plane; chromatophore one, making 4-8 turns; fertile cell swollen on tube side only; spores ellipsoid, 40-50 × 70-125 μ, yellowish brown, outer wall marked by a more or less distinct longitudinal line. Ill.

40. S. BORGEANA Transeau, 1915, p. 23. Filaments 30-35 μ diam., cells 50-200 μ long; dissepiments plane; one chromatophore, making 1.5-5 turns; fertile cells inflated on the outer side, straight on the inner side; spores ellipsoid, 33-40 × 54-70 μ, yellow, smooth. Ill.

41. S. DAEDALEA Lagerheim, 1888, p. 592; Transeau, 1915, p. 24. Filaments 33-36 μ diam., cells 5-8 diam. long; dissepiments plane; chromatophore single, making 2-3.5 turns; fertile cell little or not swollen, somewhat shortened; spores ellipsoid, 36-45 × 75-120 μ, brown, membrane with flexuous groovings. Mass., Ill. *Europe.*

42. S. VELATA Nordstedt, 1873, p. 1, Pl. I; Petit, 1880, p. 24, Pl. VII, figs. 1-5. Filaments scattered among other algae; cells 29-41 μ diam., 2-4 diam. long; dissepiments not replicate; chromatophore single, rarely two, making 1.5-6 turns: fertile cells slightly swollen; spores ovoid to cylindric-ovoid, 35-45 × 60-90 μ, brown; membrane scrobiculate. Middlesex Fells, Mass., Lambert. *Europe.*

Var. OCCIDENTALIS Transeau, 1914, p. 294, Pl. XXVI, figs. 8-9; P. B.-A., No. 961. Cells up to 53 μ diam., chromatophores 1-3; spores yellowish brown. Ill., Transeau; Vancouver, Gardner.

Differs from the typical form by the larger filaments, larger number of chromatophores, and the lighter color of the spores.

43. S. GOETZII Schmidle, 1901, p. 251, Pl. IV, fig. 8; Transeau, 1915, p. 25. Filaments 22-24 μ diam., cells 9-10 diam. long; dissepiments replicate; chromatophore one, with many pyrenoids and dentate margin, making 5-6 turns; fertile cells somewhat shorter and swollen, to 32 μ diam.; spores ellipsoid, 28-30 × 42-56 μ, red-brown. membrane finely punctate or granulate. Mass. *Africa.*

A single collection at Welfleet, Mass., by Charles Bullard, is the only record for the species outside of Africa.

44. S. DILUTA Wood, 1869a, p. 139; 1872, p. 170, Pl. XV, fig. 2; Transeau. 1915, p. 27; P. B.-A., No. 513. Filaments 70-80 μ diam., cells 1-1.5 diam. long, dissepiments plane, fertile cells not swollen; chromatophores about 5, narrow, with many pyrenoids, making ½ to 1 turn; spores ovoid, about 60 μ diam., 1.5-2 diam. long, dark brown, membrane verruculose or somewhat reticulate. Mass., Conn., N. Y., Pa.

Hitherto confused with *S. nitida*, this species seems amply distinct by the short cells, the shape and color of the spores, and the markings of the median membrane.

45. S. SUBMAXIMA Transeau, 1914, p. 295, Pl. XXVII, figs. 3-4. Cells 70-110 × 100-300 μ; dissepiments plane; chromatophores 8-9, making .1-1 turn; fertile cells slightly or not inflated; spores lenticular, brown, 70-110 μ diam., 50-75 μ thick; membrane smooth. Usually forming dark brown, lubricous

masses; often with thick, pectose sheath, up to 17 μ thick. Mass., Ill.

46. S. ELLIPSOSPORA Transeau, 1914, p. 294, Pl. XXVII, fig. 1; 1915, p. 25. Filaments dark green, lubricous; veg. cells 125-150 × 125-500 μ; dissepiments plane; chromatophores 3-8, making ½-4 turns; spores ellipsoid with more or less pointed ends, 100-140 × 160-255 μ. Me., Mass., Ill., Minn.

Var. CRASSOIDEA Transeau, 1914, p. 295, Pl. XXVII, fig. 2. Cells 140-150 × 140-560 μ; spores compressed ellipsoid, ends broadly rounded in one position, sharply pointed in another, 120-140 × 145-255 μ. Ill.

Differs from the typical form chiefly in the shape of the spore.

47. S. PRATENSIS Transeau, 1914, p. 292, Pl. XXV, figs. 12-14; Pl. XXVI, figs. 1-2. Forming yellowish green masses; cells 17-20 × 80-240 μ, dissepiments plane; chromatophores 1-2, making 1-8 turns; fertile cells inflated, up to 55 μ; sterile cells cylindrical, inflated or bullate (up to 90 μ); zygospores ovoid, ellipsoid or cylindrical with rounded ends, 24-46 × 50-70 μ, yellow, membrane smooth; aplanospores similar to zygospores. Ill.

48. S. PROPIA Transeau, 1915, p. 25. Cells 60-68 × 80-150 μ, dissepiments plane; chromatophores 3, making .5-1 turn; fertile cells cylindrical; spores ellipsoid, 42-60 × 80-120 μ; yellow brown, membrane irregularly pitted. Ill.

49. S. NOVAE-ANGLIAE Transeau, 1915, p. 26. Cells 50-60 × 200-350 μ; dissepiments plane; chromatophores 3-5, making 2.5-4.5 turns; fertile cells not inflated; spores ovoid, 50-65 × 80-120 μ, yellow, membrane reticulate and densely punctate. Mass., Ill.

50. S. PUNCTIFORMIS Transeau, 1914, p. 294, Pl. XXVI, fig. 7. Filaments usually scattered; cells 27-30 × 120-390 μ; dissepiments plane: chromatophores 1-2, narrow, making 3-6 turns; fertile cells inflated, 44-50 μ; male cells 90-140 μ long, female cells 100-250 μ long; occurring singly or in pairs, alternating with vegetative cells; tube usually produced by male cells; spores ovoid to cylindric-ovoid, 40-48 × 60-110 μ, yellow, membrane punctate. Ill.

51. S. NARCISSANA Transeau, 1914, p. 290, Pl. XXV, figs. 4-6. Filaments usually scattered; cells 12-14 × 200-400 μ; one chromatophore, slender, making 2-5 turns; dissepiments semi-replicate; fertile cells much inflated towards the middle, rounded or quadrate in outline, up to 33 μ diam., not shortened; zygospores unknown; aplanospores ellipsoid to ovoid, 23-30 × 50-120 μ, yellow, membrane smooth. Ill.

The replication is unique in character; occupying only 180° on each side of a dissepiment, alternating on the two sides.

52. S. RECTANGULARIS Transeau, 1914, p. 291, Pl. XXV, figs. 9-11. Filaments usually scattered; cells 35-40 × 150-320 μ, dissepiments replicate; chromatophores 2-4, making 2-5 turns; fertile cells quadrately inflated towards the middle, up to 70 μ diam; spores ovoid to cylindric-ovoid with rounded ends, 45-65 × 75-120 μ, yellowish brown, membrane smooth. Ill.

53. S. FARLOWII Transeau, 1915, p. 29; P. B.-A., No. 362. Cells 24-30 × 70-180 μ; dissepiments replicate; one, rarely two chromatophores, making 2.5-6 turns; fertile cells inflated to 39-60 μ; spores ellipsoid, ends more or less pointed, 32-45 × 48-93 μ, yellow, smooth. Mass.

Apparently much of the material that has passed in New England for *S. Grevilleana*, comes nearer to this species, of which the ellipsoid spores with pointed ends constitute the most distinctive character.

54. S. ILLINOISENSIS Transeau, 1914, p. 296, Pl. XXVIII, figs. 1-3. Forming dull green tangled masses; cells 65-85 × 100-300 μ; dissepiments plane; chromatophores 6-9, narrow, nearly straight and longitudinal, or spiral and making .1-1 turn; conjugating cells shortened and somewhat inflated and geniculate; tube short and broad; male cells shorter than female; spores 85-115 × 140-190 μ, ovoid to ellipsoid, yellow, membrane thick and punctate. Ill.

55. S. FLORIDANA Transeau, 1915, p. 30. Cells 56-66 × 120-335 μ; dissepiments plane; chromatophores 4-5, nearly straight or making a half turn; conjugating cells geniculate, shortened; fertile cells inflated, up to 135 μ; tube very short and broad; spores ellipsoid, 75-105 × 95-135 μ, yellow, smooth. Fla.

56. S. MICROPUNCTATA Transeau, 1915, p. 27. Cells 30-36 × 120-300 μ; dissepiments plane; one chromatophore, making 3-7 turns; fertile cells scattered in twos or fours among vegetative cells, or continuous, inflated on the tube side, outer side straight; tubes formed almost wholly by the male cell; spores ellipsoid, 37-42 × 57-70 μ, yellow, membrane minutely punctate. N. H., Ill.

57. S. REFLEXA Transeau, 1915, p. 28. Cells 30-40 × 120-300 μ; dissepiments plane; chromatophore single, making 3-8 turns; fertile cells in groups of 2 or 4, inflated or strongly reflexed; tube formed by male cell; spores ellipsoid, 44-54 × 90-150 μ, yellow-brown, smooth. Ill.

58. S. HYDRODICTYA Transeau, 1915, p. 28. Cells 75-100 × 210-360 μ; dissepiments plane; chromatophores 7-10, either straight or spiral, and making one-tenth to one-half turn; fertile cells more or less inflated; tube formed by the male cell; spores lenticular or globose-lenticular, 80-120 × 110-195 μ, brown, membrane pitted. Ill.

59. S. RETICULATA Nordstedt in Wittrock & Nordstedt, Alg. Exsicc., No. 362; De Toni, 1889, p. 774. Filaments 28-40 μ diam., cells 4-11 diam. long; dissepiments usually replicate; chromatophores 1-3, usually 2, making about 4 turns; fertile cells somewhat swollen at the middle; spores ovate-ellipsoid, 46-56 × 80-108 μ, yellow, membrane irregularly reticulate. Mass., Fla. *Brazil.*

60. S. AREOLATA Lagerheim, 1883, p. 56, Pl. I, figs. 18-20. Filaments about 36 μ diam.; cells 5-9 diam. long; dissepiments replicate; chromatophores 1-2, making 4-9 turns; fertile cells swollen; spores ovoid or rarely globose, 45-57 × 60-120 μ, brownish yellow; membrane densely areolate. Me. *Europe.*

61. S. FALLAX (Hansg.) Wille, 1900, p. 16, Pl. I, figs. 19-26; Transeau, 1915, p. 30; *S. insignis* var. *fallax* Hansgirg, 1888a, p. 253; *S. inconstans* Collins, 1912, p. 73; P. B.-A., Nos. 1768, 1570, 1571. Cells 33-45 μ diam., 2-8 diam. long; dissepiments partly replicate, partly plane; chromatophores 3-4, slender, with many pyrenoids, straight or slightly spiral; conjugating tube formed by male cell; female cell much swollen; spores ellipsoid, 45-80 × 75-140 μ, brown, membrane with network of fine raised lines. Mass., Ill. *Europe.*

Transeau's disposition under this species of forms attributed to three other species is followed here, as the best in our present state of knowledge of them. It is quite likely that there may be changes when more is known. As noted by Transeau, 1915, p. 24, it is doubtful if *S. lutetiana* occurs in America; all references so far appear to refer to the present species. G. A. Hill, 1916a, p. 247 has a note on *S. lutetiana*, apparently made from sterile material, and based on the description in Collins, 1909, p. 114. While the identification is doubtful, the observations on the chromatophores are interesting, indicating that in *Spirogyra* species with normally one spiral this may grow rapidly, turn back from the dissepiment and continue growing, afterwards breaking apart, when the appearance is quite that of two normal and distinct chromatophores.

62. S. IRREGULARIS Nägeli in Kützing, 1849, p. 440; 1855a, p. 7, Pl. XXII, fig. 11. Pale or dirty green, little lubricous; vegetative cells cylindrical, 32-36 μ diam., 3½-7 diam. long; dissepiments plane; fertile cells scarcely swollen; chromatophores 2-3, very slender, with large, nodulose, distant pyrenoids, making three-fourths to one turn in a cell; spores 32-36 μ diam., 1½-2 diam. long. Charleston, Ill., Transeau. *Europe.*

Spirogyra gigantica Grace A. Hill, 1916, p. 198, is founded on a sterile plant resembling *S. crassa*, but with somewhat larger filaments, 173-188 μ against 150-160; chromatophores making more turns to the cell; pyrenoids somewhat larger. The dimensions of *S. crassa* are probably taken from Collins, 1909, p. 113, but Miss Hill apparently overlooked p. 105 of the same paper. "Specific distinctions not always clear, based on the character of the dissepiments, the number and breadth of the chromatophores, the size and form of the spore, the character of its median membrane, the inflation of the fertile cell, and, too often, the dimensions of the filaments; this last character being too uncertain to have much weight, except when associated uniformly with other characters."

The specific name proposed appears to sin against the international rules of botanical nomenclature, Chapter I, Art. 7. "Scientific names are in Latin for all groups." *Giganteus* is good Latin, and has frequently been used as a specific name; there appears to be no authority for *giganticus*.

Page 119, cancel all under DEBARYA, and substitute,

DEBARYA Wittrock, 1872, p. 35.

Cells cylindrical, or contracted at the dissepiments; chromatophores either several, stellate, each with one pyrenoid, or a single axial plate with several pyrenoids; conjugation between two filaments not differing in appearance, the entire contents of the conjugating cells (gametangia) passing into the tube to form the zygospore; gametangia not walled off from the spore, but filling up with cellulose.

KEY TO THE SPECIES OF DEBARYA.

1. **Spores with longitudinal lines and cross ridges.** 1. *D. glyptosperma.*

1. **Spores verrucose or scrobiculate, without lines.** 2.

2. Vegetative cells 9-12 μ diam. 2. *D. americana.*
2. Vegetative cells 15 μ diam. or more. 3.
3. Cells 16-20 μ diam., chromatophores 2, stellate. 3. *D. decussata.*
3. Cells 20-26 μ diam., chromatophore an axial plate. 4. *D. laevis.*

1. D. GLYPTOSPERMA (De Bary) Wittrock, 1872, p. 35; P. B.-A., No. 1419; *Mougeotia glyptosperma* De Bary, 1858, p. 78, Pl. VIII, figs. 20-25; Wolle, 1887, p. 229, Pl. CXLVI, figs. 6-9. Filaments crisped, lubricous, 10-15 μ diam., cells 6-12 diam. long, fertile cells still longer; spores ovoid, 42-49 × 30-40 μ, with smooth, saccate, yellowish, translucent outer membrane and yellowish-brown median membrane, with three longitudinal parallel ridges connected by fine radial cross lines. Fig. 9. Mass., Minn., Fla. *Europe, New Zealand.*

Var. FORMOSA Transeau, 1915, p. 18. Vegetative cells 7.5-9 μ diam., spores 30-42 × 24-30 μ, steel blue. Among *Zygnema peliosporum* in P. B.-A., No. 808, Cal.

2. D. AMERICANA Transeau, 1915, p. 18. Vegetative cells 9-12 × 27-120 μ, constricted at the dissepiments, chromatophore a two-lobed axial plate with two pyrenoids; zygospores ovoid or quadrate-ovoid, 20-40 × 30-40 μ, with angles rounded, produced or retuse; parthenospores 15-20 × 20-30 μ, unilaterally ellipsoid with retuse ends; median spore wall minutely and irregularly verrucose, yellow brown at maturity. Ontario, A. B. Klugh.

3. D. DECUSSATA Transeau, 1915, p. 19. Vegetative cells 16-20 × 25-50 μ, cylindrical; chromatophores two, stellate, each with a pyrenoid; zygospores ovoid, quadrate-ovoid or irregular, 24-30 × 30-48, with rounded, retuse or produced angles; aplanospores unilaterally ovoid, 17-25 × 20-40 μ; parthenospores 15-20 × 20-30 μ; median membrane scrobiculate, yellow brown; akinetes with smooth, heavy walls, 18-20 × 20-30 μ. Pa., Ill., Mich., Minn., Ont. Transeau.

4. D. LAEVIS (Kütz.) W. & G. S. West, 1897, p. 476; *Zygogonium laeve* Kützing, 1845, p. 225. Vegetative cells 20-26 μ diam., 1-5 diam. long; fertile cells often much longer; spores broadly ellipsoid to ovoid, 42-50 μ long, 20-30 μ thick; median membrane thick, brown, scrobiculate. Wis., G. M. Smith.

Page 122, and p. 75 of supplement, for Key to the Species of Mougeotia, substitute,

1. Fructification by zygospores; aplanosphores unknown. 2.
1. Zygospores exceptional; usual reproduction by aplanospores. 22.
2. Spore bounded by 2 cells. 3.
2. Spore normally bounded by more than 2 cells. 15.

3. Conjugation geniculate. 13. *M. laetevirens.*
3. Conjugation not geniculate. 4.
4. Filaments usually geniculate; conjugation almost always lateral. 12. *M. genuflexa.*
4. Filaments not geniculate; conjugation scalariform. 5.
5. Spore smooth. 6.
5. Spore pitted or punctate. 13.
6. Filaments 20 μ diam. or more. 7.
6. Filaments 15 μ diam. or less. 9.
7. Spore projecting into the cell on each side. 8.
7. Spore occupying the tube only. 11.
8. Spore about 60 μ diam. 5. *M. minnesotensis.*
8. Spore 45 μ diam. or less. 10.
9. Filaments 12-14 μ diam. 7. *M. delicatula.*
9. Filaments 6-10 μ diam. 3. *M. parvula.*
10. Fertile filaments straight. 4. *M. sphaerocarpa.*
10. Fertile filaments undulate. 6. *M. divaricata.*
11. Filaments about 50 μ diam. 10. *M. crassa.*
11. Filaments 30 μ diam. or less. 12.
12. Spore 55-60 μ diam. 11. *M. macrospora.*
12. Spore 30-40 μ diam. 1. *M. scalaris.*
13. Spore transversely ovoid. 8. *M. verrucosa.*
13. Spore globose or nearly so. 14.
14. Filaments 8-10, rarely 15 μ diam. 2. *M. nummuloides.*
14. Filaments 22-32 μ diam. 9. *M. robusta.*
15. Spore normally bounded by 3 cells. 14. *M. tenuis.*
15. Spore normally bounded by 4 cells. 16.
16. Spore punctate or scrobiculate. 17.
16. Spore smooth. 18.
17. Filaments 8-12 μ diam. 15. *M. quadrangulata.*
17. Filaments 6-8.5 μ diam. 25.
18. Filaments bluish or purplish with age. 18. *M. capucina.*
18. Filaments not becoming bluish or purplish. 19.
19. Filaments 10-12 μ diam. 20.
19. Filaments 8 μ diam. or less. 21.
20. Spore globose to angular globose, wall of uniform thickness. 19. *M. calcarea.*
20. Spore transversely ellipsoid, wall thicker at poles. 24. *M. bicalyptrata.*
21. Spore quadrangular with concave sides. 16. *M. viridis.*
21. Spore quadrangular with straight sides. 17. *M. elegantula.*
22. Aplanospores spherical. 19. *M. calcarea.*
22. Aplanospores elongate or subpolygonal. 23.
23. Aplanospores swollen on one side only. 20. *M. ventricosa.*
23. Aplanospores swollen on both sides. 24

24. Filaments 5 6 μ diam. 21, *M. Boodlei.*
24. Filaments 10-13 μ diam. 22. *M. Transeaui.*
25. Spore with slightly tumid sides. 23. *M. tumidula.*
25. Spore with strongly concave sides. 25. *M. gracillima.*

Page 124, after description of MOUGEOTIA ROBUSTA, add,

Var. BIORNATA Wittrock in Wittr. & Nordst., Alg. Exsicc., No. 651, 1884. Mesospore yellow-brown, strongly scrobiculate; epispore verruculose internally; filaments 22-30 μ diam., spores 30-36 × 42-47 μ. Charleston, Ill., Transeau. *Sweden, Ceylon.*

After description of M. GENUFLEXA, add,

Var. GRACILIS (Kütz.) Reinsch, 1867, p. 215; *M. gracilis* Kützing, 1845, p. 221. Smaller throughout; filaments 15-24 μ diam., spores 24-30 μ diam. Charleston, Ill., Transeau. *Europe.*

Page 127, after description of M. CALCAREA, add,

23. M. TUMIDULA Transeau, 1914, p. 297, Pl. XXVIII, fig. 4. Vegetative cells 6-8.5 × 70-120 μ diam., zygospores quadrate, somewhat tumid, 22-26 × 20-30 μ, elliptical when seen from the side, angles retuse, median membrane distinctly but minutely scrobiculate. Charleston, Ill., Transeau.

24. M. BICALYPTRATA Wittrock in Wittr. & Nordst., Alg. Essicc., No. 741, 1886; De Toni, 1889, p. 722. Vegetative cells 11-12 μ diam., 3-9 diam. long; conjugating cells slightly genuflexed; spore ellipsoid or subellipsoid, transverse, 33-38 μ max. diam., 25-28 μ min. diam.; epispore brownish, thickened at each pole; mesospore brown, smooth. Carp Lake, near Mackinaw, Mich., Transeau. *Sweden.*

Resembles *M. calcarea*, but differs by the more ellipsoid spore, and darker epispore with calyptras.

25. M. GRACILLIMA (Hass.) Wittrock, 1872, p. 40; Transeau, 1917, p. 225; *Staurocarpus gracillimus* Hassall, 1845, p. 185, Pl. VII, fig. 6; *Staurospermum gracillimum* De Bary, 1858, p. 81, Pl. VIII, fig. 12. Cells 5-7 μ diam., 8-20 diam. long; spores quadrate (sometimes triangular) about 25 μ wide, sides deeply concave, angles retuse, median membrane finely granulate. Twin Lakes, Mich., Transeau. *Europe.*

Page 129. Note, Printz, 1914, p. 18, considers *Chlamydomonas communis* Snow to be not the same as *C. communis* Perty, and substitutes *C. Snowii* Printz. The name *C. eriensis* proposed by Printz in place of *C. globosa* Snow, is unnecessary, as *C. globulosa* Perty does not invalidate *C. globosa* Snow.

Page 130, after description of CHLAMYDOMONAS NIVALIS, add,

6. C. MONADINA Stein, 1878, Vol. III, Pl. XV, figs. 38-39; Wille, 1903, p. 144, Pl. IV, fig. 19. Cell subglobose, 14-26 μ diam., cilia 2, about as long as the cell; 2 pulsating vacuoles at anterior end; stigma elongate, near anterior end; chromatophore cup-shaped, posteriorly thickened, with one pyrenoid. Greenland, P. Richter, as *C. Braunii.* *Europe.*

CRYPTOGLENA Ehrenberg, 1832, p. 150.

Cells ellipsoid to ovoid, with thin wall and 2 cilia, with several disk-shape blue-green chromatophores; reproduction by repeated division of cells that have lost their cilia.

C. AMERICANA B. M. Davis, 1894, p. 96, Pl. XI. Motile cells ellipsoid, 8-10 $\times$ 5-6 μ; stigma single or double; motionless cells 7-9 $\times$ 6-7 μ. Fig. 3. Mass., Bermuda.

Like *Glaeochaete* and *Glaucocystis* this genus has often been placed among the Myxophyceae on account of the color, but all other characters indicate the Chlorophyceae.

PYRAMIMONAS Schmarda, 1850, p. 9.

Cells obconical, with 4 longitudinal ribs, with no definite cell wall; chromatophore cup-shape, lobed, with stigma, and with pyrenoid at base; cilia 4, equal; reproduction by successive longitudinal divisions.

P. TETRARHYNCHUS Schmarda, 1850, p. 9, Pl. III, figs. 1-8. Fig. 4. Madison, Wis., G. M. Smith. *Europe.*

SPONDYLOMORUM Ehrenberg, 1848, p. 236.

Colony of 16 cells, loosely attached in 4 alternating whorls of 4 cells each; cells obovoid, with membrane forming a papilla at the smaller end of the cell; each cell with 4 cilia at the larger end, and with pyrenoid and stigma. Asexual reproduction by the formation of a 16-celled colony in each mother cell.

Only one species.

S. QUATERNARIUM Ehrenberg, 1848, p. 236. Cells 5-15 μ diam.; colony 36-75 μ diam. Fig. 5. Conn., Ohio, Cal. *Europe.*

Page 134, after EUDORINA ELEGANS, add,

BESSEYOSPHAERA Shaw, 1916, p. 254.

Colonies spherical, containing biciliate cells in a single layer near the surface of the colony; vegetative and gonidial cells intermingled, unconnected; gonidial cells developing asexually to form new colonies; sexual reproduction unknown.

Differs from *Volvox* in the absence of protoplasmic connection between the cells, and in that the differentiation of vegetative and gonidial cells does not occur in a colony until it is freed from the mother colony. From *Pleodorina* it differs in having vegetative and gonidial cells intermingled, not developed in separate areas.

B. POWERSII Shaw, 1916, p. 254. Mature colony 1800-2500 μ diam., usually about 2000 μ; vegetative cells about 12 μ diam., distant 50-250 μ; gonidia 10-78 in number; new colonies less than 150 μ diam. when leaving mother colony, differentiation occurring later.*

Page 135, for generic and specific account of VOLVOX, substitute,

Colonies spherical or ovoid, of 200-20,000 cells or even more; cells pyriform, in most species united by protoplasmic threads, and closely set near the surface of the colony, the cilia projecting. A number of cells are specialized as parthenogonidia, asexually forming new colonies by repeated division. Sexual reproduction by antheridia and oogonia; the former containing 8-256 clavate antherozoids, with red stigma and two cilia; oospores round, with smooth or stellate membrane; new colonies formed by their germination, in the same way as by parthenogonidia.

Powers, 1907 & 1908, gives results of the author's studies of the genus, leading to the belief that it is impossible to include all our American forms under the European species, *V. globator* and *V. aureus;* indeed he found no plants agreeing with either of those species. Only long-continued observations in many localities can determine whether Powers' new species will be maintained, but the following notes indicate the diagnostic characters as far as possible; the author does not give as full comparative diagnoses as might be wished; for details the two papers should be consulted; the "second form" Powers, 1907, appears now as *Besseyosphaera* Shaw.†

* The wording is somewhat changed from the author's description, which is curiously zoological for a botanical subject. "Daughters less than 150 μ diam. at birth." Figures of this species from photomicrographs were given by Powers, 1907, but they are very unsatisfactory, and as no fresh material is available, no figures are given with this paper.

†Powers' papers appeared in a publication containing little botanical matter; indeed he refers to his species, 1908, p. 142, as part of "our fauna", and they have not attracted the attention they deserve, whether their conclusions are fully accepted or not.

Page 135, for Key to the Species of Volvox, substitute,

1. **Colonies ovoid; antheridia arranged in spheres, without vegetative cells.** 1. ***V. spermatosphara.***
1. **Colonies spherical.** **2.**
   2. **Colonies 600-1500 μ diam.** **3.**
   2. **Colonies 200-500 μ diam.** **4.**
3. **Monoecious; antherozoids in free flat disks.** 4. ***V. globator.***
3. **Dioecious; antherozoids in hollow spheres, becoming flattened.** 5. ***V. perglobator.***
   4. **Colonies 350-500 μ diam.; reproductive bodies 8-10, in 2 or 3 planes.** 2. ***V. Weissmanniana.***
   4. **Colonies about 200 μ diam.; reproductive bodies in varying number, not originating in any definite order.** 3. ***V. aureus.***

1. V. SPERMATOSPHARA Powers, 1908, p. 142, Pl. XXIII, XXIV; 1907, Pl. XI-XIII. Colonies distinctly ovoid; cells with stigmas abundant at anterior pole, decreasing in number towards posterior pole; no strands of protoplasm connecting cells; mature colonies 150-1000 μ diam., commonly 250-600 μ, containing 1000-3000 cells; parthenogonidia, oospores and male colonies in varying proportions in the same colony, 1-25 in all, average 8; parthenogonidia ovoid, about 200 μ diam.; oospores 40-50 μ diam., with smooth wall; "sperm spheres" spherical, 100-120 μ diam., containing 64, 128 or 256 disks, usually 32 antherozoids in each; sperm spheres without distinction between poles, with vegetative cells, breaking up while in the mother colony. Neb., Mo.

2. V. WEISSMANNIANA Powers, 1908, p. 152, Pl. XXV, XXVI. Colonies spherical, poles differentiated; cytoplasmic threads distinct; mature colonies 350-500 μ diam.; parthenogonidia, oogonia and male colonies in varying proportions in same mother cell, usually 8, arising in two planes, sometimes 10, the two additional in another plane; parthenogonidia 150-170 μ diam.; oospores 40-50 μ diam., with smooth wall; male colonies spherical, 200-250 μ diam., containing numerous antheridia, curved disks, of 64 or 128 antherozoids each. Mo.

3. V. AUREUS Ehrenberg, 1832, p. 77; 1838, p. 71, Pl. IV, fig. 2. Proterogynous; colonies about 200 μ diam., of 600-900 cells with cytoplasmic connections; vegetative cells 4-6.5 μ diam.; oogonia 1-15, 50-60 μ diam., membrane smooth; antheridia numerous, small, 16 or 32 cells each, united in small daughter colonies, with vegetative cells. *Europe.*

No American citations or localities are given for this species or for *V. globator* as it is probable that much of the material assigned to these two species would now be assigned to one of the newer species.

4. V. GLOBATOR Linnaeus, 1758, p. 320; Ehrenberg, 1838, p. 68, Pl. IV, fig. 1. Colonies spherical, monoecious and usually proterandrous, 600-800 μ diam., of 3,000-20,000 cells, 2-3 μ diam., with cytoplasmic connections; parthenogonidia to the number of 8 in a colony, about 50 μ diam.: oogonia 20-40 in a colony, about 50 μ diam., wall with stellate projections; antheridia seldom over 5 in a colony, discoid, 35-40 μ diam., antherozoids numerous, 5-6 μ long. *Europe.*

5. V. PERGLOBATOR Powers, 1908, p. 162. Colonies spherical, 900-1500 μ diam., dioecious, mostly trioecious; vegetative cells in mature colonies more distant than in other species, but with distinct protoplasmic connections; oogonia stellate; antherozoids united in large numbers to form hollow spheres "globoids", soon becoming flattened, poles differentiated; reproductive bodies of all kinds numerous in a colony, from 40 to 300. Mass., Me., Mich., Neb., La.

Powers' description of this species is less full than the descriptions of the two others, and there are no plates; in material from Fenway Park, Boston, Mass., which seems to belong to this species, the number of reproductive bodies was less than that given by Powers, but much more than that characteristic of *V. globator*, the only species of the same habit and order of magnitude; the oogonia and antheridia were in distinct colonies, the former about 60 μ diam.; the latter 40-50 μ diam.; mature colonies ranged from 800 to 1200 μ diam.

Page 138, add note,

INEFFIGIATA has proved to be a state of *Botryococcus Braunii.*

Page 140, add note,

Lemmermann, 1915, unites the genera PALMODICTYON and PALMODACTYLON under the former name, with two species, PALMODICTYON VIRIDE Kütz. and P. VARIUM (Näg.) Lemmermann. The change seems justified.

Page 146, CHLOROCHYTRIUM, for "biciliate zoospores" read "biciliate or quadriciliate zoospores." For Key to the Species of Chlorochytrium, substitute,

1. In fresh water phanerogams. 2.

1. In algae. 3.

2. A prolongation of the cell wall remaining where the zygote entered the host, *Lemna trisulca.* *C. Lemnae.*

2. Cell entirely enclosed, no prolongation to surface of host. In various plants, including species of *Lemna*, but not recorded in *L. trisulca*. 2. *C. Knyanum*.
3. Cell with pointed base. 3. *C. Schmitzii*.
3. Base of cell not pointed. 4.
4. Cell subhemispherical, base flattened. 4. *C. dermatocolax*.
4. Base of cell not flattened. 5.
5. Fertile cell elongate-ovoid; in gelatine of *Rivularia* colonies. 8. *C. gloeophilum*.
5. Cell globose or subglobose. 6.
6. In membranaceous red algae of the Pacific; cells usually 100 μ diam. or more. 5. *C. inclusum*.
6. Cell 60 μ diam. or less. 7.
7. Cell 40-60 μ diam., entirely included in fronds of *Porphyra*. 7. *C. Porphyrae*.
7. Cell 30 μ diam. or less, partly external, or when immersed having a tube-like projection connecting with the surface. 6. *C. Moorei*.

Page 148, cancel generic description of CHLOROCYSTIS, and for C. COHNII (Wright) Reinhardt substitute CHLOROCHYTRIUM MOOREI Gardner, 1917, p. 382; *Chlorocystis Cohnii* Moore, 1900, p. 100; not *C. Cohnii* Reinhardt, 1885, p. 4, which is *Chlorochytrium Reinhardtii* Gardner, 1917, p. 382; nor *Chlorochytrium Cohnii* Wright, 1879, p. 355; place as No. 6 under CHLOROCHYTRIUM.

7. C. PORPHYRAE Setchell & Gardner in Gardner, 1917, p. 379, Pl. XXXII, fig. 6. Cells spherical, 40-60 μ diam., imbedded in the membrane of *Porphyra perforata* forma *segregata* Setchell & Hus. on both sides of the median layer of cells; chromatophore single, at first small, covering the upper part of the cell, increasing by sending out several arms, finally covering the wall; pyrenoid single, large; cell wall 2-3 μ thick, not laminate; color grass-green: sexual reproduction by biciliate gametes, 3-4 μ diam., fusiform to subspherical, escaping by an oval opening in the wall; asexual reproduction unknown. Lands End, San Francisco, Cal., Gardner.

8. C. GLOEOPHILUM Bohlin, 1897, p. 28, Pl. I, figs. 53-54; G. F. Moore, 1917, p. 271, Pl. XVIII. Vegetative cells subspherical, 25-30 μ diam., with single parietal chromatophore, usually covering the entire cell wall, with one large pyrenoid; later developing into an ovoid-oblong sporangium, 50-70 × 25-35 μ occasionally even larger; wall 5-10 μ thick, often with irregular prominences, external or internal, which sometimes show lamination; 32-64 spherical aplanospores, 4 μ diam.,

formed by successive division, released by disintegration of the mother cell wall. In colonies of *Rivularia Bornetiana*, Mass., Conn. *So. America.*

Moore observed the formation of a pore in the cell wall, similar to that used for the exit of zoospores in the other species of the genus, but no zoospores were seen in this species, nor any tendency of the aplanospores to make use of the pore. He suggests that zoospores, unavailable in the dense gelatine of the host, have ceased to be produced, the pore remaining as the only evidence of their former existence.

DICRANOCHAETE Hieronymus, 1887, p. 293.

Cell reniform, attached, with a single chromatophore with or without pyrenoids; with slender, dichotomously branched bristles. Reproduction by 8-24 zoospores each with stigma, contractile vacuole and 2 cilia.

D. RENIFORMIS Hieronymus, 1887, p. 293; G. S. West, 1916, p. 212, fig. 139. Cells seen vertically reniform, laterally subhemispherical, up to 32 μ wide; bristle arising from the base and passing up by a lateral groove in the cell wall, 80-160 μ long. Attached to submerged plants etc. Fig. 6. Maine, F. D. Lambert. *Europe.*

GLOEOCHAETE Lagerheim, 1883, p. 39.

Cells globose or subglobose, 1-4 in a wide mucilaginous coating, each with 1 or more long, slender, tapering setae; chromatophore bell-shape, blue-green; reproduction by vegetative division.

G. WITTROCKIANA Lagerheim, 1883, p. 39; G. S. West, 1904, p. 344, fig. 160. Cells 6-21 μ diam., setae 100-260 μ long, one or more to a cell. Fig. 7. Harpswell, Maine, F. D. Lambert, Wis., G. M. Smith. *Europe.*

In spite of the color, the affinities of this plant seem to be with the Chlorophyceae.

Page 149, for Key to the Species of Characium, substitute.

1. Growing on animals.	**2.**
1. Not on animals.	**3.**
2. Ovoid or broadly ellipsoid.	**8.** *C. DeBaryanum.*
2. Elongate.	**11.**
3. Sessile.	**1.** *C. sessile.*
3. With a longer or shorter stipe.	**4.**
4. Apex acute.	**5.**
4. Apex rounded.	**7.**

5. Without basal enlargement of stipe.	7. *C. ambiguum.*
5. With basal enlargement of stipe.	6.
6. Basal enlargement capitate.	9. *C. acuminatum.*
6. Basal enlargement a disk.	12.
7. Without basal enlargement of stipe.	8.
7. With basal enlargement of stipe.	10.
8. Stipe long.	9.
8. Stipe short and stout.	2. *C. Sieboldii.*
9. Cell pyriform, up to 8 μ long, stipe 10-16 μ.	13. *C. stipitatum.*
9. Cells up to 20 μ long, stipe 8 μ.	5. *C. heteromorphum.*
10. Broadly ellipsoid.	6. *C. obtusum.*
10. Narrowly lanceolate to linear.	4. *C. strictum.*
11. Regularly elongate-fusiform.	14. *C. limneticum.*
11. Cylindrical with tapering ends.	12. *C. gracilipes.*
12. Cell erect or somewhat oblique; stipe short.	11. *C. Pringsheimii.*
12. Cell more or less distinctly falcate; stipe longer.	15. *C. rostratum.*

Page 150, Note *C. Naegelii* and *C. cylindricum* have been transferred to Characiopsis, p. 4.

C. DEBARYANUM should not read (Reinsch) nov. comb., but C. DEBARYANUM (Reinsch) De Toni, 1889, p. 628.

Page 151, after description of C. GRACILIPES, add,

13. C. STIPITATUM (Bachmann) Wille, 1909, p. 45; Brunnthaler in Pascher, 1915, p. 81, fig. 26; G. M. Smith, 1916, p. 472, Pl. XXIV, figs. 4-6; *Chlamydomonas stipitata* Bachmann, 1908, p. 81, figs. 1-15. Cells globose to ovoid, 5-8 μ diam., with very slender stipe, 10-16 μ long. In the gelatinous coating of *Coelosphaerium*. Wis., G. M. Smith. *Europe.*

14. C. LIMNETICUM Lemmermann, 1903, p. 81, Pl. III, figs. 7-10. On the crustacean *Diaphanosoma*. Cells 25-80 × 5-14 μ, fusiform, mostly curved, rarely straight, prolonged into a stipe 6-10 μ long, without basal disk. Apex ending in a long, bristle-shaped beak; chromatophores 4-8, band-shape, parietal, with 1 pyrenoid; Wis., G. M. Smith. *Sweden.*

15. CHARACIUM ROSTRATUM Reinhard fide Printz, 1913, p. 41, Pl. II, fig. 32; 1915a, p. 17, Pl. I, figs. 36-39. Cell from lanceolate with curved apex to strongly falcate; length without stipe, 23-28 μ, width 5-7 μ; stipe 5-9 μ long, with distinct basal disk. Twin Lakes, Mich., Transeau. *Europe, Asia.*

The orginal publication by Reinhard being inaccessible, the determination is from Printz.

Bruntbaler in Pascher, 1915, p. 83, resuscitates *C. subsessile*

(Wolle) De Toni, 1889, p. 622; *Hydrianum subsessile* Wolle, 1877a p. 186; and *C. giganteum* (Wolle) De Toni, 1889, p. 624; *Hydrianum giganteum* Wolle, 1877a, p. 186, but descriptions are too unsatisfactory for recognition.

Page 157, for Key to the Species of Rhaphidium, substitute,

KEY TO THE SPECIES OF ANKISTRODESMUS.

1. Cells or colonies in gelatinous sheath. 5. *A. lacustris.*
1. No gelatinous sheath. 2.
  2. Cells fusiform, ending in long bristles. 4. *A. setigerus.*
  2. No bristles. 3.
3. Cells much twisted. 2. *A. convolutus.*
3. Cells straight or curved, not twisted. 4.
  4. Cells slender, fusiform to acicular, straight, sigmoid or somewhat lunate, gradually tapering to a fine point. 1. *A. falcatus.*
  4. Cells stouter. 5.
5. Cells subcylindrical, usually straight, short-pointed. 3. *A. Braunii.*
5. Cells more or less lunate with acute apices; chromatophore with central notch and 2 pyrenoids. 6. *A. Chodati.*

Page 158, after description of R. SETIGERUM, note,

G. M. Smith, 1916, p. 473, Pl. XXIV, fig. 8, removes this species to the genus *Schroederia* as *S. setigera* (Schröder) Lemmermann, 1898, p. 311, and describes a new species, *S. Judayi* G. M. Smith, 1916, p. 474, Pl. XXIV, figs. 9-11. Cells fusiform, straight or curved, ends attenuate into hair-like projections, one of which terminates in a disk; chromatophore single, parietal, with one pyrenoid. Length with spines, 45-63 μ, without spines, 14-30 μ; breadth 6-25 μ. Wis., G. M. Smith.

The genus SCHROEDERIA was separated from ANKISTRODESMUS by Lemmermann on account of the much prolonged apices, but has not generally been accepted. G. M. Smith figures a terminal disk in *S. setigera*, as well as in *S. Judayi*. If this is really a generic character, it may raise some questions as to the affinities of the genus.

5. A. LACUSTRIS (Chodat) Ostenfeld, 1907, p. 384; *Raphidium Braunii* var. *lacustris* Chodat, 1902, p. 200, fig. 117. Cells scattered without order in the gelatinous sheath, fusiform, 18-37 $\times$ 4 μ, straight or somewhat curved, ends usually acute. Wis., G. M. Smith. *Europe.*

6. A. CHODATI (Tanner) Brunnthaler in Pascher, 1915, p. 193, fig. 306; *Raphidium Chodati* Tanner-Fullemann, 1906,

p. 158, fig. 11. Cells arcuate, acuminate, 30-80 μ long, 5-7 μ wide, chromatophore notched at the middle, with two pyrenoids. Wis., G. M. Smith. *Europe.*

The description belongs to the European plant; the American plant, while agreeing as to dimensions, notched chromatophore and pyrenoids, is usually straight or slightly curved.

CLOSTERIOPSIS Lemmermann, 1898c, p. 29.

Cells mostly solitary, very long in proportion to the diameter, with many pyrenoids in a single series; otherwise as in *Ankistrodesmus.*

C. LONGISSIMA (Schröder) Lemmermann, var. TROPICA W. & G. S. West, 1904, p. 31, Pl. I, fig. 1. Cells mostly solitary, 225-370 × 6-7.5 μ, slightly curved, tapering gradually to the slender but subtruncate ends. Fig. 8. Wis., G. M. Smith. *Europe.*

The typical form of *C. longissima*, not yet reported here, has tips tapering to an extreme fineness, and is usually more curved.

QUADRIGULA Printz, 1915, p. 49.

Cells cylindric-fusiform, straight or slightly curved, apices more or less acuminate, without pyrenoid; vegetative reproduction by division of cell in two planes at right angles to each other at the longitudinal axis of the cell, the four daughter cells remaining enclosed in a gelatinous mass, which as a result of successive divisions may contain as many as 128 cells. Only one species.

Q. CLOSTERIOIDES (Bohlin) Printz, 1915, p. 49, Pl. IV, figs. 110-116; *Nephrocytium closterioides* Bohlin, 1897, p. 18, Pl. I, figs. 23-24; *Raphidium Pfitzeri* Schröder, 1902, p. 152, Pl. VI, fig. 6; *Ankistrodesmus Pfitzeri* G. S. West, 1904, p. 224, fig. 94. G. Cells 12-30 × 1.5-3.7 μ. Fig. 9. Wis., G. M. Smith; New Buffalo, Mich., Transeau. *Europe.*

The cells are in shape much like those of *Ankistrodesmus*, but in the latter the cell division is by an oblique wall. In *A. lacustris*, in which the daughter cells remain enclosed in a gelantinous body of definite form, they are in no definite order, while in *Quadrigula* the four daughter cells merely separate but remain parallel. In a subsequent division all cells in the colony participate, so that however large the number of cells, they continue symmetrically placed.

Page 159, for Key to the Species of Oocystis, substitute.

1. Outer wall of the family thickened at the poles. 2.
1. Outer wall not thickened at poles. 4.
2. Individual cells thickened at poles. 3.
2. Individual cells not thickened at poles. 7. *O. parva.*
3. Many chromatophores. 3. *O. solitaria.*
3. 1-2 chromatophores. 2. *O. lacustris.*
4. Families often united in colonies by successive persistent walls. 10.
4. Families not united in colonies. 5.
5. Cells with thickening at poles. 6.
5. Cells not thickened at poles. 8.
6 Cells with polar thickening projecting internally. 8. *O. nodulosa.*
6. Cells without internal projection. 7.
7. Cells with concave sides and pointed ends. 9. *O. panduriformis.*
7. Cells with convex sides. 4. *O. crassa.*
8. Cells elongate-ellipsoid, about 2.5 diam. long. 11.
8. Cells proportionally broader, ends more broadly rounded. 9.
9. Cells 9-17 μ long. 1. *O. Borgei.*
9. Cells 33-40 μ long. 6. *O. Naegelii.*
10. Poles rounded. 5. *O. novae-semliae.*
10. Poles acute. 11. *O. gloeocystiformis.*
11. Chromatophores 1-2, with pyrenoid; cells mostly solitary. 12. *O. rupestris.*
11. Chromatophores 10-20, without pyrenoid: cells usually in families. 10. *O. elliptica.*

Page 79 of Supplement, after description of O. NOVAE-SEMLIAE, add, Var. MAXIMA W. & G. S. West, 1894, p. 13, Pl. II, fig. 25. Cells 2-3 times larger than in the typical form, 19-23 × 12-15 μ; family of 2-4 cells, 40-52 × 23-42 μ. Wis., G. M. Smith. *Europe.*

7. O. PARVA W. & G. S. West. 1898, p. 335; 1900, Pl. CCCXCIV, figs. 14-17. Cells mostly solitary, but sometimes in families of 2-4 cells; ellipsoid, 6-12 × 4-7 μ, ends slightly pointed, not thickened, wall firm; chromatophores 2-3. Wis., G. M. Smith. *Europe.*

8. O. NODULOSA W. & G. S. West, 1894, p. 15, Pl. II, fig. 31. Cells oblong-ellipsoid, end rounded with papillate thickening, projecting internally; cells 25-30 × 16-18 μ, solitary or two in the much broadened mother cell wall. Wis., G. M. Smith. *Europe.*

9. O. PANDURIFORMIS var. MINOR G. M. Smith, 1916, p. 471, Pl. XXIV, fig. 2. Cells ovoid with somewhat concave

sides and pointed ends, with 15-25 disk-shape chromatophores with distinct pyrenoids; cells 30-35 μ long, median diam. 11-14 μ, max. diam. 12-15 μ. Wis., G. M. Smith.

The typical form, W. & G. S. West, 1894, p. 15, Pl. II, figs. 33-35, of about double these dimensions, has not been reported in this country.

10. O. ELLIPTICA W. West, 1892, p. 736; Printz, 1913, p. 182, Pl. IV, fig. 33. Cells elongate-ellipsoid, with ends rounded, not thickened, 22-25 × 11-12 μ, rarely solitary, mostly in 4-8 celled families; chromatophores 10-20, without pyrenoid. Mich., Transeau. *Europe.*

Var. MINOR, W. & G. S. West, 1894, p. 14, Pl. II, fig. 26, Cells 15-22 × 7-10 μ. Wis.. G. M. Smith. *Europe.*

11. O. GLOEOCYSTIFORMIS Borge, 1906, p. 23, Pl. II, fig. 1. Cells ellipsoid, with a thickening and a short, acute prolongation at each pole, 9 × 4.5 μ, 2 to several in a family, families several in a general gelatinous coating, showing more or less distinctly successive mother-cell walls. Wis., G. M. Smith. *Tierra del Fuego.*

12. O. RUPESTRIS Kirchner, 1880, p. 169, Pl. II, fig. 2; Printz, 1913, p. 174, Pl. IV, figs. 7-9; Wittr. & Nordst., Alg. Exsicc., Nos. 725, 1248. Cells oblong-ellipsoid, 13-28 × 6-12 μ, poles rounded, not thickened; chromatophores 1-2, with pyrenoid; mother cell wall soon dissolving, hence cells usually solitary. Wis., G. M. Smith. *Northern Europe.*

GLAUCOCYSTIS Itzigsohn in Rabenhorst, 1868, p. 417.

Cells ellipsoid or ovoid, solitary or 2-8 in a family enclosed by the mother cell wall; chromatophores blue-green, in younger cells many and scattered, later filiform and radiating stellately from a central vacuole; asexual reproduction by autospores, usually 4 in a cell.

G. NOSTOCHINEARUM Itzigsohn in Rabenhorst, 1868, p. 417; G. S. West, 1916, p. 40, fig. 24. Cells ellipsoid, 18-28 × 10-18 μ, membrane thin. Fig. 10. Scattered among other algae in quiet water. Mass. *Europe.*

This genus has often been placed among the Myxophyceae, on account of its color, but its other characters seem to place it better in the Chlorophyceae, near *Oocystis.*

Page 160, cancel everything relating to CHODATELLA, and substitute, LAGERHEIMIA Chodat, 1895b, p. 86.

Cells ovoid or ellipsoid, the membrane bearing 2 or more setae, the base with or without thickening; chromatophores one or many, parietal, with or without pyrenoid; cells free or contained in the mother cell wall. Reproduction as in *Oocystis*, from which it differs only by the presence of setae. *Chodatella* Lemmermann is included, its only difference from *Lagerheimia* being the absence of thickening at the base of the setae.

KEY TO THE SPECIES OF LAGERHEIMIA.

1. Setae from all parts of the cell.	2. *L. Droescheri.*
1. Setae from ends only.	2.
2. Cells with an obtuse projection at each end.	1. *L. citriformis.*
2. Cells without obtuse projection.	3.
3. Setae 44-55 μ long.	5. *L. longiseta.*
3. Setae 7-26 μ long.	4.
4. Cells 12-21 × 9-15 μ; 3-7 setae at each end.	3. *L. ciliata.*
4. Cells 5-13 × 2.5-8.5 μ; 2-3 setae at each end.	4. *L. subsala.*

1. L. **citriformis** (Snow) nov. comb.; *Chodatella citriformis* Snow, 1903, p. 381, Pl. II, fig. VIII. Cell ellipsoidal with an obtuse projection at each end, 13-23 × 8-20 μ; chromatophore single, with pyrenoid; setae slender, in whorls about the projections at the ends of the cells. Collins, 1909, Fig. 45. Lake Erie.

2. L. DROESCHERI (Lemm.) Printz, 1914, p. 60; *Chodatella Droescheri* Lemmermann, 1900, p. 98, Pl. III, fig. 12. Cells 10-16 × 5-12 μ, beset with numerous tapering setae, 10-17 μ long. Wis., G. M. Smith. *Europe.*

2. L. CILIATA (Lagerh.) Chodat, 1895b, p. 86; *Oocystis ciliata* Lagerheim, 1882, p. 76, Pl. III, figs. 33-37. Cells 12-21 × 9-18 μ, solitary or 2-8 in a family; setae 3-7 at each end, 18-20 μ long. Wis., G. M. Smith. *Europe.*

Var. **minor** (G. M. Smith) nov. comb.; *Chodatella ciliata var. minor* G. M. Smith, 1916, p. 477, Pl. XXV, fig. 16. Cells 8-10 × 6-7.5 μ, with 6-8 setae at each end. Wis., G. M. Smith.

Differs from the typical form by the smaller size, and usually more abundant setae.

4. L. SUBSALSA Lemmermann, 1898b, p. 193, Pl. V, figs. 2-6. Cells 5-13 × 2.5-8.5 μ, solitary or 2-8 in a family; setae

not formed until after leaving the mother cell, 2-3 just below each end, 7-26 μ long. Wis., G. M. Smith. *Europe.*

5. L. LONGISETA (Lemm.) Printz, 1914, p. 60; *Chodatella subsalsa* var. *longiseta* Lemmermann, 1898, p. 310, Pl. X, figs. 11-18. Cells ellipsoid, in vertical view circular, 8 μ wide, 12 μ long, each end with 4-10 setae, 44-55 μ long. White Sand Lake, Wis., G. M. Smith. *Europe.*

MICRACTINIUM Fresenius, 1858, p. 236.

Cells spherical or nearly so, solitary or loosely united in colonies, cell with gelatinous envelope, bearing long, hyaline setae, chromatophore bell-shaped, parietal, with or without pyrenoid; asexual reproduction by division in 2-3 directions, the autospores escaping by an opening in the wall; also by akinetes.

KEY TO THE SPECIES OF MICRACTINIUM.

1. Cells mostly solitary; setae uniformly distributed, cylindrical. 2.
1. Cells mostly in colonies; setae unilaterally placed, with thickened base. 3.
   2. Setae numerous, 25-45 μ long. 1. *M. radiatum.*
   2. Setae few, about 16 μ long. 2. *M. paucispinosum.*
3. Cells 3-7 μ diam., with 1-3 setae, about 60 μ long. 3. *M. pusillum.*
3. Cells 6.5-10 μ diam., with 4 setae, 23-40 μ long. 4. *M. quadrisetum.*

1. M. RADIATUM (Chodat) Wille, 1909, p. 57; *Golenkinia radiata* Chodat, 1894 a, p. 305, Pl. III. Cells spherical, solitary or in 4-celled colonies, 10-15 μ diam., with numerous setae, 25-45 μ long, Fig. 11. Wis. G. M. Smith. *Europe.*

2. M. PAUCISPINOSA (W. & G. S. West) G. S. West, 1916, p. 198, fig. 124, F; *Golenkinia paucispinosa* W. & G. S. West, 1902, p. 68, Pl. I, fig. 18. Cells solitary, spherical, 15-16 μ diam., with a few setae, about 16 μ long. Wis., G. M. Smith. *Ireland.*

3. M. PUSILLUM Fresenius, 1858, p. 236, Pl. XI, figs. 46-49; G. M. Smith, 1916, p. 477, Pl. XXV, fig. 18; *Richteriella botryoides* Lemmermann, 1898, p. 306, Pl. X, figs. 1-6. Cells spherical, 3-7 μ diam., forming colonies of four cells in one plane, each with 1-3 tapering setae, about 60 μ long. Wis., G. M. Smith. *Europe.*

4. M. QUADRISETUM (Lemm.) G. M. Smith, 1916, p. 479, Pl. XXV, fig. 17; *Richteriella quadriseta* Lemmermann, 1898, p. 307, Pl. X, fig. 7. Cells somewhat ellipsoid or ovoid, 6.5-7 × 7-10 μ, each with 4 setae, 23-40 μ long. Wis., G. M. Smith. *Europe.*

FRANCEIA Lemmermann, 1898, p. 307.

Cells single or united in colonies, enclosed in a gelatinous, hyaline envelope; cell with 2-3 parietal chromatophores, and with long spines, base of spine not thickened; asexual reproduction by division of cells in one plane.

F. OVALIS (Francé) Lemmermann, 1898, p. 308, *Phythelios ovalis* Francé, 1894, p. 2, figs. 1-5; *Golenkinia Franzei* Chodat, 1894a, p. 308. Cells ovoid or ellipsoid, 10 μ wide, 17 μ long, with many spines, about 23 μ long. Fig. 12. Wis., G. M. Smith. *Europe.*

The dimensions given above are those of the European plant; Smith's specimens from Wisconsin are decidedly smaller, 7 × 13 μ, with spines 15 μ long.

ACANTHOSPHAERA Lemmermann, 1899a, p. 118.

Cells spherical, solitary (chromatophore single?) with distinct pyrenoid; membrane very thin, with gelatinous coating and many spines; spines with lower part rather thick and refringent, above very slender and hyaline. Only one species.

A. ZACHARAISII Lemmermann, 1899a, p. 118, Pl. I, figs. 10-11. Cells 10-14 μ diam., spines 30-35 μ long. The principal character of this species is found in the spines, the lower third relatively stout and distinct; the upper two-thirds delicate and hyaline, visible only when dried, or under high magnification. Fig. 13. Wis., G. M. Smith. *Europe.*

Page 161, for Key to the Species of Nephrocytium, substitute,

1. Cells semicular with rounded ends. 3. *N. obesum.*
1. Cells reniform. 2.
   2. Daughter cells 2-7 μ diam., 3-6 diam. long. 1. *N. Agardhianum.*
   2. Daughter cells 11-22 μ diam., 2 diam. long. 2. *N. Naegelii.*

and after description of N. NAEGELII, add,

3. N. OBESUM W. & G. S. West, 1894, p. 13, Pl. II, figs. 39-40. Daughter cells nearly semi-circular with rounded ends, the ventral edge straight or slightly concave, 15-28 μ wide, rarely more, 25-49 μ long. Two cells within the mother cell wall, which may be over 100 μ long and wide, with very thick membrane. Manistique, Mich., Transeau. *England, So. America.*

Page 161, for Key to the Species of Tetraedron, substitute,

1. Cells without spines or sharp tips to lobes. 2.
1. Cells with spines or sharp tips to lobes. 8.
   2. Cells with 3 rounded angles. 3.
   2. Cells with more than 3 angles. 4.

3. Sides straight to subconvex, membrane reticulate. 6. *T. reticulatum.*
3. Sides straight to sinuate, membrane smooth or finely punctate. 2. *T. muticum.*
4. Cells with 4 angles. 5.
4. Cells with 5 angles or more. 7.
5. Cells 18-30 μ diam.; membrane granular-punctate. 5. *T. punctatum.*
5. Membrane smooth. 6.
6. Cells 6-11 μ diam., sides distinctly emarginate. 4. *T. minimum.*
6. Cells 15-21 μ diam., sides not emarginate. 3. *T. tetragonum.*
7. Irregularly 5-6-angled, 35-75 μ diam., menbrane thin. 13. *T. gigas.*
7. Rather regularly 6-8-angled, 17-26 μ diam., membrane laminate. 11. *T. pachydermum.*
8. Cells semicircular to ovate with sides of unequal curvature, a spine at each end. 18. *T. obesum.*
8. Cells not as above. 9.
9. Each angle with one spine. 10.
9. Each angle with 2 or more spines. 17.
10. Spines short. 11.
10. Spines longer. 16.
11. Cells asymmetrical or contorted. 29.
11. Sides and surfaces of cells symmetrical or nearly so. 12.
12. Cells flattened, triangular. 1. *T. trigonum.*
12. Cells more than 3-angled. 13.
13. Cells 4-angled. 14.
13. Cells 5-angled. 15.
14. Cells flattened, quadrate. 7. *T. quadratum.*
14. Cells tetraedral. 12. *T. regulare.*
15. Cells flattened. 9a. *T. caudatum.*
15. Cells pentaedrical. 20. *T. pentaedricum.*
16. Cells irregularly triangular, twisted, 73-81 μ diam., spines about 30 μ long. 19. *T. tortum.*
16. Cells either fusiform, 65 × 12 μ, or stellate with 3 rays, body about 36 μ diam., margins sinuous, angles passing gradually into spines. 27. *T, proteiforme.*
17. 4-10 slender spines, 30-40 μ long, at each angle. 21. *T. spinulosum.*
17. Spines relatively shorter and stouter. 18.
18. Cells with arm-like prolongations. 19.
18. Cells without arm-like prolongations. 23.
19. Arms not divided, except at tip. 20.
19. Arms 1-5 times divided. 21.
20. Cells tetraedral. 22.
20. Cells flatter. 28.
21. Ultimate divisions very slender, acute. 8. *T. gracile.*
21. Ultimate divisions broader, especially in top view. 30.

22. Body of cell inconspicuous, rays twice bifid, total diam. up to 70 μ. 22. *T. limneticum.*
22. Body more conspicuous, rays once bifid or trifid; total diam. not over 33 μ. 28. *T. hastatum.*
23. Cells irregularly octaedral. 25. *T. floridense.*
23. Cells 3- or more-angled. 24.
24. Cells flattened. 27.
24. Cells not flattened. 25.
25. Cells with rounded sides and inconspicuous angles. 14. *T. armatum.*
25. Cells irregularly tetraedric, with conspicuous angles. 26.
26. Angles and spines repeatedly forked. 16. *T. enorme.*
26. Angles short, with concave ends and 2 short spines. 15. *T. bifurcatum.*
27. Cells quadrangular. 26. *T. lobulatum* var. *polyfurcatum.*
27. Cells polygonal. 10. *T. angulosum.*
28. Cells cruciate. 23. *T. pusillum.*
28. Cells with 2 long, subparallel, and 2 deeply emarginate sides. 29. *T. arthrodesmiforme* var. *lobulatum.*
29. Cells much twisted, with deep median division into semicells. 30. *T. victoriae.*
29. Cells without deep division, with 3 or 4 unequal sides. 9. *T. quadricuspidatum.*
30. Width between apices 30-40 μ; cells flat or pyramidal. 26. *T. lobulatum.*
30. Width between apices 50-70 μ; cells flat. 24. *T. planctonicum.*

Page 162, after TETRAEDRON TRIGONUM var. PUNCTATUM, add,

Var. SETIGERUM (Archer) Lemmermann, 1904, p. 110; *Tetrapedia setigera* Archer, 1872, p. 365, Pl. XXI, figs. 14-17; G. S. West, 1904, p. 349; *Polyedrium trigonum* var. *setigerum* Schröder, 1898, p. 23, Pl. I, fig. 6. Cells with strongly concave sides, the rounded angles each with a long straight spine. Wis., G. M. Smith. *Europe.*

Described by Archer and accepted by West and Forti as belonging to the Myxophyceae, the species seems to belong better to the Chlorophyceae, as surmised by Schröder and Lemmermann; as noted by G. M. Smith the chromatophore is grass-green and contains a single central pyrenoid. Shape and dimensions agree exactly with Archer's description, so that there is little doubt of the identity.

Page 165, after T. REGULARE var. LONGISPINUM, add,

Var. INCUS Teiling, 1912, p. 277, fig. 12. Cells tetraedral,

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less commonly flat with concave sides; short sides 14-16 μ, longer sides 16-18 μ, isthmus of former 13-14 μ, of latter 7-9 μ wide; spines 7-8 μ long, usually slightly curved. Wis., G. M. Smith. *Europe.*

Var. TORSUM (W. B. Turner) Brunnthaler in Pascher, 1915, p. 150, fig. 169; *Polyedrium tetraedricum* var. *torsum* W. B. Turner, 1892, p. 158, Pl. XX, fig. 15. Angles prolonged and twisted. Wis., G. M. Smith. *Asia.*

Page 80 of supplement, after T. CAUDATUM, add,

Var. LONGISPINUM Lemmermann, 1898, p. 151; 1899a, p. 117, Pl. I, figs. 8-9. Cells 10-12 μ diam., spines 8-10 μ long, each bent at a right angle with the plane of the cell body. Wis., G. M. Smith. *Europe.*

Page 166, after description of T. ENORME, add,

18. T. OBESUM (W. & G. S. West) Brunnthaler in Pascher, 1915, p. 154; *Reinschiella obesa* W. & G. S. West, 1901a, p. 100, Pl. IV, figs. 53-54. Cells semi-circular to ovate with one side more convex than the other, about 30 × 14 μ, each end with a strong spine about 7 μ long, curved towards the convex side; cells often in pairs. Me., F. D. Lambert. *Siam.*

19. T. TORTUM W. & G. S. West, 1895b, p. 52. Cell irregularly triangular, twisted, sides convex or concave or nearly straight; angles slightly prominent, each ending in a sharp spine about 30 μ long. Membrane thick. Cell without spines, 73-81 μ diam., 42-44 μ thick. "North America" West.

20. T. PENTAEDRICUM W. & G. S. West, 1895a, p. 84, Pl. V, figs. 15-16. Cells pentagonal, sides concave, angles rounded, each with a curved or hooked spine. Cells 10-15 μ diam., without spine; spine 4.5-5.5 μ long. Wis., G. M. Smith. *Madagascar.*

21. T. SPINULOSUM Schmidle, 1896, p. 193; Brunnthaler in Pascher, 1915, p. 154, fig. 188; *Polyedriopsis spinulosa* Schmidle in Lemmermann, 1899a, p. 118. Cells 4-5-angled, up to 20 μ diam., angles somewhat prolonged, each bearing 4-10 irregularly placed, slender, somewhat tapering spines, 30-40 μ long. Wis., G. M. Smith. *Europe.*

The habit, small body with many very long slender spines, is quite different from the other species of the genus, and perhaps most writers would accept Schmidle's second thought, and make a separate genus for it. But when one begins to divide up *Tetraedron*, it is hard to stop, and for the present *Polyedriop-*

sis may be kept as a subgenus, following Wille, with this one species.

22. T. LIMNETICUM Borge, 1900, p. 5, Pl. I, fig. 2. Cell tetraedral, angles extending into long arms, each with 2 short spines at tip; cells 65-70 μ diam., arms about 8-10 μ diam. Wis., G. M. Smith. *Europe.*

23. T. PUSILLUM (Wallich) G. S. West, 1897a, p. 237; *Micrasterias pusilla* Wallich, 1860, p. 281, Pl. XIII, fig. 13. Cells flattened, cruciate, arms each with 2 crooked spines at end; cells 25 μ wide, 10 μ thick. Wis., G. M. Smith. *India.*

24. T. PLANCTONICUM G. M. Smith, 1916, p. 479, Pl. XXVI, figs. 19-20. Cells 4-5-sided, sides generally incurved and equal; angles of cells prolonged into bifurcate or trifurcate processes ending in 2 or 3 horns; processes broad in top view, narrow in side; cells without processes 18-24 μ diam., with processes 50-70 μ diagonal diam., diam. of processes 9-12 × 5-8 μ, length 15-25 μ. Wis., G. M. Smith.

25. T. FLORIDENSE W. & G. S. West, 1898, p. 7. Cells irregularly octaedral, sides slightly convex, angles forked, with a somewhat curved spine on each fork; cells 34-44 μ without spines, with spines 44-59 μ. Deland, Fla.

26. T. LOBULATUM (Näg.) Hansgirg, 1888, p. 132; *Polyedrium lobulatum* Nägeli, 1849, p. 84, Pl. IV, B, fig. 3; Reinsch, 1867, p. 78, Pl. II, fig. II. Cells irregularly and indistinctly tetraedral, sometimes flattened, margins from straight to deeply concave; angles usually 2-parted, each part with 2, rarely 3 points, very rarely the angle only emarginate; width 30-74 μ. Wis., G. M. Smith. *Europe.*

Var. POLYFURCATUM G. M. Smith, 1916, p. 480, Pl. XXVI, figs. 21-22. Prolongations branching 3-5 times, ultimate divisions with 3 spines; prolongations nearly as long as body of cell; diam. 10-20 μ without processes, 30-40 μ with processes; diagonal diam. 35-50 μ. Wis., G. M. Smith.

This variety seems transitional between the forms with spinous angles and those with distinctly arm-like prolongations.

27. T. PROTEIFORME (Turn.) Brunnthaler in Pascher, 1915, p. 152, fig. 177. *Polyedrium proteiforme* W. B. Turner, 1892, p. 158, Pl. XX, fig. 24b. Cells fusiform or triangular, with sinuate sides and prolonged angles, each passing into a spine, not sharply distinct from the cell disk; fusiform individuals about 65 μ long, 12 μ wide; triangular 36 μ diam. with spines. Wis., G. M. Smith. *India.*

A cut, however rude, gives a better idea of this species, than a description, however full; this is true more or less of all species of the genus. To do any work in it one should have either a library with everything published on fresh water algae, or Pascher's handbook, with its cuts.

28. T. HASTATUM (Reinsch) Hansgirg, 1888, p. 132; *Polyedrium tetraedricum* var. *hastatum* Reinsch, 1867, p. 77, Pl. V, fig. III. Cells tetraedral, about 23 μ wide, with 4 lateral subconcave surfaces; angles gradually narrowed, each with a single spine, shortly tridentate. Wis., G. M. Smith. *Europe.*

Var. PALATINUM (Schmidle) Lemmermann, 1904, p. 112; *Polyedrium hastatum* var. *palatinum* Schmidle, 1900, p. 148, Pl. VI, figs. 4-5. Cells rounded, mostly tetraedal, less commonly disciform, each angle drawn out into a long prolongation, bifurcate at the tip. Wis., G. M. Smith. *Europe.*

29. T. ARTHRODESMIFORME var. LOBULATUM Woloszyńska, 1914, p. 203, Pl. VI, fig. 11. Cells with two long straightish sides, each with a long, somewhat spreading prolongation, ending in 2 short acute lobes, the 2 short sides deeply incised, leaving only a narrow isthmus; width 16 32 μ, length with spines up to 56 μ. Wis. G. M. Smith. *Europe.*

In the typical form, *T. tetragonum* forma *arthrodesmiforme* G. S. West, 1909, p. 245, Pl. CCCXCVIII, fig. 1, the apices of the prolongations are simple.

30. T. VICTORIAE Woloszyńska, 1914, p. 203, Pl. VI, figs. 1-4. Cells 4-lobed, deeply emarginate, forming two subcruciform, strongly twisted semi-cells; angles rounded, with a short straight spine with blunted tip; cells 20-30 $\times$ 10-15 μ. Wis., G. M. Smith. *Africa.*

The original material from Africa had cells with dimensions as above; Smith's plants from Wisconsin measure 40-60 $\times$ 15-20 μ, but do not differ otherwise.

Page 167, cancel all in regard to ELAKATOTHRIX, and substitute,

Cells cylindrical or fusiform, with one parietal chromatophore, nearly covering the wall, with pyrenoid; an extensive gelatinous thallus, often branching and anastomosing, including many cells, usually in longitudinal series; asexual reproduction by transverse division.

KEY TO THE SPECIES OF ELAKATOTHRIX.

1. Sheath little or not branched; cells narrowly fusiform.
1. *E. gelatinosa.*

1. Sheath branching and anastomosing; cells broad fusiform or ovoid.
2. *E. americana.*

1. E. GELATINOSA Wille, 1898, p. 302; Pascher, 1915, p. 220, figs. 25 & 26. Cells elongate fusiform, 18-22 × 4-6 μ, in more or less distinct linear series; gelatinous sheath cylindrical or subfusiform, little or not at all branched, containing up to 32 cells, rarely more. Fig. 14. Wis., G. M. Smith. *Northern Europe.*

2. E. AMERICANA Wille, 1899, p. 150; P. B.-A., No. 607. Cells broad fusiform or ovoid, 12-25 × 6-15 μ; gelatinous sheath in the form of a laciniate, anastomosing thallus, attached to various plants and reaching a length of several cm.; later forming floating masses of indefinite form. Conn. *Northern Europe.*

FUSOLA Snow, 1903, p. 389.

Cells fusiform, parietal chromatophore nearly or quite covering the wall, with large central pyrenoid; asexual reproduction by transverse division of cell, the daughter cells separating and issuing from the mother cell; single cells surrounded by a broad gelatinous coating of similar shape to the cell, containing 2-4 daughter cells during division, then dividing to contain a single cell. Only one species.

F. VIRIDIS Snow, 1903, p. 389, Pl. II, fig. 6; *Elakatothrix americana* Collins, 1909, fig. 51, not of p. 167. Cells 27-40 × 9-12 μ, broad fusiform, sometimes slightly sigmoid; sheath 35-60 × 15-25 μ. Lake Erie. *Northern Europe.*

Pascher, 1915, p. 220, gives *Fusola americana* Snow as a synonym of *Elakatothrix americana;* no such binomial was used.

Page 168, after generic description of SCENEDESMUS, cancel key, and substitute,

A very thorough monograph of this genus, G. M. Smith, 1916a, has been utilized for the following account of the American forms. These are now given in the same order and under the same names as in the monograph, with descriptions of all not already described in this work.

KEY TO THE SPECIES OF SCENEDESMUS.

1. Cell membrane smooth, without terminal spines, teeth, granulations or lateral ridges. 2.
1. Cells with projections of some sort. 8.
2. Cells acicular to fusiform. 3.
2. Cells ovoid. 7.

3. Cells without polar bulbs or thickenings. 4.
3. Cells with polar bulbs or thickenings. 5. *S. incrassatulus.*
4. Cells all in one plane. 5.
4. Cells not in one plane. 6.
5. All cells straight. 1. *S. obliquus.*
5. Median cells straight, end cells curved. 2. *S. dimorphus.*
6. Cells alternate, end cells usually not in same plane as others. 3. *S. Bernardii.*
6. Cells forming a curved surface. 4. *S. acuminatus.*
7. Cells in a linear or alternating, not a double series. 6. *S. bijuga.*
7. Cells in two series. 7. *S. arcuatus.*
8. Cells with teeth at poles, but no other projections. 8. *S. denticulatus.*
8. Cells with projections other than teeth. 9.
9. Cells with longitudinal ridges. 10.
9. Cells without ridges. 12.
10. Cells with ridges only. 9. *S. acutiformis.*
10. Cells with ridges and other projections. 11.
11. Cells with teeth at poles. 10. *S. brasiliensis.*
11. End cells with spines. 11. *S. armatus.*
12. Cells with short spines or granulations. 13.
12. Cells with long spines or horns. 14.
13. Spines or granulations covering the wall. 12. *S. Hystrix.*
13. Spines or granulations in longitudinal rows. 13. *S. serratus.*
14. Spines on all cells. 15.
14. Spines on end cells only. 16.
15. Spines both on poles and middle part of cell. 14. *S. abundans.*
15. Spines only at poles. 15. *S. longus.*
16. Cells in lateral contact throughout. 16. *S. quadricauda.*
16. Cells in contact for middle third only. 17. *S. opoliensis.*

1. S. OBLIQUUS (Turp.) Kützing, 1833, p. 609; G. M. Smith, 1916a, p. 428, Pl. XXV, fig. 7; XXIX, figs. 63-68; Collins, 1909, p. 168; *Achnanthes obliqua* Turpin, 1820, fig. 9; 1828, p. 312, Pl. XIII, fig. 9.

2. S. DIMORPHUS (Turp.) Kützing, 1833, p. 608; G. M. Smith, 1916a, p. 434, Pl. XXV, fig. 8; XXXII, figs. 185-189; XXXIII, figs. 190-195; *S. obliquus* var. *dimorphus* Collins, 1909, p. 169; *Achnanthes dimorphus* Turpin, 1820, fig. 2; 1828, p. 312, Pl. XIII, fig. 12.

3. S. BERNARDII G. M. Smith, 1916a, p. 436, Pl. XXV, fig. 6; XXXIII, figs. 196-208. Colonies of 2-8 cells; cells fusiform, often sigmoid, 8-16 × 3-7 μ; in a loose alternate series, attached only near the poles. Wis., G. M. Smith.

4. S. ACUMINATUS (Lagerh.) Chodat, 1902, p. 211; *Selenas-*

trum acuminatum Lagerheim, 1882, p. 71, Pl. III, figs. 27-30; W. & N., No. 441. Colonies of 4 cells; cells somewhat lunate, falcate or sigmoid, apices acuminate; not in one plane, but as a more or less curved surface, a median section of the colony sometimes showing a curvature of as much as 180°; cells 6-7 μ thick, apices distant 30-40 μ. Wis., G. M. Smith. *Europe.*

Smith (in litt.) states that his plant referred to above is certainly a *Scenedesmus*, and to be identified with the plant of Lagerheim and Chodat; that he has also a true *Selenastrum* considerably resembling it. If the same two species occur in Europe, it may account for some recent authors doubting the validity of Chodat's transfer of Lagerheim's species.

Var. MINOR G. M. Smith, 1916a, p. 436, Pl. XXIX, figs. 70-74. Cells 3.5-6 μ thick, apices distant 18-28 μ. Wis., G. M. Smith.

Var. TETRADESMOIDES G. M. Smith, 1916a, p. 439, Pl. XXIX, figs. 75-80. Cells less lunate, 11-15 × 2.5-4 μ, curvature of colony from slight to nearly a circle. Wis., G. M. Smith.

5. S. INCRASSATULUS Bohlin, 1897, p. 24, Pl. I, figs. 45-51; G. M. Smith, 1916a, p. 440, Pl. XXV, figs. 9-10. Colonies 4-8-celled, occasionally 2-celled, cells in a single series or alternating, or somewhat irregular, 17-24 × 5-8 μ; fusiform, subacute with an apical thickening of the membrane, median cells usually slightly curved, end cells distinctly so, outer side convex, inner plane or concave. Stover's Pond, Harpswell, Maine, F. D. Lambert. *Brazil, Burma.*

In the Harpswell material the cells are irregularly placed, showing little seriate arrangement, but otherwise are quite typical.

Var. MONONAE G. M. Smith, 1916a, p. 440, Pl. XXIX, figs. 81-83. Cells 11-12 × 4-4.5 μ. Wis., G. M. Smith.
Cells more slender than in the typical form, and smaller in all dimensions.

6. S. BIJUGA (Turp.) Lagerheim, 1893a, p. 158; Collins, 1909, p. 168; G. M. Smith, 1916a, p. 441, Pl. XXV, fig. 2; *Achnanthes bijuga* Turpin, 1828, p. 310, Pl. XIII, fig. 4.

Var. FLEXUOSUS (Lemm.) Collins, 1909, p. 168; G. M. Smith, 1916a, p. 446, Pl. XXV, fig. 10; *S. bijugatus* var. *flexuosus* Lemmermann, 1898b, p. 191, Pl. V, fig. 1.

Var. ALTERNANS (Reinsch) Borge, 1907, p. 57; Collins, 1909, p. 168; G. M. Smith, 1916a, p. 447, Pl. XXV, figs. 14-15; *S. alternans* Reinsch, 1866, p. 135, Pl. XX, fig. D. 5.

Var. IRREGULARIS (Wille) G. M. Smith, 1916a, p. 448, Pl. XXVIII, figs. 59-62; *S. bijugatus* forma *irregularis* Wille, 1903a, p. 92, fig. 4. Cells irregularly arranged, alternately or in two series, 7.5-10 × 3.5-6 μ. Wis., G. M. Smith. *Europe.*

7. S. ARCUATUS Lemmermann, 1899a, p. 112, Pl. I, figs. 2-4; G. M. Smith, 1916a, p. 449, Pl. XXVI, figs. 19-20; XXIX, figs. 94-98; XXX, figs. 99-100. Colonies 4-16-celled, usually 8, more or less curved, small openings between cells; cells in two series, oblong-ovoid or subangulate, 9-15 × 5-9 μ. Wis., G. M. Smith. *Europe.*

Var. PLATYDISCA G. M. Smith, 1916a, p. 451, Pl. XXX, figs. 101-105. Colony usually 8-celled, cells in two series in one plane, with very small openings, 8-11 × 4.5-6 μ. Wis., G. M. Smith.

8. S. DENTICULATUS Lagerheim, 1882, p. 61, Pl. II, figs. 13-17; G. M. Smith, 1917, p. 452, Pl. XXVI, fig. 23. Colonies 4-celled, cells alternately or subcruciately arranged, ovoid or ovoid-oblong, apices rounded, with two small teeth, 7-15 × 5-11 μ. Wis., G. M. Smith. *Europe.*

Var. LINEARIS Hansgirg, 1888, p. 266; Collins, 1909, p. 169; G. M. Smith, 1916a, p. 454.

9. S. ACUTIFORMIS Schröder, 1897b, p. 45, Pl. II, fig. 4; G. M. Smith, 1916a, p. 456, Pl. XXVI, figs. 28-29; XXIX, figs. 84-89. Colonies 2-8-celled, cells uniseriate, fusiform, end cells with 4 longitudinal ridges, median cells with 2 each; cells 16-22 × 5.5-8 μ. Wis., G. M. Smith. *Europe.*

The number of ridges can best be seen in cross section; a side view shows usually only one ridge to a cell.

10. S. BRASILIENSIS Bohlin, 1897, p. 22, Pl. I, figs. 36-37; G. M. Smith, 1916a, p. 458, Pl. XXVI, figs. 30-31. Colonies 4-8-celled, cells in a single straight series, oblong, obtuse, each with minute teeth at pole, and four very slender longitudinal ridges, 11-24 × 8-20 μ. Melrose, Mass., C. Bullard; Wis., G. M. Smith. *Africa, Asia, So. America, Europe.*

11. S. ARMATUS (Chodat) G. M. Smith, 1916a, p. 460, Pl. XXVIII, fig. 53; XXIX, figs. 90-93; XXX, figs. 109-110; *S. Hystrix* var. *armatus* Chodat, 1902, p. 215, fig. 140. Colonies 2-8-celled, cells in a straight or subalternate series, ovoid or oblong-ovoid, end cells with a spine at each pole, median cells spineless; all cells with more or less distinct fine lateral ridges; cells 7-14 × 4-7 μ, spines 5.5-7 μ long. Wis., G. M. Smith. *Europe.*

Var. CHODATII G. M. Smith, 1916a, p. 461, Pl. XXX, figs. 111-114. Cells proportionally more slender, notches between poles deeper; cells 11-15 × 4-5 μ. Wis., G. M. Smith.

Var. SUBALTERNANS G. M. Smith, 1916a, p. 461, Pl. XXX, figs. 115-120. Cells subalternately arranged, often pyriform, 9-12 × 3-5.5 μ. Wis., G. M. Smith.

12. S. HYSTRIX Lagerheim, 1882, p. 62, Pl. II, fig. 18; Collins, 1909, p. 169; G. M. Smith, 1916a, p. 462, Pl. XXVI, fig. 35.

13 S. SERRATUS (Corda) Bohlin, 1901, p. 44, Pl. I, fig. 2; G. M. Smith, 1916a, p. 465, Pl. XXVIII, figs. 55, 57; *Arthrodesmus serratus* Corda, 1839, p. 244, Pl. VI, fig. 35. Colonies 4-celled, in a single straight series, cells oblong-ovoid, end cells each with a single longitudinal series of minute teeth, median cells each with two series: poles of all cells with 3-4 teeth each, cells 15-20 × 4.5-7 μ. Wis., G. M. Smith. *Austria, Azores.*

14. S. ABUNDANS (Kirchner) Chodat, 1913, p. 77; G. M. Smith, 1916a, p. 465, Pl. XXX, figs. 133-136; Pl. XXXI, figs. 137-140; *S. caudatus* var. *abundans* Kirchner, 1878, p. 98; *S. quadricauda* var. *abundans* Collins, 1909, p. 169. Colonies usually 4-celled, cells ovoid to oblong-ovoid, in a straight or subalternate series; end cells with spines at poles and between poles; median cells with spines at poles only; cells 8-12 × 4-7 μ; spines 4-7.5 μ long.

Var. LONGICAUDA G. M. Smith, 1916a, p. 467, Pl. XXX, figs. 121-125. Cells 7-9 × 3-6 μ; spines 6-10 μ long. Wis., G. M. Smith.

Spines longer than in the typical form, but fewer.

Var. SPICATUS (W. & G. S. West) G. M. Smith, 1916a, p. 468, Pl. XXVII, fig. 51; XXXI, figs. 141-146; *S. spicatus* W. & G. S. West, 1898, p. 335. Colonies 2-4-celled, cells in 2-celled colonies and end cells in 4-celled colonies bearing a longitudinal series of 5-7 spines; median cells of 4-celled colonies bearing 1-2 spines at each pole; cells 7.5-9 × 4 μ; spines 2-2.5 μ long. Wis., G. M. Smith. *Europe.*

Var. BREVICAUDA G. M. Smith, 1916a, p. 468, Pl. XXX, figs. 126-132. Cells smaller, 5-8 × 2.5-5 μ; spines 1.5-3 μ long; spines fewer, never 5 on a cell. Wis., G. M. Smith.

Var. ASYMMETRICA (Schröder) G. M. Smith, 1917, p. 468, Pl. XXVII, figs. 45-46; *S. quadricauda* var. *asymmetrica* Schröder, 1897, p. 45, Pl. II, fig. 5. End cells with a spine at each pole; every cell with one lateral spine. Wis., G. M. Smith. *Europe.*

15. S. LONGUS Meyen, 1829, p. 774, Pl. XLIII, fig. 28; G. M. Smith, 1916a, p. 469, Pl. XXVIII, fig. 54; XXXI, figs. 156-158; *S. quadricauda* forma *setosus* and forma *horridus* Collins, 1909, p. 169. Colony 2-8-celled, cells oblong-cylindric or ovoid, rounded at each end, with one chromatophore and one pyrenoid; a single spine at each pole; cells 8-11 × 4-5 μ; spines 2-4 μ long. Wis., G. M. Smith. *Europe.*

Occasionally a spine may be wanting of the normal number, but this is exceptional.

Var. BREVISPINA G. M. Smith, 1916a, p. 471, Pl. XXXI, figs. 151-155. Cells longer and narrower, 9-11 × 3-5 μ; spines shorter, about 2 μ. Wis., G. M. Smith.

Var. MINUTUS G. M. Smith, 1916a, p. 471, Pl. XXXI, figs. 147-150. Cells smaller, 6.5-8 × 2-3 μ; spines 1.5-2 μ long. Wis., G. M. Smith.

Var. ELLIPTICUS (W. & G. S. West) G. M. Smith, 1916a, p. 472, Pl. XXVII, fig. 44; *S. quadricauda* var. *ellipticus* W. & G. S. West, 1895a, p. 83, Pl. V, fig. 6; Collins, 1909, p. 169.

Var. **Naegelii** (Bréb.) G. M. Smith in litt., nov. comb; *S. Naegelii* Brébisson, 1856, p. 158; *S. caudatus* (?) Nägeli, 1849, p. 91, Pl. V, figs. 2, c & d. Cells larger than in the typical form, 18-33 × 7-11 μ, spines 15-30 μ long. Colony usually 8-celled, median cells with usually only one spine each, 3 adjacent cells with spines at the same end, the 3 other with spines at the opposite end. Wis., G. M. Smith. *Europe.*

16. S. QUADRICAUDA (Turp.) Brébisson in Brébisson & Godey, 1835, p. 66; Collins, 1909, p. 169; G. M. Smith, 1916a, p. 472, Pl. XXVII, fig. 39; XXXI, figs. 172-175; XXXIII, fig. 176; *Achnanthes quadricauda* Turpin, 1820, fig. 13; 1828, p. 311, Pl. XIII, fig. 6.

Var. QUADRISPINA (Chodat) G. M. Smith, 1916a, p. 479, Pl. XXVII, fig. 43; XXXI, figs. 167-170; *S. quadrispina* Chodat, 1913, p. 58, figs. 45-52. Cells broad ovoid, 8.5-11 × 3.5-6 μ; spines short. Wis., G. M. Smith. *Europe.*

Var. PARVUS G. M. Smith, 1916a, p. 480, Pl. XXXI, figs. 162-166. Cells ovoid-cylindric, 5.5-8 × 3 μ; spines 4.5-8 μ long. Wis., G. M. Smith.

Var. LONGISPINA (Chodat) G. M. Smith, 1916a, p. 480, Pl. XXVII, fig. 42; XXXI, figs. 159-161; *S. longispina* Chodat, 1913, p. 60, figs. 53-58. Cells ovoid-cylindric, 8-11 × 3.5-5 μ; spines 7.5-14 μ long. Wis., G. M. Smith. *Europe.*

The spines are 11-14 μ long in the European plant, 7.5-9.5 μ in the American.

Var. WESTII G. M. Smith, 1916a, p. 480, Pl. XXXIII, figs. 177-180. Cells 16-22 × 4.5-8 μ; spines 12-16 μ long. Wis., G. M. Smith.

A large form, but in its maximum not reaching the minimum of var. *maximus*.

Var. MAXIMUS W. & G. S. West, 1895a, p. 83, Pl. V, figs. 9-10; G. M. Smith, 1916a, p. 481, Pl. XXVII, fig. 40. Cells twice as large as in the typical form, 27-36 × 9-11.4 μ, with long curved spines. Waltham, Mass., F. D. Lambert.

Europe, Africa, Asia.

17. S. OPOLIENSIS Richter, 1896, p. 7, fig. A-E; G. M. Smith, 1916a, p. 481, Pl. XXVII, fig. 49; XXXII, figs. 181-184. Colonies 2-4-celled, cells in a straight series, end cells fusiform or subnavicular, with a long spine at each pole; median cells regularly fusiform, usually unarmed; cells united for about the median third only; cells 17-28 × 5-8 μ; Lake Erie, Snow; Wis., G. M. Smith. *Europe.*

The characters just given are the normal for the species, but there is much variation as to the size and number of the spines; they are never entirely wanting, and on the other hand are never present on all the poles in the colony.

Page 170, for description of CRUCIGENIA, substitute.

Colonies free, of 4-8-16, rarely more cells, lying in the same plane, with perforations at places where the cells have divided and separated from each other; cells with parietal chromatophore, with or without pyrenoid, touching at the middle or at the edges, and enclosed in more or less plentiful gelatine; asexual reproduction by division of a cell into 4 daughter cells, arranged like the mother colony. Fresh water plankton algae.

KEY TO THE SPECIES OF CRUCIGENIA.

1. Cells with more or less rounded outline. 4.
1. Cells more distinctly angular. 2.
  2. Cells triangular. 6. *C. tetrapedia.*
  2. Cells not triangular. 3.
3. Cells rhomboidal, sides concave. 2. *C. crucifera.*
3. Cells trapeziform. 7. *C. fenestrata.*
  4. Cells quadrate with rounded corners, or suborbicular. 3. *C. quadrata.*
  4. Cells oval, oblong or subtriangular. 5.
5. Colonies of 4 cells, separating soon after division. 1. *C. rectangularis.*
5. 4-celled colonies remaining united. 6.

6. Colonies united by short gelatinous bands. 4. *C. Lauterborni.*
6. Colonies united in extensive flat sheets. 5. *C. irregularis.*

1. C. RECTANGULARIS (A. Br.) Gay, 1891, p. 100, Pl. XV, fig. 151; W. & N., Alg. Exsicc. Nos. 53, 171; *Staurogenia rectangularis* A. Braun, 1855, p. 70. Cells 4-6 × 5-7 μ, oval or oblong, united in fours, touching near the outer end, or curved and touching near the middle. Greenland, Mass., Wis. *Europe.*

2. C. CRUCIFERA (Wolle) Collins, 1909, p. 170; *Staurogenia crucifera* Wolle, 1877, p. 140; *S. cruciata* Wolle, 1887, p. 171, Pl. CLVII, figs. 9-11. Cells rhomboidal, equilateral, with incurved sides and rounded angles, four forming a colony of the same form as the individual cell; "cells with a cruciform marking on the surface." Wolle.

Since Wolle's imperfect description and rudimentary figures, no information has been obtained as to this species, until its rediscovery by G. M. Smith, who found it in Tenderfoot Lake, Wis., June, 1917.

3. C. QUADRATA Morren, 1830, p. 413, Pl. XV, figs. 1-5; including *C. triangularis* (Chodat) Schmidle, 1900, p. 234. Cells quadrate, 3-4 μ square, with more or less rounded corners, or subcircular, united in regular, quadrate, 4-celled colonies. Wis., G. M. Smith. *Europe.*

4. C. LAUTERBORNI (Schmidle) Chodat, 1902, p. 206, fig. 127; *Staurogenia Lauterborni* Schmidle, 1896, p. 192, fig. 1. Cells arranged as in *C. rectangularis*, 6 × 3-4 μ, the 4 celled colonies united in groups of 8-32 by short gelatinous projections. Wis., G. M. Smith. *Europe.*

5. C. IRREGULARIS Wille, 1898, p. 302. Cells 6-14 × 4-9 μ, united as in *C. rectangularis*, but more irregularly, and more cells to a colony, 45-90 μ diam.; the colonies united by gelatine into a flat or undulate expansion. Wis., G. M. Smith. *Europe.*

6. C. TETRAPEDIA (Kirchner) W. & G. S. West, 1902, p. 62; Pascher, 1915, p. 174, fig. 251; *Staurogenia ? tetrapedia* Kirchner, 1880, Pl. II, fig. 1. Colony 4-celled, plane, quadrangular, cells in close contact, each a right-angled triangle, the outer side (opposite the right angle) somewhat concave, cells about 5-10 μ long; colonies united 4-16, individual cells assuming a quadrangular shape before division, the division diagonal. Chromatophore parietal, without pyrenoid. Wis., G. M. Smith. *Europe.*

7. C. FENESTRATA Schmidle, 1900a, p. 234; Pascher, 1915, p. 174, fig. 252. Cells trapeziform, 6-8 × 2-3 μ, colonies 4-celled,

plane, exactly quadrate with squarish central opening; included in an indistinct gelatinous layer; division on the diagonals of the quadrate colony. Wis., G. M. Smith. *Europe.*

ACTINASTRUM Lagerheim, 1882, p. 70.

Cells ovoid to clavate or subcylindrical, radiately attached by their apices to form small colonies, which often remain attached; chromatophore parietal, with or without pyrenoid; asexual reproduction by longitudinal and transverse division.

KEY TO THE SPECIES OF ACTINASTRUM.

1. Cells elongate-clavate, 10-24 × 3-6 μ, with pyrenoid. 1. *A. Hantzschii.*
1. Cells nearly cylindrical, 14-18 × 1.75-2 μ, without pyrenoid. 2. *A. gracillimum.*

1. A. HANTZSCHII Lagerheim, 1882, p. 70, Pl. III, figs. 25-26. Colonies usually 4-celled; cells elongate-clavate, 10-24 × 3-6 μ, with one pyrenoid, apices attenuate or acuminate, membrane delicate, hyaline. St. Louis, Mo., Ada Hayden, 1910, p. 43. *Europe.*

2. A. GRACILLIMUM G. M. Smith, 1916, p. 480, Pl. XXVI, fig. 23. Colonies 4-8-celled, cells elongate cylindrical or slightly tapering, 14-18 × 1.75-2 μ, without pyrenoid. Wis., G. M. Smith.

Page 80 of supplement, cancel ACTINASTRUM.

Page 171, after description of KIRCHNERIELLA, insert,

KEY TO THE SPECIES OF KIRCHNERIELLA.

1. Cells lunate or reniform. 2.
1. Cells cylindrical, curved or twisted. 3.
 2. Ends of cells pointed, distant. 1. *K. lunaris.*
 2. Ends of cells blunt, approximate. 2. *K. obesa.*
3. Cells 8-10 μ long; ends usually recurved. 3. *K. contorta.*
3. Cells 15-25 μ long, spirally or irregularly twisted. 4. *K. elongata.*

After description of Var. DIANAE, add,

3. K. CONTORTA (Schmidle) Bohlin, 1897, p. 20; *K. obesa* var. *contorta* Schmidle, 1894, p. 44, Pl. VII, fig. 2. Cells cylindrical with rounded ends, 8-10 × 0.7-2 μ, the ends hooked and curved. Wis., G. M. Smith. *Europe.*

4. K. ELONGATA G. M. Smith, 1916, p. 473, Pl. XXIV, fig. 7. Colonies of 4, 8, 16 or many cells imbedded in a copious homogeneous matrix; cells cylindrical, rounded at ends, spirally or irregularly twisted into a knot-like snarl; chromatophore parietal, without (?) pyrenoid; cells 15-25 × 2-2.75 μ, colonies up to 100 μ diam. Wis., G. M. Smith.

Page 80 of supplement, after description of KIRCHNERIELLA OBESA, add,

Var. APERTA (Teiling) Brunnthaler in Pascher, 1915, p. 182; *K. aperta Teiling*, 1912, p. 276, fig. 9. Differs from the type by the acute-angled incision, being in this respect intermediate between *K. lunaris* and *K. obesa;* dimensions the same as in *K. obesa;* apices blunt. Wis., G. M. Smith. *Europe.*

Page 172, for Key to the Species of Coelastrum, substitute,

1. Cells united by arm-like processes from the membrane. 5. *C. reticulatum.*
1. Cells in contact or united by quite short processes. 2.
  2. Cells without external projections. 3.
  2. Cells with external projections. 4.
3. Cells spherical or slightly elongate, interspaces small. 1. *C. microporum.*
3. Cells ovoid, mutually compressed, interspaces ½-1 cell diam. 2. *C. sphaericum.*
  4. Each cell normally with one projection. 5.
  4. Each cell normally with several projections. 6.
5. External view of cell hexagonal. 3. *C. proboscideum.*
5. External view of cell 10-12-angled. 4. *C. cambricum.*
  6. Each cell with 3 polar projections. 4a. *C. cubicum.*
  6. Each cell with several irregularly placed projections. 6. *C. verrucosum.*

Page 173, after description of C. CAMBRICUM, add,

Var. INTERMEDIUM (Bohlin) G. S. West, 1907, p. 136; *C. pulchrum* var. *intermedium* Bohlin, 1897, p. 35, Pl. II, figs. 16-17. Projections broader and less acute than in the typical form. Fla., Borge.

Page 173, after description of C. RETICULATUM, add,

C. SCABRUM Reinsch, 1877, p. 232; Printz, 1913, p. 90, Pl. VII, fig. 192; Brunnthaler in Pascher, 1915, p. 197, fig. 316. Colonies spherical or subcubical, of 8-16 cells; cells spherical, 8-10 μ diam., each with 3-6 firm, regularly arranged truncate prolongations, punctulate at the apex. Mackinaw, Mich., Transeau. *South Africa.*

PHYTOMORULA Kofoid, 1914, p. 38.

Colony of 16 cells, 4 cells in the same plane being superimposed on 4 other similar cells, also in one plane, the group of 8 being surrounded by a ring of 8 cells. Chromatophore parietal, with numerous minute pyrenoids and central nucleus. Reproduction unknown.

P. REGULARIS Kofoid, 1914, p. 38, Pl. VII. Colony solid, flattened, orbiculate, the peripheral cells broadly cuneate, the other cells squarish in surface view of the colony, 10-15 μ wide; each cell with a slight external projection. The only species, found in a fresh water reservoir at Berkeley, California. Fig. 15. C. A. Kofoid.

The peculiar arrangement of the cells is better understood by the figures than by description. The colony may be considered as a sphere much compressed in the line of the polar axis, the two polar groups of four cells each coming in contact, the equatorial cells forming a ring, fitting into the groove around the group of eight, "like an automobile tire into the rim of the wheel," in the words of Kofoid.

Page 173, for Key to the Species of Sorastrum, substitute,

1. **Outer angles of cells rounded, each with 2 spines.** 2.
1. **Outer angles ending each in a short, conical point.** 2. ***S. bidentatum.***
   2. **Cells as long as broad or longer.** 3. ***S. americanum.***
   2. **Cells broader than long.** 1. ***S. spinulosum.***

After description of S. SPINULOSUM, add,

Var. HATHORIS (Cohn) Lemmerman *; *Selenosphaerium hathoris* Cohn, 1879, p. 13, Pl. XI, figs. 16-17. Cells 16-20 μ wide, 10 μ high and thick, central body more distinct than in the typical form. Pa., West. *Europe.*

After description of S. BIDENTATUM, add,

3. S. AMERICANUM (Bohlin) Schmidle, 1899a, p. 230, fig. 6; *Selenosphaerium americanum* Bohlin, 1897, p. 40, Pl. II, figs. 38, 41. Cells as long as broad or longer, obcordate or obpyramidal, with stout gelatinous stipe attaching to distinct central body of colony; cells 8-15 × 6-8 μ; colony 22-60 μ diam., without spines. Wis., G. M. Smith. *Europe, So. America.*

Page 175. Cancel paragraph beginning "The European *D. Lunatus*" and substitute,

2. D. LUNATUS A. Braun, 1855, p. 44; Rabenhorst, 1868, p. 36, fig. 7. Inner cells ovoid-ellipsoid, outer lunate; cells 10-20 μ long, colonies up to 100 μ diam. Wis., G. M. Smith; Fla., Borge. *Europe.*

After paragraphs referring to DICTYOCYSTIS, add,

* Fide Brunnthaler in Pascher, 1915, p. 201.

TETRADESMUS, G. M. Smith, 1913, p. 76.

Colonies free, of four cells in two planes, the cells in one plane laterally united to those in the other plane; reproduction by autocolonies. Otherwise like *Scenedesmus*.

T. WISCONSINENSIS G. M. Smith, 1913, p. 76, Pl. I. Cells ovoid, ends sharply pointed, 4-6 × 12-15 μ. Fig. 16. Madison, Wis., G. M. Smith.

WESTELLA De Wildeman, 1897, p. 532.

Families of four cells in one plane; cells spherical or subspherical, rarely somewhat angular, with bell-shaped chromatophore. Families united by gelatinous threads, the remnants of mother cell walls, into aggregates of 20-80 cells. Vegetative reproduction by division in two planes, the daughter cells (autospores) escaping from the dissolving wall.

W. BOTRYOIDES (W. West) De Wildeman, 1897, p. 532; *Tetracoccus botryoides* W. West, 1892, p. 735, Pl. X, figs. 43-48. Cells 3.5-8 μ diam.; aggregates 30-84 μ diam. Fig. 17. Wis., G. M. Smith. *Europe.*

TETRASTRUM Chodat, 1895a, p. 114.

Similar to *Crucigenia*, but with projections from the edges of the cells.

KEY TO THE SPECIES OF TETRASTRUM.

1. Cells each with one low protuberance. 1. *T. apiculatum.*
1. Cells each with several fine spines. 2. *T. staurogeniaeforme.*

1. T. APICULATUM. (Lemm.) Schmidle, 1900, p. 154; *Staurogenia apiculata* Lemmermann, 1898a, p. 151; *Crucigenia apiculata* Collins, 1909, p. 170. Lake Erie, Snow; Wis., G. M. Smith. *Europe.*

2. T. STAUROGENIAEFORME (Schröder) Chodat, 1902, p. 208, fig. 148; *Cohniella staurogeniaeformis* Schröder, 1897a, p. 273, Pl. XVII, figs. 5-6. Cells subsemicircular, each bearing about 5 hyaline spines; cells 5-6 μ long. Fig. 18. Wis., G. M. Smith. *Europe.*

Page 176, after three paragraphs of PEDIASTRUM, add

Within the past four years two papers have been published, in which this genus has been carefully presented; but the two arrive at very different results. Nitardy, 1914, consolidates species and forms relentlessly and somewhat contemptuously; Brunnthaler in Pascher, 1915, while acknowledging the great variability, does not consider that we have enough data to decide what should be considered permanent and what due to environment. The names used in the 1909 paper have not been changed here, but American forms and species reported since then have been added.

Page 176, for Key to the Species of Pediastrum, substitute,

1.	Marginal cells undivided, cuspidate.	8.
1.	Marginal cells bilobed.	2.
2.	Lobes of marginal cells simple.	3.
2.	Lobes of marginal cells emarginate, bidentate or bifid.	7.
3.	Disk continuous.	4.
3.	Disk perforate.	11.
4.	Lobes of marginal cells incurved, forcipate.	3. *P. forcipatum.*
4.	Lobes of marginal cells straight or nearly so.	5.
5.	Margin finely tuberculate-crenulate.	5. *P. vagum.*
5.	Margin not tuberculate-crenulate.	6.
6.	Lobes ending in short, broadly triangular teeth.	12.
6.	Lobes ending in linear projections.	13.
7.	Disk continuous.	8. *P. tetras.*
7.	Disk perforate.	9. *P. biradiatum.*
8.	Marginal cells with a single tooth or cusp.	1. *P. simplex.*
8.	Marginal cells with more than one tooth or cusp.	9.
9.	Marginal cells tridentate.	2. *P. tricornutum.*
9.	Marginal cells with two projections.	10.
10.	Projections in one plane, short, distant.	10. *P. integrum.*
10.	Projections long, not in the same plane.	11. *P. Kawrayskii.*
11.	Cell wall with a network of very fine ridges.	12. *P. sculptatum.*
11.	Without network.	7. *P. duplex.*
12.	Cell wall with a rather coarse network of ridges.	13. *P. araneosum.*
12.	Without network.	6. *P. angulosum.*
13.	Prolongations capitate.	14. *P. glanduliferum.*
13.	Prolongations not capitate.	4. *P. Boryanum.*

Page 178, after description of P. BORYANUM, add,

Var. LONGICORNE Reinsch, 1867, p. 96. Marginal cells with rounded lobes, each extended in a usually incurved projection, 15-30 μ long. Greenland, Richter. *Europe.*

Page 179, after description of P. DUPLEX, add,

Var. ASPERUM A. Braun, 1855, p. 93. Cells 8-64, up to 35 μ wide, prolongations short, rough or toothed. Fla., Borge. *Europe.*

Var. CORNUTUM Raciborski, 1890, p. 101. Cells slightly attached, openings irregular, not rounded; marginal cells subcordate, each lobe ending in a long, straight, cylindrical prolongation. Fla., Borge. *Europe.*

Var. RETICULATUM Lagerheim, 1882, p. 56, Pl. II, fig. 1. Colonies of 8-16 cells; all cells strongly emarginate, openings large, rounded. Wis., G. M. Smith. *Europe.*

Var. GRACILLIMUM W. & G. S. West, 1895b, p. 52. Colony up to 87 μ diam.; cells very slender, marginal cells arcuate, with two long, slender processes, emarginate at the apex; other cells 4-radiate, with very large openings. Wis., G. M. Smith.

Page 179, after description of Var. EMARGINATUM, add,

10. P. INTEGRUM Nägeli, 1849, p. 96, Pl. V. B. Disk continuous, rounded, cells 4-32, disk up to 100 μ diam., cells usually irregularly placed, marginal cells differing little from disk cells, 5-6-angled, 20-28 μ diam., marginal cells each with two short, blunt, distant prolongations. Wis., G. M. Smith. *Europe.*

11. P. KAWRAYSKII Schmidle, 1897a, p. 269; Brunnthaler in Pascher, 1915, p. 103, fig. 63. Disk continuous, rounded, disk cells often irregular, 5-6-angled, 10-12 μ diam.; marginal cells about 14 μ wide, with two rather large, smooth, straight, truncate projections, not in the same plane, often crossing, sometimes one or both wanting. Wis., G. M. Smith. *Europe.*

12. P. SCULPTATUM G. M. Smith, 1916, p. 475, Pl. XXV, fig. 13. Disk oval or circular, 8-32-celled; disk cells 4-6-sided, with few openings; marginal cells bilobed, the lobes produced into divergent or parallel horn-like processes. Cell wall covered with a network of very fine ridges; disk 80-150 μ diam., cells 10-15 μ. Wis., G. M. Smith.

13. P. ARANEOSUM Raciborski, var. *rugulosum* (G. S. West) G. M. Smith, 1916, p. 476, Pl. XXV, fig. 14; *P. Boryanum* var. *rugulosum* G. S. West, 1907, p. 132, Pl. V, fig. 22. Disk 150-200 μ diam., cells 22-29 μ; margins of cells irregularly wavy, surface with wavy ridges. Wis., G. M. Smith. *Europe.*

Typical *P. araneosum* Raciborski, 1890, p. 11, has not been reported from America.

14. P. GLANDULIFERUM Bennett, 1892, p. 7, Pl. II, figs. 5-7. Colonies elliptical, continuous or with very small openings; marginal cells 5-6-angled, 10 μ wide, 12 μ long, with a small semicircular incision, with two projections from each cell, about midway between side of cell and incision, projections about 15 μ long, filiform, distinctly capitate. Wis., G. M. Smith. *Europe.*

3. EUASTROPSIS Lagerheim, 1895a, p. 20.

Colonies 2-celled, flat, in one plane, membrane thin and smooth; chromatophore a parietal disk with one pyrenoid; asexual reproduction by zoospores 2-many in a cell, formed by successive division, ovoid, with 2 cilia, escaping in a gelatinous vesicle by an opening in the mother cell wall, and after coming to rest forming 1-16 new colonies.

1. E. RICHTERI (Schmidle) Lagerheim, 1895a, p. 20, Pl. I, figs. 12-27; *Euastrum Richteri* Schmidle, 1894, p. 60, Pl. VII, fig. 25. Cells trapezoid, strongly emarginate, 5-20 × 4.5-25 μ; colonies 10-40 × 6-25 μ; zoospores 5 μ diam. Fig. 19. Wis., G. M. Smith. *Europe.*

Page 187, add,

GEMINELLA Turpin, 1828, p. 329.

Cells ovoid-cylindric to short-cylindric, normally in a single series in a wide, homogeneous gelatinous sheath; chromatophore zonate with one pyrenoid; asexual reproduction by cell division, the daughter cells usually remaining approximate; zoospores unknown; akinetes in some species.

The generic name *Hormospora* is antedated by *Geminella*. It is now generally recognized that in addition to the Hormospora-forms assumed by some species of *Ulothrix*, etc., there are autonomous forms with the characters of the genus. It is a question whether *Radiofilum* is distinct; the only distinguishing character now available is the structure of the sheath, homogeneous or longitudinally laminate in *Geminella*, transversely in *Radiofilum*. Wille, 1909, p. 72, has *Hormospora* and *Radiofilum* as sections of *Geminella*. In none of the species is the life history fully known, so for the present the two genera are retained.

KEY TO THE SPECIES OF GEMINELLA.

1. Cells transversely elongate. 1. *G. scalariformis.*
1. Cells longitudinally elongate. 2. *G. interrupta.*

Page 188, for HORMOSPORA SCALARIFORMIS read,

GEMINELLA **scalariformis** G. S. West ms.; *Hormospora scalariformis* G. S. West, 1905, p. 282, Pl. CCCLXIV, figs. 6-7. Fig. 21.

After description of GEMINELLA SCALARIFORMIS, add,

Forma MARINA G. S. West in Collins & Hervey, 1917, p. 31. Cells proportionally longer, sheath more homogeneous. In salt water, Bermuda, Collins.

2. G. INTERRUPTA Turpin, 1828, p. 329, Pl. XIII, fig. 24; emend. Lagerheim, 1883, p. 68, Pl. I. figs. 30-35. Cells 5-7 μ diam., 6-15 μ long, in a single series; sheath 16-18 μ diam.; cells from recent division remaining approximate; akinetes 9-10 μ diam., to 15 μ long, with thick, dark wall. Wis., G. M. Smith, New Buffalo, Mich., Transeau. *Europe.*

Page 189, add to generic description of RADIOFILUM,

With more or less distinct transverse lamellate or fibrillose structure.

KEY TO THE SPECIES OF RADIOFILUM.

1.	Cell division transverse only; cells uniseriate.	2.
1.	Cell division transverse and longitudinal; cells uni-multiseriate, sheath often branched.	4. *R. irregulare.*
2.	Sheaths wide, of inner laminate and outer homogeneous layers.	2. *R. conjunctivum.*
2.	Sheath of uniform laminate structure.	3.
3.	Cells lenticular with sharp lateral edge.	1. *R. apiculatum.*
3.	Cells spherical or ellipsoid.	4.
4.	Sheaths cylindrical, cells broadly ellipsoid.	3. *R. flavescens.*
4.	Sheaths torulose, cells subspherical.	5. *R. moniliforme.*

1. R. APICULATUM see p. 188.

2. R. CONJUNCTIVUM Schmidle, 1894, p. 48, Pl. VII, figs. 4-5. Filaments usually short and fragile; cells spherical or depressed-spherical, with more or less distinct and sharp lateral edge, usually 6 × 4 μ, united by short gelatinous bands, of firmer consistency than the general sheath; sheath about 25 μ diam., with a thin homogeneous outer layer, and an inner layer, distinctly laminate transversely. Wis., G. M. Smith. *Europe.*

3. R. FLAVESCENS G. S. West, 1899, p. 57, Pl. CCCXCV, figs. 10, 11. Cells broadly ellipsoid, 7.5-10.5 μ diam., color yellowish green; sheath not much wider than cells, more or less distinctly laminate. Wis., G. M. Smith; Twin Lake, Mich., Transeau. *Europe.*

4. R. IRREGULARE (Wille) Brunnthaler*; *Ulothrix* (*Hormospora*) *irregularis* Wille, 1880, p. 63, Pl. II, figs. 41-42. Cells ellipsoid, 12-15 μ wide, 4-6 μ long, dividing both laterally and longitudinally; sheath up to 30 μ wide, lamination more or less distinct; by the division of the cells the sheath may contain two or several series, or the sheath may divide into two or more series each, either reuniting to form a single sheath, or forming an ordinary branch. Cuttyhunk, Mass., Miss J. M. Furber; Carp Lake, Emmet Co., Mich., Transeau. *Europe.*

5. R. MONILIFORME Collins & Furber ms.† Cells subspherical, sheath moniliform, following the shape of the cells. Cuttyhunk, Mass., Miss J. M. Furber.

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* So quoted by Heering in Pascher, 1914, p. 40, but without reference.

† Unpublished species; this note not a publication.

P. 219, for No. 1 of Key to the Species of Prasiola, substitute,

1. Marine.		1a.
1. Fresh water or terrestrial.		2.
1a. Frond 33-45 μ thick, with or without stipe.	4.	*P. borealis.*
1a. Frond 10-15 μ thick, with long distinct stipe.	6.	*P. stipitata.*

P. 221, after account of P. CRISPA, add,

6. P. STIPITATA Suhr in Jessen, 1848, p. 16, Pl. III, figs. 11-16; I. F. Lewis, 1916, p. 90, figs. 1-2. Fronds tufted, several from the same base, stipe long, slender, at extreme base of only a single series of cells, widening and increasing in number of cells, finally expanding into a cordate-cuneate frond, up to 5 mm. long. Cells of frond, before dividing, 6-10 μ square, in quite regular and distinct square areas; cells in stipe larger and more distant, in regular longitudinal and transverse series, but not forming areas. In dense masses on rocks at high tide. Woods Hole, Mass., I. F. Lewis. *Europe.*

Page 221, after the generic description of GAYELLA, insert,

KEY TO THE SPECIES OF GAYELLA.

1. Fronds with deep regular constrictions and no rhizoids. 2. *G. constricta.*
1. Fronds cylindrical or somewhat irregular, with abundant rhizoids. 1. *G. polyrhiza.*

In description of G. POLYRHIZA, change "parietal" to read "stellate" chromatophores.

Page 222, after account of G. POLYRHIZA, add,

2. G. CONSTRICTA Setchell & Gardner in Gardner, 1917, p. 384, Pl. XXXII, fig. 5; XXXIII, figs. 5-9. Frond similar to that of *G. polyrhiza*, but curved and uncinate, and with frequent deep constrictions at fairly regular intervals, each constriction caused by the failure of a certain group of primary cells, usually 2-6 in a group, to divide vertically. A few very slight rhizoidal projections at the extreme base, no other rhizoids; primary filament about 20 μ diam., upper part of frond up to 150 μ, intervals between constrictions 200 μ to 1 mm. Cal., N. L. Gardner.

This new species, quite distinct from *G. polyrhiza*, certainly supports the validity of the genus. *Prasiola borealis* grows in the neighborhood, but no intermediate forms have been found. It seems to be a case where the conditions that favor *Prasiola* favor also the nearly related *Gayella*.

Page 225 and p. 83 of supplement, for Key to the Species of Oedogonium,* substitute,

1. Macrandrous.	2.
1. Nannandrous.	59.
2. Oogonium opening by a pore.	3.
2. Oogonium opening by a lid.	40.
3. Spore globose.	4.
3. Spore ellipsoid.	21.
4. Pore median.	5.
4. Pore supramedian.	8.
4. Pore superior.	13.
5. Membrane of oospore smooth.	6.
5. Membrane of oospore pitted.	92.
5. Membrane of oospore spinous.	4. *Oe. suecicum*.†
6. Monoecious.	94.
6. Dioecious.	7.
7. Oogonia 22-25 μ diam.	2. *Oe. rufescens*.
7. Oogonia 30-38 μ diam.	2. *Oe. sociale*.
8. Pore slightly above the middle.	9.
8. Pore almost superior.	11.
9. Monoecious.	10.
9. Dioecious.	7. *Oe. cardiacum*.
10. Oogonium subglobose or subdepressed-globose.	5. *Oe. obsoletum*.
10. Oogonium subglobose or subellipsoid globose.	6. *Oe. plusiosporum*.
11. Monoecious.	12.
11. Dioecious.	8. *Oe. franklinianum*.
12. Oospore 31-41 μ diam.; suffultory cell not swollen.	9. *Oe. varians*.
12. Oospore 40-48 μ diam.; suffultory cell swollen.	76. *Oe. tyrolicum*.
13. Oogonium manifestly swollen.	14.
13. Oogonium little if any swollen.	19.
14. Membrane of oospore smooth.	15.
14. Membrane of oospore pitted.	93.
15. Monoecious.	16.
15. Dioecious.	12. *Oe. plagiostomum*.
16. Vegetative cells less than 18 μ diam.	17.
16. Vegetative cells 20-30 μ diam.	11. *Oe. Vaucherii*.

* 89. Oe. Reinschii, fructification unknown, is not included in this key; The hexagonal-appearing cells are characteristic.

† Descriptions of species with serial numbers from 1-74 will be found on p. 229 and following pages of Collins, 1909; species with letters a or b after their serial number are described on p. 84 and following pages of Collins, 1912: species from 75 up are described on the pages immediately following this key.

17. Oogonium 40 μ diam. or less. 18.
17. Oogonium 42-50 μ diam. 10. *Oe. fragile.*
 18. Vegetative cells 10-14 μ diam. 10a. *Oe. globosum.*
 18. Vegetative cells 15-18 μ diam. 75. *Oe. intermedium.*
19. Monoecious. 14. *Oe. geniculatum.*
19. Dioecious. 20.
 20. Oogonium one-third to one-half wider than vegetative cells. 15. *Oe. capilliforme.*
 20. Oogonium scarcely wider than vegetative cells. 16. *Oe. capillare.*
21. Oogonium swollen to twice the diam. of filament or more. 22.
21. Oogonium less swollen; average less than double the filament. 33.
 22. Membrane of oospore smooth. 23.
 22. Membrane of oospore ribbed or pitted. 27.
23. Monoecious. 25.
23. Dioecious. 24.
 24. Vegetative cells 25-30 μ diam. 7. *Oe. cardiacum* var. *carbonicum.*
 24. Vegetative cells 35-45 μ diam. 19. *Oe. rivulare.*
25. Division of antheridial cell vertical. 17. *Oe. upsaliense.*
25. Division of antheridial cell horizontal. 26.
 26. Oogonium largest near base, oospore filling lower part. 21a. *Oe. pseudoboscii.*
 26. Oogonium ellipsoid, quite filled by oospore. 18. *Oe. Richterianum.*
27. Membrane of oospore ribbed. 28.
27. Membrane of oospore areolate or pitted. 31.
 28. Ribs continuous and entire. 29.
 28. Ribs not continuous and entire. 30.
29. Monoecious. 20. *Oe. paludosum.*
29. Dioecious. 21. *Oe. Boscii.*
 30. Ribs composed of elongate dots. 22. *Oe. margaritiferum.*
 30. Ribs distinctly dentate. 23. *Oe. crenulato-costatum.*
31. Membrane of oospore areolate. 23. *Oe. crenulato-costatum.* var. *aureum.*
31. Membrane of oospore pitted. 32.
 32. Oogonium 38-48 μ diam. 25. *Oe. punctatum.*
 32. Oogonium 70-83 μ diam. 24. *Oe. taphrosporum.*
33. Membrane of oospore smooth. 34.
33. Membrane of oospore pitted. 70. *Oe. giganteum.*
 34. Monoecious. 26. *Oe. martinicense.*
 34. Dioecious. 35.
35. Oogonium usually 65-75 μ diam., rarely to 63 μ. 36.
35. Oogonium 65 μ diam. or less. 37.
 36. Vegetative cells 31-40 μ diam. 27. *Oe. Landsboroughii.*
 36. Vegetative cells 40-49 μ diam. 88. *Oe. crassum.*
37. Vegetative cells 3-9 diam. long. 38.
37. Vegetative cells 1.75-3 diam. long. 31. *Oe. mexicanum.*

38.	Oogonium oboviform.	28. *Oe. oboviforme.*
38.	Oogonium suboboviform to oboviform-ellipsoid.	39.
39.	Male plants stouter than female.	29. *Oe. pachyandrium.*
39.	Male plants more slender than female.	30. *Oe. grande.*
40.	Oospore globose.	41.
40.	Oospore ellipsoid.	53.
41.	Division of oogonium median or submedian.	42.
41.	Division of oogonium superior.	47.
42.	Cells with spiral markings.	32. *Oe. punctato-striatum.*
42.	Cells without spiral markings.	43.
43.	Oogonium with a whorl of projections.	44.
43.	Oogonium without whorl of projections.	45.
44.	Projections mammiform.	38a. *Oe. mammiferum.*
44.	Projections blunt-conical.	38b. *Oe. Itzigsohnii.*
45.	Monoecious.	77. *Oe. acmandrium.*
45.	Dioecious.	46.
46.	Oospore 20-24 μ diam.	78. *Oe. consociatum.*
46.	Oospore 25-29 μ diam.	33. *Oe. Howardii.*
46.	Oospore 32-38 μ diam.	79. *Oe. pratense.*
47.	Monoecious.	48.
47.	Dioecious.	38. *Oe. Pringsheimii.*
48.	Vegetative cells with 3 nodulose swellings.	41. *Oe. nodulosum.*
48.	Vegetative cells cylindrical.	49.
49.	Oogonium pyriform or subpyriform.	50.
49.	Oogonium oboviform-globose to subglobose.	51.
50.	Oogonium 26-30 μ diam.	34. *Oe. Pithophorae.*
50.	Oogonium 40-45 μ diam.	71. *Oe. pyriforme.*
51.	Oogonium distinctly swollen.	52.
51.	Oogonium little swollen.	37. *Oe. autumnale.*
52.	Vegetative cells 15 μ diam. or less.	35. *Oe. crispum.*
52.	Vegetative cells 16 μ diam. or more.	36. *Oe. obesum.*
53.	Membrane of oospore smooth.	54.
53.	Membrane of oospore ribbed.	55.
54.	Oogonium oblong-ellipsoid or biconic.	56.
54.	Oogonium pyriform.	72. *Oe. sanctae-thomae.*
55.	Ribs 30-35.	42. *Oe. nobile.*
55.	Ribs 15-19.	80. *Oe. pauco-costatum.*
56.	Vegetative cells 3-7 μ diam.	57.
56.	Vegetative cells 10-18 μ diam.	39. *Oe. Ahlstrandii.*
57.	Oogonium biconic to subglobose.	70a. *Oe. pusillum.*
57.	Oogonium elongate-ellipsoid.	58.
58.	Oogonium 14-19 μ diam.	40. *Oe. gracillimum.*
58.	Oogonium 23-28 μ diam.	81. *Oe. oblongum.*
59.	Dwarf males pluricellular.	60.
59.	Dwarf males unicellular.	87.

60. Antheridium exterior.	61.
60. Antheridium interior.	84.
61. Oogonium opening by a pore.	62.
61. Oogonium opening by a lid.	77.
62. Oospore globose.	63.
62. Oospore ellipsoid.	73.
63. Pore median or slightly above.	64.
63. Pore superior.	68.
63. Pore inferior.	52. *Oe. Huntii.*
64. Membrane of oospore smooth.	65.
64. Membrane of oospore spinous or ribbed.	66.
65. Oogonium 30-37 μ diam,	43. *Oe. Braunii.*
65. Oogonium 49-53 μ diam.	44. *Oe. flavescens.*
66. Membrane of oospore ribbed.	82. *Oe. illinoisense.*
66. Membrane of oospore spinous.	67.
67. Oogonium subdepressed-globose.	45. *Oe. pungens.*
67. Oogonium subglobose to ellipsoid.	46. *Oe. echinospermum.*
68. Membrane of oospore smooth.	69.
68. Membrane of oospore spinous.	70.
69. Oogonium solitary.	47. *Oe. irregulare.*
69. Oogonia usually seriate.	59. *Oe. multisporum.*
70. Spines without order.	71.
70. Spines arranged spirally.	72.
71. Spines scanty; oogonium subglobose.	48. *Oe. armigerum.*
71. Spines dense; oogonium depressed-globose.	49. *Oe. echinatum.*
72. Oogonium 51-64 μ diam.; veg. cells 15-35 μ diam.	50. *Oe. stellatum.*
72. Oogonium 63-78 μ diam.; veg. cells 42-59 μ diam.	51. *Oe. Donnellii.*
73. Pore median or slightly higher.	74.
73. Pore superior.	75.
74. Membrane of oospore smooth.	53. *Oe. sexangulare.*
74. Membrane of oospore spinous.	54. *Oe. Hystrix.*
75. Membrane of oospore smooth.	76.
75. Membrane of oospore ribbed.	57. *Oe. Wolleanum.*
75. Membrane of oospore pitted.	58. *Oe. concatenatum.*
76. Suffultory cell not swollen.	55. *Oe. crassiusculum.*
76. Suffultory cell swollen.	56. *Oe. Borisianum.*
77. Oospore globose.	78.
77. Oospore ellipsoid.	82.
78. Division median.	83. *Oe. macrosporum.*
78. Division superior.	79.
79. Suffultory cell distinctly swollen.	59a. *Oe. monile.*
79. Suffultory cell not swollen.	80.
80. Terminal cell apiculate or setaceous.	84. *Oe. praticolum.*
80. Terminal cell obtuse.	81.

81. Oogonium 36-45 μ diam., usually seriate. 60. *Oe. macrandrium.*
81. Oogonium 29-36 μ diam., single or 2. 85. *Oe. propinquum.*
82. Division superior; oogonium 14-23 μ diam. 95.
82. Division apical; oogonium over 30 μ diam. 83.
83. Oogonium 33-56 μ diam. 62. *Oe. acrosporum.*
83. Oogonium 66-82 μ diam. 86. *Oe. tentoriale.*
84. Oogonium opening by a pore. 85.
84. Oogonium opening by a lid. 64. *Oe. undulatum.*
85. Membrane of oospore smooth. 86.
85. Membrane of oospore ribbed. 63. *Oe. cyathigerum.*
86. Oogonium 28 μ diam. 87. *Oe. depressum.*
86. Oogonium 55-60 μ diam. 73. *Oe. cataractum.*
87. Oospore globose. 88.
87. Oospore ellipsoid. 69. *Oe. pluviale.*
88. Division of oogonium median. 89.
88. Division of oogonium inferior. 68. *Oe. platygynum.*
89. Oospore nearly or quite filling oogonium. 90.
89. Oospore not nearly filling oogonium 67. *Oe. Areschougii.*
90. Oogonium 20-27 μ diam. 65. *Oe. Rothii.*
90. Oogonium 30-38 μ diam. 91.
91. Oospore depressed-globose. 66. *Oe. decipiens.*
91. Oospore globose. 74. *Oe. londinense.*
92. Dioecious, oogonium 24-27 μ diam. 3. *Oe. Magnusii.*
92. Monoecious, oogonium 30-40 μ diam. 90. *Oe. cymatosporum.*
93. Monoecious, vegetative cells 14-23 μ diam. 13. *Oe. foveolatum.*
93. Dioecious, vegetative cells, female, 24-48 μ diam. 91. *Oe. americanum.*
94. Oogonium 23-28 μ diam. 1. *Oe. cryptoporum.*
94. Ooogonium 32-38 μ diam. 92. *Oe. laeve.*
95. Oogonium ovoid, larger below. 61. *Oe. longatum.*
95. Oogonium obovoid, larger above. 93. *Oe. rugulosum.*

Page 229, after description of OE. RUFESCENS, insert,

Var. EXIGUUM Hirn, 1900, p. 76, Pl. I, fig. 5. Vegetative cells more slender, oogonium single or 2, oospore subdepressed-globose, antheridium 3-celled. Ill., Transeau. *Europe.*

veg. cell,	5-9 μ diam.,	4-10 diam. long.
oog.,	22-24 μ "	20-28 μ long.
oos.,	20-22 μ "	17-23 μ "
anth. cell,	5 μ "	10-12 μ "

Page 233, before OE. PLAGIOSTOMUM var. GRACILIUS, insert,

OE. PLAGIOSTOMUM Wittrock ex Hirn, 1900, p. 100, Pl. VI, fig. 39.

veg. cell, female,	23-27 μ diam.,	3-4.5 diam. long.
veg. cell, male,	23-25 μ "	2-3 " "
oog.,	43-49 μ "	46-57 μ long.
oos.,	41-47 μ "	42-49 μ "
anth. cell,	22-24 μ "	5-7 μ "

Eastham, Mass., F. S. Collins. *Europe.*

The male plants of the typical form of *Oe. plagiostomum* were observed for the first time in this material, and the dimensions are taken therefrom. The other dimensions are copied from Hirn; the Eastham material showed slightly larger.

Page 237, after description of OE. PALUDOSUM var. AMERICANUM, insert,

Var. PARVISPORUM Hirn, 1900, p. 120, Pl. XIII, fig. 70. Oospore smaller, not filling the oogonium, oogonium subellipsoid or suboblong-ellipsoid, antheridium subepigynous, subhypogynous or scattered.

veg. cell,	15-20 μ diam.,	3-6 diam. long.
oog.,	38-44 μ "	70-86 μ long.
oos.,	35-41 μ "	54-60 μ "
anth. cell,	15-17 μ "	7-12 μ "

Ill., Transeau. *Europe.*

Page 239, after description of OE. CRENULATUM forma CYLINDRICUM, insert,

Var. LONGIARTICULATUM Hansgirg ex Hirn, 1900, p. 130, Pl. XV, fig. 86. Vegetative cells more slender, oogonia suboblong-oboviform, single, oospore oboviform or nearly ellipsoid, not quite filling the oogonium, lines on the membrane distinctly crenate.

veg. cell,	12-15 μ diam.,	5-6 diam, long.
oog.,	27-30 μ "	57-60 μ long.
oos.,	24-47 μ "	45-48 μ "

Eastham, Mass., F. S. Collins. *Europe.*

Page 243, after note on OE. GRANDE var. AEQUATORIALE f. HORTENSE, add,

Forma ROBUSTUM Hirn, 1900, p. 144.

veg. cell, female,	34-45 μ diam.,	2.5-6 diam. long.
veg. cell, male,	33-42 μ "	2.5-6 " "
oog.,	54-66 μ "	78-90 μ long.
anth. cell,	30-36 μ "	9-15 μ "

Middlesex Fells, Mass., A. B. Seymour; Ill., Transeau.

According to Transeau this form is distinct and well marked in Illinois, and seems to deserve varietal rank.

Page 245, after OE. CRISPUM, add,

Forma INFLATUM Hirn, 1900, p. 161, Pl. XXV, fig. 140; Transeau, 1917, p. 231. A slender form, with larger oogonia and oospores.

veg. cell,	12-16 μ diam.,	3-6 diam. long.
oog.,	40-50 μ "	48-53 μ "
oos.,	37-45 μ "	38-45 μ "
anth. cell,	8-12 μ "	9-12 μ "

Mich., Transeau. *Europe.*

Page 260, after the description of OE. CYATHIGERUM, add,

The typical form has been found in Ohio, Transeau.

Var. ELLIPTICUM Magnus & Wille ex Hirn, 1900, p. 255, Pl. XLIV, fig. 271.

Vegetative cells shorter, oogonium and oospore smaller; oospore often not quite filling the oogonium, of varying form, quadrangular-ellipsoid or nearly ellipsoid, rarely subglobose; oogonium single or 2; dwarf males on suffultory cell, more rarely on oogonium.

veg. cell,	19-30 μ diam.,	1.5-4 diam. long.
suff. cell,	26-43 μ "	1.5-3 " "
oog.,	50-63 μ "	68-94 μ "
oos.,	48-57 μ "	48-65 μ "
nan. cell,	15-18 u "	43-55 μ "

Ohio, Transeau. *South America.*

Page 262, after OE. UNDULATUM forma SENEGALENSE add,

Var. AMERICANUM Transeau, 1917, p. 232. Vegetative cells as in the typical form, oogonia and oospores larger.

oog.,	58-68 μ diam.,	60-80 μ long.
oos.,	48-60 μ "	48-56 μ "

Trout Lake, Mich., Transeau.

Forma SENEGALENSE, the only certainly American form before recorded, is about as much smaller than the typical form in these dimensions as var. AMERICANUM is larger, but differs in other respects.

Page 266, after description of OE. LONDINENSE, add,

75. OE. INTERMEDIUM Wittrock ex Hirn, 1900, p. 94, Pl. V,

fig. 31. Monoecious, oogonium single, oboviform to oboviform-globose, pore superior; oospore globose or oboviform-globose (more rarely globose-oboviform) quite or nearly filling the oogonium; membrane smooth, usually thick; antheridium 1-4-celled, subepigynous or hypogynous, or rarely scattered; spermatozoids binate, division horizontal.

veg. cell,	15-18 μ diam.,	3-4.5 diam. long.
oog.,	31-37 μ "	34-45 μ long.
oos.,	30-36 μ "	33-41 μ "
anth. cell,	14-16 μ "	5-10 μ "

Charleston, Ill.; Utica, Ohio, Transeau. *Europe.*

Stouter than *Oe. fragile*, more slender than *Oe. Vaucherii*, in both of which species the oospores are more definitely globose than in *Oe. intermedium*.

76. OE. TYROLICUM Wittrock ex Hirn, 1900, p. 91, Pl. IV, fig. 25. Monoecious; oogonium single, seldom 2, ellipsoid-globose or sometimes obovoid, pore supramedian or nearly superior; oospore globose, rarely globose-ellipsoid, not quite filling the oogonium; membrane smooth; antheridium 1-4-celled, subepigynous or subhypogynous; spermatozoids binate, division horizontal.

veg. fil.,	15-24 μ diam.,	3-5 diam. long,
oog.,	45-53 μ "	57-70 μ long.
oos.,	40-48 μ "	40-48 μ "
anth. cell,	12-21 μ "	9-11 μ "

Middlesex Fells, Mass., F. D. Lambert. *Halle in Tyrol.*

77. OE. ACMANDRIUM Elfving ex Hirn, 1900, p. 150, Pl. XXIII, fig. 120. Monoecious, oogonium single, rarely 2, depressed-globose or subglobose, operculate, division median, narrow; oospore depressed-globose (or subglobose) filling or nearly filling the oogonium, membrane smooth; antheridium 1-3-celled, subepigynous, epigynous or hypogynous, often terminal; (?) spermatozoids single; basal cell usually elongate.

veg. cell,	7-10 μ diam.,	3.5-7 diam. long.
oog.,	30-35 μ "	28-38 μ long.
oos.,	28-33 μ "	25-29 μ "
anth. cell,	8-10 μ "	10-15 μ "

Ill., Transeau. *Northern Europe.*

78. OE. CONSOCIATUM Collins & Hervey, 1917, p. 36, Pl. I. figs. 1-4; P. B.-A., No. 2068. Dioecious ?, macrandrous; oogonium single, globose or depressed-globose, operculate,

division median or slightly superior, narrow; oospore globose or depressed-globose, filling the oogonium; membrane smooth; vegetative cells more or less distinctly clavate; basal cell depressed-globose; filaments often united in dense stellate clusters.

veg. cell,	6-12 μ (-20 μ) diam.,	1-4 diam. long.
oog.,	28 μ diam.,	26-28 μ long.
oos.,	26 μ "	24-26 μ "

Bermuda, A. B. Hervey.

79. OE. PRATENSE Transeau, 1914, p. 297, Pl. XXIX, figs. 9-12. Dioecious, macrandrous, oogonium single, very rarely 2, subdepressed-globose or broadly pyriform-globose, operculate, division median, narrow but distinct; oospore depressed-globose or subglobose, filling or nearly filling the oogonium, membrane smooth; male filaments more slender than female; antheridia 1-2-celled, usually alternating with vegetative cells; spermatozoid single; basal cell of filament commonly elongate.

veg. cell, female,	10-17 μ diam.,	3.5-5.5 diam. long.
veg. cell, male,	8-15 μ "	4-5.5 " "
oog.,	33-40 μ "	33-50 μ long.
oos.,	32-38 μ "	28-35 μ "
anth. cell,	10-14 μ "	13-18 μ "

Charleston, Ill., Transeau.

Somewhat resembling *Oe. acmandrium* Elfv. and *Oe. psaegmatosporum* Nordst., but both these are monoecious, and of smaller dimensions.

80. OE. PAUCO-COSTATUM Transeau, 1914, p. 300, Pl. XXVIII, fig. 5. Dioecious, macrandrous; oogonium single, ellipsoid, operculate, division superior; oospore ellipsoid, nearly filling the oogonium; outer membrane smooth, median longitudinally ribbed, ribs 15-19, inner membrane smooth; antheridium 2-8-celled; spermatozoids binate, division horizontal; terminal cell obtuse, basal cell usually elongate.

veg. cell, female,	(15-) 20-27 μ diam.,	3.5-5.5 diam. long.
veg. cell, male,	(15-) 19-25 μ "	3.2-5.5 " "
oog.,	54-60 μ "	70-104 μ long.
oos.,	50-56 μ "	66-90 μ "
anth. cell,	18-23 μ "	8-12 μ "

Casey, Ill,, Transeau.

Resembling *Oe. australicum* Hirn, but larger, spores more distinctly ellipsoid, and with fewer ribs.

81. OE. OBLONGUM Wittrock ex Hirn, 1900, p. 185, Pl.

XXIX, fig. 181. Monoecious, oogonium single, oblong, operculate, division superior; oospore ellipsoid, filling the inflated median or lower part of the oogonium; membrane smooth; antheridium 1-3-celled, subepigynous, subhypogynous or scattered, spermatozoids binate, division horizontal.

veg. cell,	6-11 μ diam.,	3-8 diam. long.
oog.,	23-26 μ "	41-50 μ long.
oos.,	21-23 μ "	30-33 μ "
anth. cell,	6-9 μ "	7-9 μ "

Charleston, Ill., Transeau. *Europe.*

In *Oe. gracillimum* the oogonium somewhat resembles that in this species, but the former is smaller in all parts.

82. OE. ILLINOISENSE Transeau, 1914, p. 299, Pl. XXIX, figs. 6-8. Dioecious, nannandrous, gynandrosporous; oogonia single, subglobose to oboviform-globose, pore median; oospore globose or subglobose, nearly filling the oogonium; epispore with 4-7 spiral ribs, uniting at poles, polar axis always transverse to axis of the filament; inner wall smooth; suffultory cell swollen; androsporangia 1-5-celled; basal cell elongate; dwarf males slightly curved, on suffultory cell; antheridium exterior, 1-4-celled.

veg. cell,	13-18 μ diam.,	6-8 diam. long.
suff. cell,	32-40 μ "	1.5-2 " "
oog.,	51-60 μ "	60-70 μ long.
oos.,	45-56 μ "	48-66 μ "
andr. cell,	13-17 μ "	17-22 μ "
nan. stipe,	14-17 μ "	37-57 μ "
anth. cell,	9-12 μ "	15-23 μ "

Lerna, Ill., Transeau.

83. OE. MACROSPORUM W. & G. S. West ex Hirn, 1900, p. 227, Pl. XXXVIII, fig. 232. Dioecious, nannandrous; oogonium single, subdepressed-globose, operculate, division median, very narrow; oospore subdepressed-globose, filling the oogonium, membrane smooth; dwarf males curved, on the suffultory cell; antheridium exterior, 1-?-celled.

veg. cell,	13-13.5 μ diam.,	4-5 diam. long.
oog.,	44-46 μ "	39-40 μ long.
nan.,	11-5 μ "	38 μ "

Utica, Ohio, Transeau. *England.*

The only nannandrous species with external antheridium and median division of the oogonium.

84. OE. PRATICOLUM Transeau, 1914, p. 298, Pl. XXIX, figs. 1-5. Dioecious, (?) nannandrous, idioandrosporous; oogonium single, more rarely 2-7, ellipsoid to globose-ellipsoid, often terminal, sometimes scattered, wall sometimes rather thick, operculate, division superior, near summit, lid very small, deciduous; oospore ellipsoid to globose-ellipsoid, quite filling the oogonium; membrane smooth; androsporangial filaments a little smaller than female filaments; androsporangium 1-20-celled; vegetative cells slightly capitellate, basal cell usually elongate; terminal cell apiculate or extended into a long hyaline seta.

veg. cell, female,	16-26 μ diam.,	4-5 diam. long.
veg. cell, andr.,	14-22 μ "	4-5 " "
oog.,	48-60 μ "	62-74 μ long.
oos.,	46-58 μ "	60-72 μ "
andr. cell,	20-24 μ "	18-22 μ "

Charleston, Ill., Transeau.

Related to *Oe. obtruncatum* Wittr., but somewhat larger, idioandrosporous, and with different form of terminal cell.

85. OE. PROPINQUUM Wittrock ex Hirn, 1900, p. 236, Pl. XL, fig. 243. Dioecious, nannandrous; oogonium single or 2, oboviform-globose, operculate, division superior; oospore globose, nearly filling the oogonium, membrane smooth; dwarf males near or on oogonium, stipe curved; antheridium exterior, 1-2-celled.

veg. cell,	10-13 μ diam.,	3-5 diam. long.
oog.,	29-36 μ "	35-45 μ long.
oos.,	24-31 μ "	24-31 μ "
nan. stipe,	11-13 μ "	20-23 μ "
anth. cell,	7-8 μ "	6-8 μ "

Charleston, Ill., Transeau. *Europe.*

Near *Oc. macrandrium*, Wittr., but the latter has larger dimensions, and the oogonia are more generally seriate.

86. OE. TENTORIALE Nordstedt & Hirn in Hirn, 1900, p. 248, Pl. XLII, fig. 260. Dioecious, nannandrous; oogonium single, terminal, short-ellipsoid or oboviform-globose, operculate, division superior, lid very small, deciduous; inner surface of membrane with longitudinal ribs, sometimes anastomosing; oospore completely filling oogonium, its membrane uniting with that of the oogonium; epispore longitudinally ribbed, with fine striations between the ribs, about 40-45 ribs at the middle of the oospore, ribs minutely crenulate; endospore smooth; suffultory

cell usually swollen; basal cell usually elongate, terminal obtuse; dwarf males nearly erect, on suffultory cell; antheridium exterior, 1-2-celled.

veg. cell,	20-33 μ diam.,	3-7 diam. long.
suff. cell,	25-37 μ "	3-5 " "
oog.,	66-82 μ "	73-88 μ long.
nan. stipe,	10-14 μ "	37-48 μ "
anth. cell,	9-12 μ "	7 μ "

Charleston, Ill., Transeau. *Brazil.*

In many of its characters like *Oe. acrosporum* De Bary, but larger throughout, with oogonia of more variable shape, usually thicker in proportion to the length.

87. OE. DEPRESSUM Pringsheim ex Hirn, 1900, p. 249, Pl. XLII, fig. 261. Dioecious, nannandrous, gynandrosporous; oogonium single, depressed-globose, pore median; oospore depressed-globose, not filling the oogonium; androsporangium 2-celled; dwarf males oblong-oboviform, on the oogonium; antheridium interior.

veg. cell,	8-9 μ diam.,	3-6 diam. long.
oog.,	28 μ "	26 μ long.
oos.,	23 μ "	17.5 μ "
nan. cell,	4-5 μ "	14-16 μ "

Greenland, P. Richter. *Germany.*

88. OE. CRASSUM Wittrock ex Hirn, 1900, p. 139, Pl. XVIII, fig. 99. Dioecious, macrandrous; oogonium single, rarely 2, oboviform-ellipsoid, pore superior; oospore ellipsoid or globose-ellipsoid, not filling the oogonium, membrane smooth; male plants somewhat more slender than female; antheridium up to 20-celled; spermatozoids binate, division vertical.

veg. cell,	40-49 μ diam.,	2-4 diam. long.
oog.,	68-75 μ "	93-125 μ long.
oos.,	63-69 μ "	75-110 μ "

Hanover, Ohio; New Buffalo, Mich., Transeau. *Europe.*

89. OE. REINSCHII Roy ex Hirn, 1900, p. 319, Pl. L, fig. 326. Cells generally hexagonal in vertical section (widest at the middle) occasionally subellipsoid or subcylindrical; basal cell not elongate, subhemispherical; terminal cell obtuse.

veg. cell,	6-9 μ (-11) diam.,	1.25-2.5 diam. long.
basal cell,	8-9 μ	5-6 μ long.

Fla., Borge. *Europe, South America.*

No organs of fructification have been observed in this species, though it is known from many stations.

90. OE. CYMATOSPORUM Wittrock & Nordstedt ex Hirn, 1900, p. 80, Pl. II, fig. 13. Monoecious; oogonia single, rarely two, subdepressed-globose, pore median or slightly higher; oospore depressed globose, filling or not quite filling the oogonium, with triple membrane, median pitted, others smooth; antheridia 1-4-celled, subepigynous, subhypogynous, hypogynous or scattered; spermatozoid single.

veg. cell,	8-10 μ diam.,	4-7 diam. long.
oog.,	(24-) 30-40 μ "	27-40 μ long.
oos.,	(22-) 27-35 μ "	(19-) 22-33 μ "
anth. cell,	7-10 μ "	9-11 μ "

With other species, Waverley, Mass., A. B. Seymour. *Europe.*

Nearly allied to *Oe. Magnusii*, but monoecious, with longer cells, larger and more flattened oogonium and larger oospore.

91. OE. AMERICANUM Transeau, 1917, p. 231. Dioecious, macrandrous, oogonia single, globose to depressed globose, pore superior; oospore globose, ellipsoid-or depressed-globose, partly or wholly filling the oogonium; membrane triple, the median scrobiculate; antheridia 1-5 celled, frequently alternating with vegetative cells; spermatozoids binate, division horizontal; basal cell elongate, terminal cell obtuse.

veg. cell, female,	28-48 μ diam.	1.5-3 diam. long.
veg. cell, male,	24-30 μ "	1.5-4 " "
oog.,	40-76 μ "	48-70 μ long.
oos.,	38-74 μ "	46-56 μ "
anth. cell,	20-28 μ "	4-12 μ "

Charleston, Ill.; New Buffalo, Mich., Transeau.

Nearest to *Oe. foveolatum* among our species, but dioecious and of larger dimensions throughout; the markings are on the median, not the outer wall.

92. OE. LAEVE Wittrock ex Hirn, 1900, p. 75; Transeau, 1917, p. 231. Monoecious, oogonia single, depressed-globose, pore median; oospore depressed-globose, filling the oogonium; antheridia 1-2-celled, subepigynous; spermatozoid single.

veg. cell,	10-12 μ diam.,	2-6 diam. long.
oog.,	32-38 μ "	28-30 μ long.
oos.,	30-35 μ "	23-26 μ "
anth. cell,	9-10 μ "	9-13 μ "

Saugetuck, Mich., Transeau. *France.*

93. OE. RUGULOSUM Nordstedt ex Hirn, 1900, p. 241, Pl. XL, fig. 249; Transeau, 1917, p. 231. Dioecious, nannandrous; oogonia single or 2, oboviform or oboviform-ellipsoid, very rarely oviform, operculate; division superior; oospore ellipsoid, nearly filling the oogonium, rarely globose-ellipsoid and then not filling the oogonium (membrane sometimes very finely crenulate) suffultory cell not swollen; dwarf males on oogonium or near it; antheridium exterior, 1 (-?)-celled, curved.

veg. cell,	4.5-8 μ diam.,	2.5-5 diam. long.
oog.,	16-20 μ "	22-29 μ long.
oos.,	15-18 μ "	19-23 μ "
anth. cell,	4-6 μ "	5-6 μ "
nan. cell,	5-7 μ "	11-14 μ "

New Buffalo, Mich., Transeau. *Europe.*

Page 275, after account of BULBOCHAETE minor, add,

OEDOCLADIUM Stahl ex Hirn, 1900, p. 374.

Terrestrial, branching, partly subterranean and subhyaline, partly above ground and green; vegetative cells cylindrical, growth chiefly by division of terminal cell of a filament or of a branch; oogonia arising by simple division of a vegetative cell.

O. **albemarlense** I. F. Lewis in litt. Monoicum, oogoniis singulis, plerumque terminalibus, subglobosis, apice conica, poro inferiore apertis, membrana levi, oosporis globosis, oogonium non complentibus, episporio levi, mesosporio scrobiculato (in sectione optica undulato) endosporio levi; antheridiis ad 9-cellularibus; cellulis vegetativis subcylindricis, cellula terminali apice conica.

Monoecious, oogonia single, mostly terminal, subglobose with conical apex, pore inferior, membrane smooth; oospore globose, not filling the oogonium; epispore smooth, mesospore scrobiculate (in optical section undulate) endospore smooth; antheridia to 9-celled; vegetative cells subcylindrical, terminal cell with conical apex. Fig. 22.

On sandy loam, bank of the Rivanna above the woolen mill near Charlottesville, Albemarle County, Virginia, Oct.-Dec., 1916, I. F. Lewis. Type deposited in the herbarium of the Cryptogamic Laboratory, Harvard Univeraity.

veg. cell, superterranean,	25-40 μ diam.,	50-150 μ long.
veg. cell, subterranean,	11 μ "	-350 μ "
oog.,	90 μ "	95 μ "
oos.,	69 μ "	69 μ "
anth. cell,	20-15 μ "	8-19 μ "

The only other known species, *O. protonema* Stahl ex Hirn, 1900, p. 374, Pl. LIV, fig. 396, was found on moist earth near Strasbourg in 1877, but does not appear to have been found elsewhere. *O. albemarlense* is larger throughout, the upper part of *O. protonema* being only about 7 μ diam., and is also distinguished by the scrobiculate mesospore and the inferior pore. Like *O. protonema* it is found in company with *Botrydium*, *Vaucheria*, *Riccia*, etc.

Page 279, for Key to the Species of Endoderma, substitute,

1. Endophytic, marine.	2.
1. Epiphytic, fresh water.	5.
2. In leaves of Zostera.	3. *E. perforans.*
2. In marine algae.	3.
3. Cells mostly irregular.	2. *E. viride.*
3. Cells mostly cylindrical.	4.
4. Cells 5-10 μ diam.	1. *E. Wittrockii.*
4. Cells 2-6 μ diam.	6. *E. filiforme.*
5. Cells subglobose to ellipsoid.	4. *E. Pithophorae.*
5. Cells much flattened.	5. *E. polymorphum.*

Page 280, after description of E. POLYMORPHUM, add,

6. E. FILIFORME Collins & Hervey, 1917, p. 39. Filaments branched laterally and dichotomously; cells cylindrical, 6 μ diam. below, tapering to 2 μ near apex; sporangia formed from any cell of the older part, depressed hemispherical, 6-12 μ diam.; bristles continuous with the cell, 4 μ diam. at base, tapering to 2 μ. In wall of *Lyngbya confervoides* Ag., Bermuda, Collins.

Page 281, change generic character of CHAETOSPHAERIDIUM in first three lines as follows: —

Cells globose, ovoid or hemispherical, with one or more disk-shaped chromatophores, each with one pyrenoid.

For Key to the Species of Chaetosphaeridium, substitute,

1. Utricles evanescent; general gelatinous coating conspicuous.	1. *C. globosum.*
1. Utricles well develeped; gelatinous coating inconspicuous.	2.
2. Cells globose, chromatophore single.	2. *C. Pringsheimii.*
2. Cells ovoid, chromatophores two.	3. *C. ovalis.*

After description of C. PRINGSHEIMII, add,

Forma CONFERTA Klebahn, 1893, p. 307, Pl. XIV, fig. 11. Cells closely compacted, often seeming to form a layer; utricles very short. Wis., G. M. Smith. *Europe.*

3. C. OVALE G. M. Smith, 1916, p. 471, Pl. XXIV, fig. 1. Thallus of 5-20 cells, epiphytic on filamentous Chlorophyceae; gelatinous sheath indistinct; cells ovoid, with 2 parietal chromatophores each containing a pyrenoid; sheath at base of setae conspicuous. Cells 20-22 × 13-15 μ; setae about 125 μ; basal sheath 3-5 μ. Wis., G. M. Smith.

Page 282, after description of ACROCHAETE PARASITICA, add,

CHAETONEMA Nowakowski, 1877, p. 75.

Frond filiform, branching, bearing long, inarticulate bristles with somewhat swollen bases; cell division intercalary and terminal; chromatophore disk-shape, parietal, with 1 or more pyrenoids. Asexual reproduction by zoospores formed 2 in a cell, with 4 cilia and contractile vacuole, without stigma.

Only one species.

C. IRREGULARE Nowakowski, 1877, p. 75; Huber, 1892, p. 302, Pl. XII; P. B.-A., No. 2137. Cells 9-15 μ diam., 2-4 diam. long; bristles 4-5 μ diam. at base. In gelatinous coating of *Batrachospermum*, *Tetraspora*, etc. Fig. 20. Mass. *Europe.*

PHAEOPHILA Hauck, 1876, p. 57.

Articulate filaments epi- or endophytic, each cell bearing 1-3 long, inarticulate hairs, continuous with the cell, and not dilated at the base. Reproduction by zoospores.

P. FLORIDEARUM Hauck, 1876, p. 57; 1885, p. 464, fig. 200. In various loose-tissued algae; cells of irregular form, 12-40 μ diam. Fig. 23. Bermuda. *Europe.*

Page 288, after the description of genus PRINGSHEIMIA, add,

KEY TO THE SPECIES OF PRINGSHEIMIA.

1. Median cells usually taller than their diam.; cells not showing distinct radial or zonate arrangement. 1. *P. scutata.*
1. All vegetative cells broader than high; radial and zonate arrangement of cells distinct. 2. *P. Udotae.*

After description of P. SCUTATA, add,

2. P. (?) UDOTAE Börgesen, 1913, p. 11, fig. 3. Vegetative cells mostly elongate towards the margin, 17-70 μ long, average 40 μ; 5-25 μ wide, average 16 μ; 10-12 μ thick; except in center of frond in distinct dichotomous radiating series, and often showing concentric arrangement; sporangia formed in central part of the disk, which elongates vertically; zoospores discharged through a neck-like papilla. On *Udotea Flabellum*, Virgin Islands, Börgesen, who places it in this genus with some doubt.

Page 290, after generic account of GONGROSIRA, add,

KEY TO THE SPECIES OF GONGROSIRA.

1. Cells 6-14 μ diam.; branches of basal layer often penetrating substratum. 1. *G. lacustris.*
1. Cells 15-30 μ diam.; no descending branches from basal layer. 2. *G. Debaryana.*

1. G. LACUSTRIS Brand, 1907, p. 502; Transeau, 1917, p. 230. Fronds small, nearly flat, later confluent, dull green; base of procumbent filaments 6-14 μ diam., usually about 11 μ, erect branches of about the same size, short, little branched; cells varying, some short and with rich contents, of irregular form, some longer, cylindrical and nearly empty. Reproduction by akinetes, and probably also by zoospores. Growing on decaying wood and on stones; in the former case the prostrate filaments may send down branches penetrating the substratum. Mich., Transeau.

Page 294, for Key to the species of Microthamnion, substitute,

1. Filaments 1-2.6 μ diam.; little branched. 3. *M. exiguum.*
1. Filaments 2.5-4 μ diam.; much branched, 2.
   2. Ramification dense; main stem and branches indistinguishable. 1. *M. Kuetzingianum.*
   2. Ramification open; main stem distinguishable. 2. *M. strictissimum.*

Page 295, after M. STRICTISSIMUM var. MACROCYSTIS, add,

M. EXIGUUM Reinsch, 1877, p. 245; Transeau, 1917, p. 230. Filaments 1.1-2.6 μ diam., sparingly branched, branches erect, with few or no ramuli, apices slightly clavate. Mich., Transeau. *Africa.*

Much smaller than our other species.

Page 297 and p. 90 of supplement, for Key to the Species of Stigeoclonium, substitute,

1. Erect filaments unbranched except at the extreme base. *S. subsimplex.*
1. Erect filaments more or less densely branched throughout. 2.
   2. Opposite branching predominant. 3.
   2. Alternate branching predominant. 9.
3. Main filaments 10 μ diam. or less. 6. *S. tenue.*
3. Main filaments 11-30 μ diam. 4.
   4. Lower cells much inflated. 5. *S. ventricosum.*
   4. Lower cells slightly or not inflated. 5.
5. Lower cells not over 2 diam. long. 6.
5. Lower cells 2-8 diam. long. 7.

6. Lower cells seldom as long as broad; ramuli tapering, thorn-like. 4. *S. subuligerum.*
6. Lower cells usually longer than broad; ramuli short-pointed. 1. *S. lubricum.*
7. Lower cells 2-5 diam. long. 1. *S. lubricum* var. *varium.*
7. Lower cells 3-8 diam. long. 8.
8. Ramuli pointed. 2. *S. amoenum.*
8. Ramuli setiform. 3. *S. flagelliferum.*
9. Filaments short, tufted. 10.
9. Filaments more elongate. 14.
10. Of thermal waters. 7. *S. thermale.*
10. Of ordinary temperatures. 11.
11. Tips obtuse or short-pointed. 8. *S. nanum.*
11. Tips attenuate or setiferous. 12.
12. Ramuli scattered. 13.
12. Ramuli densely fasciculate. 10. *S. glomeratum.*
13. Main filaments 7-9 μ diam. 9. *S. aestivale.*
13. Main filaments 4-6 μ diam. 14. *S. minus.*
14. Floating. 12. *S. stagnatile.*
14. Attached. 15.
15. Main filaments 10 μ diam. or less. 16.
15. Main filaments 10 μ diam. or more. 17.
16. Cells of main filaments 6-10 μ diam., usually 4-6 diam. long, sometimes 12 diam. *S. longearticulatum.*
16. Cells of main filaments 5-7 μ diam., 2-5 diam. long. *S. attenuatum.*
17. Filaments 10-12 μ diam., cells except in the main axis seldom over 1 diam. long. 2. *S. amoenum* forma *biforme.*
17. Filaments 12-18 μ diam. 18.
18. Main filaments with cells 1-2 diam. long, moniliform. *S. autumnale.*
18. Main filaments with cells 3-10 diam. long, cylindrical. 13. *S. subsecundum.*

Page 302, after description of S. MINUS, add,

S. LONGEARTICULATUM (Hansg.) Heering in Pascher, 1914, p. 71, fig. 95; *S. falklandicum* var. *longearticulatum* Hansgirg, 1886, p. 65, fig. 27; *S. falklandicum* Wittr. & Nordst., Alg. Exsicc., No. 110. Main filaments 6-10 μ diam., cells 4-6, occasionally 12 diam. long, cylindrical; branching sparingly below, freely above; branches somewhat narrower and with relatively shorter cells; chromatophore a narrow band at the middle of cell. Utica, Ohio, Transeau. *Europe.*

Page 305. Add, Lemmermann in Pascher, 1915, p. 47, transfers CHLOROSPHAERA LACUSTRIS Snow and C. PARVULA Snow to the following genus of Tetrasporales.

CHLOROSARCINA Gerneck, 1907, p. 221.

Cells solitary or united in colonies, with or without gelatinous coating; chromatophore parietal, with or without pyrenoid; product starch and oil; asexual reproduction by division in 2-3 directions and by biciliate zoospores.

KEY TO THE SPECIES OF CHLOROSARCINA.

1. Cells without gelatinous coating.	1. *C. lacustris.*
1. Cells with gelatinous coating.	2. *C. parvula.*

1. C. LACUSTRIS (Snow) Lemmermann in Pascher, 1915, p. 48; *Chlorosphaera lacustris* Snow, 1903, p, 386, Pl. IV, fig. 14. Cells spherical, ovoid or somewhat angular, 9-10.5 μ diam., forming dense, at first flat, later spherical free colonies without gelatinous coating; pyrenoid present; zoospores 4 in a cell, narrowly ovoid, 6.5-9 $\times$ 2.6-4 μ, with stigma. Fig. 24. Lake Erie, Snow.

2. C. PARVULA (Snow) Lemmermann in Pascher, 1915, p. 48; *Chlorosphaera parvula* Snow, 1903, p. 386, Pl. IV, fig. 15. Cells spherical or ovoid, 7.8-9 μ diam., wall thin; 4-8 united into a flat, free gelatinous family; pyrenoid present; zoospores 4-8 in a cell, broadly ovoid or spherical, 5-6 μ diam., with stigma. Lake Erie, Snow.

The value of this genus, and the inclusion in it of these two species, are very uncertain matters. The paper by Gerneck, in which the genus is proposed, though undoubtedly representing careful study, from a systematic point of view holds the record for being everything that such a paper should not be. Lemmermann transferred to the genus these two American species without having seen them, alive or dead.

Page 309, after the description of GLOEOCYSTIS SCOPULORUM, add,

GLOEOCYSTOPSIS G. M. Smith, 1916, p. 474.

Cells elongate-cylindrical, more or less curved, with rounded ends, aggregated by 4 or 8 within a non-lamellated, sharply defined, spherical, gelatinous sheath. Colonies of an indefinite number of these aggregates arranged in a spherical or ovoid mass; chromatophore parietal, with one pyrenoid, later becoming diffuse; reproduction, aside from cell division, unknown. Only species.

G. LIMNETICUS G. M. Smith, 1916, p. 475, Pl. XXIV, fig. 12. Cells 10-15 $\times$ 4-6 μ, aggregates 25-30 μ diam.; colonies up to 125 μ diam. Fig. 25. Wis., G. M. Smith; Mass., F. D. Lambert.

COCCOMYXA Schmidle, 1901, p. 20.

Cells enclosed in a general gelatinous mass, homogeneous or sometimes showing slight stratification around the cells. Cells usually elongate, with lateral, parietal chromatophore without pyrenoid; asexual reproduction by autospores, 4 in a cell. Only one American species recorded.

C. DISPAR Schmidle, 1901, p. 23, Pl. I, figs. 6-25. Gelatinous mass attached, not floating, usually small but sometimes up to several cm. diam. Cells ellipsoid, more or less unsymmetrical, 4-8 μ diam., 2-2.5 diam. long. In moist places, on wood, moss, etc. Fig. 26. Chocorua, N. H., W. G. Farlow. *Europe.*

Common mode of reproduction by an oblique wall, but this may be merely incomplete autospore formation.

Page 311, for Key to the Species of Herposteiron, substitute,

1. Cells usually subglobose, 5-15 μ diam. 2.
1. Cells usually elongate, 4-6 μ diam. 2. *H. vermiculoides.*
  2. Cells 5-10 μ diam., each usually with one seta. 1. *H. confervicola.*
  2. Cells 9-12 μ diam., each usually with several setae. 3. *H. polychaete.*

Page 312, after description of H. VERMICULOIDES, add,

3. H. POLYCHAETE Hansgirg, 1888b, p. 214, Pl. XIV, figs. 1-5. Cells subspherical, 9-12 μ diam., each bearing 2-6 setae with sharply bulbous base, and tapering gradually to a very fine point. Wis., G. M. Smith. *Europe.*

Page 315, after paragraph on COLEOCHAETE, add,

C. DECORANS Richter, 1897, p. 9. fig. 4, and C. IKERASACENSIS Richter, 1897, p. 10, fig. 5, are described as growing on *Oedogonium* from Greenland. No reproduction of any kind is known, and habit characters are not such as to make certain that they belong to this genus.

Page 323, for Key to the Species of Chaetomorpha, substitute,

1. Filaments 400 μ diam. or more. 2.
1. Filaments less than 400 μ diam. 6.
  2. Filaments increasing noticeably in diam. from the base up. 1. *C. clavata.*
  2. Filaments of nearly uniform diam., except at the extreme base. 3.
3. Basal cell several times longer than any other cell. 3. *C. media.*
3. Basal cell not markedly longer than the others. 4.
  4. Filaments more or less moniliform, usually closely curled. 1A. *C. torta.*
  4. Filaments not distinctly moniliform nor regularly curled. 5.

5. Boreal plant, dark and stiff.	2. *C. melagonium.*
5. More southern plant; not dark nor stiff.	9. *C. crassa.*
6. Filaments 40 μ diam. or more.	7.
6. Filaments not over 40 μ diam.	10.
7. Filaments not over 70 μ diam.	10. *C. gracilis.*
7. Filaments 80 μ diam. or more.	8.
8. Cells 3-8 diam. long.	6. *C. cannabina.*
8. Cells not over 2 diam. long.	9.
9. Filaments 200-250 μ diam., rarely to 125 or 400 μ; yellowish green.	4. *C. Linum.*
9. Filaments 125-175 μ diam., dark green; southern plant.	5. *C. brachygona.*
10. Fresh water; filaments attached by pluricellular rhizoids.	8. *C. chelonum.*
10. Marine; attached by a disk.	11.
11. Saxicolous; 20-40 μ diam.	7. *C. californica.*
11. Epiphytic; 10-20 μ diam.	11. *C. minima.*

Page 323, for C. CLAVATA, substitute,

1. C. CLAVATA (Ag.) Kützing, 1847, p. 166; Vickers, 1908, p. 17, Pl. VII; not P. B.-A., No. 371; *Conferva clavata* Agardh, 1824, p. 99. Filaments attached, erect, stiff, up to 60 cm. long, base about 500 μ diam., gradually increasing to 1.5 mm. at the tip; lower articulations 3-4 diam. long, those of the upper part about as long as broad, more or less moniliform, color deep green. Fla., W. I.

1A. C. TORTA (Farlow) Yendo, 1914, p. 264, excl. syn.; *C. clavata* var. *torta* Farlow in Collins, 1909, p. 323; Alg. Am.-Bor. Exsicc., No. 211; P. B.-A., No. 571; *C. clavata* P. B.-A., No. 371. Found only unattached; filaments of nearly uniform diameter throughout, little or not at all moniliform, 400-600 μ diam., cells 1-2 diam. long, filaments usually coiled in a spiral, often very close. Cal. *Japan.*

Yendo is probably right in separating this from *C. clavata*, but hardly in including under it *C. spiralis* Okamura, distributed in Okamura, Alg. Jap. Exsicc., No. 94, 1903, with description, and figured in Icones Jap. Algae, Vol. II, Pl. XCV, which seems quite distinct. Certainly nothing like it has been recorded in California. Yendo has *C. torta* (Farlow) McClatchie, and the binominal occurs in McClatchie, 1897, p. 351, but without citation or description. Though distributed as *C. clavata* var. *torta* in 1889, no description was published till 1909, and in case it should prove that Okamura's plant is the same, his name has priority. *C. spiralis*, however, seems nearer allied to *C. Darwinii* (Hook.) Kütz., which also has the upper cells subspherical, or depressed-spherical, but *C. spiralis* is in all probability distinct from the latter. It may be a question, however, if it is distinct from *C. moniligera* Kjellman, 1897b, p. 24, Pl. IV, figs. 17-23, also from Japan.

Page 324, for C. ANTENNINA, substitute,

C. MEDIA (Ag.) Kützing, 1849, p. 380; *C. antennina* Vickers, 1908, p. 19, Pl. VIII; Collins, 1909, p. 324; Börgesen, 1913, p. 16, figs. 4-5; Wittr. and Nordst., Alg. Exsicc., No. 1439; not *Conferva antennina* Bory; *Conferva media* Agardh, 1824, p. 100. Filaments deep or dark green, attached in dense tufts, stiff and firm, up to 40 cm. high; basal cell elongate, increasing from 100-150 μ diam. at base to 300-400 μ at summit, 2-8 mm. long, other cells 400-500 μ diam., 2-6, mostly 3-4 diam. long. W. I. *Brazil.*

In the West India region this species corresponds to the attached forms of *C. Linum* of the Atlantic coast from Massachusetts south, and of *C. melagonium* from Massachusetts north. The cells are longer than in either of the two last species, and the basal cell is more specialized. It has generally passed under the name of *C. antennina*, but Howe, 1914, p. 37, states from his examination of the type of the latter that it has a longer basal cell, with a diameter at the top of 500-580 μ, and the other cells are usually only 270-400 μ diam., and ⅔-1½ diam. long. *C. antennina* appears to be limited to the Pacific Ocean; the reference to Africa, Collins, 1909, p. 324, being an error.

Page 325, after description of forma LINUM, add,

CONFERVA LINUM Flora Danica, Vol. V, p. 4, Pl. DCCLXXI, 1782, appears to be the oldest name; therefore what we have considered as a form, and which is a form from the biological point of view, must stand as C. LINUM (Fl. Dan.) Kützing, 1845, p. 204, while the attached form becomes forma AEREA (Dillw.)

Page 326, after description of C. CHELONUM, add,

9. C. CRASSA (Ag.) Kützing, 1845, p. 204; 1853, p. 19, Pl. LIX, fig. II; P. B.-A., No. 1864; Börgesen, 1913, p. 18; *Conferva crassa* Agardh, 1824, p. 99. Filaments 500-550 μ diam., cells usually about as long as broad, occasionally up to 2 diam., wall thick. In loose masses in shallow water, W. I., Bermuda. *Europe.*

10. C. GRACILIS Kützing, 1845, p. 203; 1853, p. 17, Pl. LII, fig. I; Börgesen, 1913, p. 19. Filaments 40-70 μ diam., cells 2-4 diam. long. Loosely floating, W. I., Bermuda.
Europe; Singapore.

11. C. MINIMA Collins & Hervey, 1917, p. 41, Pl. I, figs. 5-7; P. B.-A., No. 2007. Filaments cylindrical or slightly clavate, short, 10-20 μ diam., cells 2-4 diam. long; membrane relatively thick and lamellate; on larger algae. Bermuda.

Page 330, under RHIZOCLONIUM CRASSIPELLITUM, note,

The typical form has been found at Bermuda, and distributed as P. B.-A., No. 2008; also at Holland, Mich., Transeau.

Page 332, in Key to the marine species of Cladophora, make changes and additions as follows:

For Nos. 1-5,

1. Low, pulvinate or matted, with main filaments more or less prostrate. 2.
1. Erect. 6.
2. Lower part of filaments 300-350 μ diam. 41. *C. intertexta.*
2. Lower part of filaments less than 300 μ diam. 3.
3. Branching mostly irregular, not dichotomous. 4.
3. Branching mostly di-trichotomous. 5a.
4. Erect branches distinct from prostrate filaments and smaller. 5.
4. No sharp distinction between different kinds of filaments. 37. *C. Magdalenae.*
5. Basal filments 150 μ diam.; erect filaments 20-50 μ diam., cells 5-20 diam. long. 38. *C. Howei.*
5. Basal filaments 40-100 μ diam.; erect filaments 30-50 μ diam., cells 4-8 diam. long. 40. *C. amphibia.*
5a. Cells cylindrical or nearly so; color dark. 58. *C. repens.*
5a. Cells of ramuli ovoid or pyriform. 5b.
5b. Cells 120-250 μ diam. 39. *C. trichotoma.*
5b. Cells 60-100 μ diam. 59. *C. frascatii.*

For No 10,

10. Cells with more or less regular constrictions. 10a.
10. Cells without regular constrictions. 20.
10a. A single constriction near base of cell. 12. *C. constricta.*
10a. Frequent constrictions of cells of main axes; ramuli often hooked or circinate. 54. *C. uncinata.*

For No. 30.

30. Branches often decumbent; rhizoidal branches numerous. 55. *C. corallicola.*
30. Not decumbent; rhizoids few or none. 30a.

30a. Articulations long, up to 20 diam. 3. *C. Rudolphiana.*
30a. Articulations not over 8 diam. long. 31.

For No. 45.

45. Forming a dense hemispherical tuft, with or without slender loose tufts arising from it. 60. *C. hemisphaerica.*
45. No dense hemispherical tuft. 45a.
45a. Substance soft and silky; cells 4-12 diam. long; ramuli erect. 45b.
45a. Substance crisp or harsh; cells 1-5 diam. long; ramuli patent. 45c.
45b. Branching continuously dichotomous, except as to ultimate ramuli. 9. *C. Stimpsoni.*
45b. Main branching dichotomous; lesser branches and ramuli dense, largely secund. 19. *C. crystallina.*
45c. Crisp but not harsh; cells 3-5 diam. long; ramuli scattered and distant. 56. *C. piscinae.*
45c. Stiff and harsh; cells mostly 1-2 diam. long; ramuli closer, often in secund series. 57. *C. rigidula.*

Page 335, in Key to the Fresh Water species, for Nos. 5 and 6, substitute,

5. Main filaments long, with few branches. 5a.
5. Filaments freely branching. 6.
5a. Strongly moniliform; cells averaging little over 1 diam. long. 62. *C. moniliformis.*
5a. Cells slightly swollen, 4-6 diam. long. 51. *C. insignis.*
6. Ramuli mostly unicellular. 48. *C. oligoclona.*
6. Ramuli pluricellular, long-celled. 6a.
6a. Branching irregular; branch-bearing cells appearing forked at summit; growing at bottom of cold, deep lakes. 61. *C. profunda.*
6a. Branching alternate, usually dense; branch-bearing cells normal; plant of shallow water. 49. *C. crispata.*

Page 337, after first paragraph, add,

C. RUDOLPHIANA forma **eramosa** N. L. Gardner forma nova. Ramis praelongis, subsimplicibus.

Branches very long, subsimple. In warm salt water pool, Key Route Power House, Oakland, Cal., April, 1915. Type in herb. N. L. Gardner, No. 2856.

Apparently a result of the abnormal, uniformly high temperature.

Page 349, after C. TRICHOTOMA, add,

Var. ELONGATA Collins in P. B.-A., No. 2141. Growing in deeper water, up to 3 dm. long, little branched below, freely branched near the surface of the water. Point Lobos, Cal., N. L. Gardner.

A form of deep quiet pools, little affected by the tide; very different in appearance from the loose matted typical form, but without technical characters sufficient for specific separation.

Page 356, after SPONGOPSIS SACCATA, add,

54. C. UNCINATA Börgesen, 1913, p. 20, figs. 9 and 10. Densely tufted, 4-5 cm. high; attached by branching rhizoids; main filaments 110 μ diam., cells 10-15 diam. long, with thick wall and frequent annular constrictions; branches 65 μ diam., without constrictions, cells 4-6 diam. long, di-trichotomously branched, with scattered or secund ramuli, 35 μ diam., often hooked or circinate; color dark green. Virgin Islands.

Amply distinct by constricted axes and strongly hooked ramuli.

55. C. CORALLICOLA Börgesen, 1913, p. 21, figs. 11-12; P. B.-A., No. 2010. Densely tufted, decumbent filaments attaching to the substratum and emitting erect branches; main filaments 125-150 μ diam., cells 5-10 diam. long, cells in secondary branches and ramuli 70 μ diam., 5-6 diam. long. Branching di-trichotomous below, few branches above, branches more or less curved or sinuous; cells more or less clavate; rhizoids abundant, 45 μ diam. Bermuda, Virgin Islands.

56. C. PISCINAE Collins & Hervey, 1917, p. 46; P. B.-A., No. 2165. Main filaments 100 μ diam.; ultimate ramuli 50 μ; cells 3-5 diam. long, nodes not constricted; terminal cell rounded or truncate; branching by wide, equal, distant forkings, with distant, patent ramuli above; color light green; substance somewhat crisp but not fragile. Bermuda.

In still water of a fish pool, forming large, loose masses, in appearance like some of the larger species of *Spirogyra*.

57. C. RIGIDULA Collins & Hervey, 1917, p. 47. Main filaments 120 μ diam., secondary 100 μ, ultimate cells 80 μ; cells 1-2 diam. long, nodes not constricted; terminal cell usually longer, sometimes 3 diam., rounded or subacute; branching at base by broad forkings, at first frequent, then distant; branches in upper half of frond long, straight, with ramuli nearly or quite at right angles, distant and scattered below, near the tips in secund series; color rather dull light green; substance firm and harsh. Bermuda.

In some respects like the preceding species, but coarser and stiffer, and with shorter cells, with lesser differences as above noted.

58. C. REPENS (J. Ag.) Harvey, 1846-51, Pl. CCXXXVI; P. B.-A., No. 2071; *Conferva repens* J. G. Agardh, 1842, p. 13. Filaments 100-150 μ diam., loosely dichotomous, not tapering to apices; cells below 2-3 diam. long, above 6-8, rarely 10 diam. Color dull, dark green; forming dense pulvinate spongy masses at low water mark and between tides. Bermuda. *Mediterranean.*

A coarse, matted, unattractive plant.

59. C. FRASCATII Collins & Hervey, 1917, p. 49; P. B.-A., No. 2164. Low, 1-2 cm. high, branching irregular, below mostly dichotomous, with wide forkings; above partly similar, partly lateral, patent, often at a right angle; ultimate ramuli 1-3-celled, nearly or quite at right angles, often secund on the outer side of a recurved branch. Cells below 70-100 μ diam., 2-5 diam. long, cylindrical; in the ramuli 60-80 μ diam., 2-3 diam. long, somewhat swollen with constricted nodes; terminal cell obtuse. Bermuda.

Growing in similar places to *C. repens*, and forming similar matted tufts, but distinct by the smaller dimensions and the lateral, secund, submoniliform ramuli.

60. **C. hemisphaerica** N. L. Gardner. sp. nov. Frons parva, compacta, hemisphaerica, radii ad 1 cm.; ramificatione dichotoma, densa; dichotomiis angustis; cellulis 60-150 μ diam., 3-6 diam. longis, saepe manifeste clavatis; postea minus regulariter hemisphaerica, ad 3 cm. alta, ramis distantioribus, superiorum cellulis 50-80 μ diam., cylindricis. Aliquando e fronde hemisphaerica exsurgunt fasciculi longi, tenues, cellulis cylindricis, 50-80 μ diam., dichotomiis longe distantibus, perangustis. Substantia chartacea, minus adhaerente.

Frond at first compact, hemisphaerical, of not over 1 cm. radius, branching at base dichotomous, dense, forkings narrow, cells 60-150 μ diam., 3-6 diam. long, often distinctly clavate; later less regularly hemispherical, up to 3 cm. radius, branches more distant, with cells in the upper part 50-80 μ diam., cylindrical. Sometimes there arise from the hemispherical frond long, slender tufts, with cylindrical cells, 50-80 μ diam., forkings very distant and narrow. Substance firm, not adhering well to paper.

On rocks and in pools, middle and upper litoral zone, Monterey County, California. Type No. 3359 in herb. N. L. Gardner, from Cypress Point, June, 1916.

The hemispherical tuft appears to be a single individual, and to be the normal form of the species. When growing in warm high pools, a long floating tuft is sometimes developed, arising from the otherwise unchanged normal frond. There is no species of this region with which it is nearly allied; the habit somewhat suggests a worn frond of some small species of Spongomorpha, but the resemblance is only in habit.

61. C. PROFUNDA var. NORDSTEDTIANA Brand, 1902, p. 64. Forming fine, loose, subradiate masses, branching erecto-patent, often secund; branches arising below the summit of a cell, the first cross wall usually slightly above the origin of the branch; main filaments 40-68 μ diam., ramuli 23-35 μ; cells usually 8-30 diam. long, in lower part of frond occasionally only 4-8 diam. On limestone bottom of Lake Ontario, at 50 m. depth. E. M. Kindle.

The typical *C. profunda* occurs in European lakes at a depth of 10-15 m., and has filaments up to 85 μ diam.; the distance from the point of origin of a branch to the summit of the cell bearing it is about the same as to the first cross wall in the branch, and the appearance is that of a forked cell, each fork bearing another cell; this appearance is less marked in var. *Nordstedtiana*. In the letter of Dr. Brand, identifying the Ontario specimen submitted to him, he proposes to call it "forma *ima*" but gives no characters. See Kindle, 1915, p. 654.

62. **C. moniliformis** sp. nov. Fronde parce ramosa, inferne dichotoma, ramis divergentibus, cellulis infimis ramorum vulgo adhaerentibus dimidio longitudinis, ramulis paucis, minoribus; cellulis ramorum ¾-2 diam. longis, plerumque diametrum paullo superantibus, medio perinflatis, usque ad 145 μ, dissepimento solum 75-80 μ; membrana manifeste striata, 20-25 μ crassa in partibus adultioribus; ramulis minus moniliformibus, nodis autem semper manifeste constrictis, circa 60 μ diam.

Frond little branched, dichotomous below, branches divergent, lowest cells of the branches usually adherent for about half their length; cells of the branches ¾-2 diam. long, usually a little longer than wide, much inflated at the middle, up to 145 μ, at the ends only 75-80 μ; wall manifestly striate, in the older parts 20-25 μ thick; ramuli less moniliform, but always distinctly constricted at the nodes, about 60 μ diam. Floating in a pond at Los Angeles, California, Feb., 1915. N. L. Gardner, No. 2570. Type in herb. F. S. Collins.

The fronds are often so little branched that one finds an unbranched filament several cm. long: the general appearance is then much that of a marine *Chaetomorpha* with short swollen cells and thick wall. Its nearest relative would seem to be *C. insignis*, but *C. moniliformis* has much shorter and more moniliform cells and thicker wall. If *C. fracta* is to be taken to include all non-attached species outside the subgenus *Aegagropila*, the present form should be included in it as a variety; but to include in *C. fracta*, *C. insignis*, *C. oligoclona* and the present form, would make *C. fracta* altogether more cumbrous and unsatisfactory than it is now; it is already bad enough.

Page 367, after description of the genus BOODLEA, add,

B. SIAMENSIS Reinbold, 1901, p. 107; in Weber, 1913, p. 68, fig. 11; Börgesen, 1913, p. 49, figs. 34-36. Somewhat intricate and spongy; main filaments rather distantly branched, branches densely and divaricately branching in all directions; ramuli here and there adherent by tenacula on their obtuse tips; length of cells variable, in main filaments up to 20 diam.; diam. of main filaments 160-200 μ, rarely 300 μ, ramuli 70-100 μ. Virgin Islands. *Eastern Asia.*

Cancel all relating to B. COMPOSITA.

After description of the genus DICTYOSPHAERIA, add,

KEY TO THE SPECIES OF DICTYOSPHAERIA.

1. **Frond hollow; interior of cell wall without acicular projections.** 1. *D. favulosa.*
1. **Frond solid; acicular projections within the cells.** 2. *D. van Bosseae.*

After description of D. FAVULOSA, add,

2. D. VAN BOSSEAE Börgesen, 1912, p. 256, figs. 7-9; 1913, p. 39, figs. 23-25. Frond irregularly rounded or hemispherical, solid, cells rounded-polygonal, about one-half mm. diam., with acicular projections from the interior cell wall. Virgin Islands.

Distinguished from *D. favulosa* by the always solid frond and usually smaller cells, averaging 500 μ diam., seldom reaching 800 μ, while those of *D. favulosa* average over 1 mm. *D. Versluysii* of the Malayan Archipelago has a solid thallus, and acicular projections into the cells, but the cells are twice the size of those of *D. van Bosseae*, and the acicular projections long in proportion.

Page 368, HORMISCIA, first line, cancel all in first paragraph after "several pyrenoids," and substitute,

Asexual reproduction by macrozoospores, many in a cell, obovoid, extending into a long projection below, and with 4 cilia above; also by microzoospores in still larger numbers in a cell, with 4 cilia and red stigma, but with less conspicuous prolongation below; also by akinetes formed by the breaking up of the filaments into individual cells, with thick wall, either producing new filaments or zoospores; sexual reproduction by small male and larger female 2-ciliate gametes (Wille, 1909, p. 115); also by isogamous 2-ciliate gametes (?).

Page 369, after note on HORMISCIA WORMSKJIOLDII, add,

H. tetraciliata Frye & Zeller, 1915, p. 9, Pl. II, seems to be a synonym of this species. It has macrozoospores similar to the zoospores of *H. penicilliformis*, also smaller 4-ciliate spores, supposed by the authors to be gametes, but probably microzoospores. Macro-and microzoospores are known in many genera of green algae, but there is no record of 4-ciliate gametes in the Cladophoraceae, and in other families they are quite exceptional. Their figure 20, "gametes fusing," would seem rather to represent two imperfectly separated microzoospores.

Page 372, for Key to the Species of Valonia, substitute,

1. Frond bullate, unbranched.	1. *V. ventricosa.*
1. Frond more or less abundantly branched.	2.
2. Branches in whorls.	5. *V. confervoides.*
2. Branches not whorled.	3.
3. Cells spherical, ovoid or pyriform.	6. *V. macrophysa.*
3. Cells cylindrical to clavate.	4.
4. Cells distinctly clavate, rather stout.	2. *V. utriculosa.*
4. Cells nearly or quite cylindrical, slender, densely branched.	3. *V. aegagropila.*

Page 373, after description of VALONIA UTRICULARIS, add,

Forma CRUSTACEA Kuckuck, 1907, p. 180; Börgesen, 1913, p. 30, figs. 17-18; P. B.-A., No. 2074. Forming dense, crisp masses in shallow water, both in quiet pools and on exposed reefs. Bermuda, Virgin Islands. *Europe.*

Page 373, after V. VERTICILLATA, add,

V. verticillata is made the type of a separate genus,

ERNODESMIS Börgesen, 1912, p. 259.

Frond with erect main axis, attached by rhizoids, claviform, annulately constricted near base, apex obtuse, bearing a whorl of similar cells, but with only one constriction near base; similar branching to the fourth order; zoospores formed in ultimate ramuli, escaping by numerous minute openings. Fig. 27

Differs from *Valonia* by the regularly whorled branching, borne on a distinct axis, the presence of annulations, and the absence of lentiform cells.

Only one species, E. VERTICILLATA (Kütz.) Börgesen, 1912, p. 259, figs. 10-12; 1913, p. 66, figs. 51-54.

Page 374, after description of V. CONFERVOIDES, add,

6. V. MACROPHYSA Kützing, 1843, p. 307; 1856, p. 30, Pl. LXXXVII, fig. 3; Kuckuck, 1907, p. 158, figs. 5-10; Börgesen, 1912, p. 243; 1913, p. 29; *V. utricularis* Alg. Am.-Bor. Exsicc., No. 171. Cells spherical to pyriform with similar proliferations, solitary or forming more or less dense masses; zoospores 4-ciliate. Bermuda, W. I. *Europe.*

Often confused with *V. utricularis*, but in the latter the normal form of the cell is clavate, while in the present species it is short pyriform. In both species, however, there is considerable variation.

Page 376, for Key to the Species of Struvea, substitute,

1. Stipe unbranched.		2.
1. Stipe branched.		3.
2. Frond 3-5 cm. high, with 4-6 pairs of branches.	1. *S. anastomosans.*	
2. Frond 7-10 cm. high, with 10-15 pairs of branches.	4. *S. elegans.*	
3. Each branch of stipe with a separate network.		4.
3. One network only.	2. *S. pulcherrima.*	
4. Branches of stipe opposite.	3. *S. ramosa.*	
4. Branches of stipe irregular.	1. *S. anastomosans.*	

Page 377, after description of S. RAMOSA, add,

4. S. ELEGANS Börgesen, 1912, p. 264, figs. 13-14; 1913, p. 51, figs. 37-38. Stipe cylindrical, 7-10 cm. high, with a few annulations near the base, unbranched, bearing above a single ovate pyramidal network, up to 4 cm. long, of 10-15 pairs of opposite branches, with similar branching to the fourth order. Virgin Islands.

Resembling *S. anastomosans*, but a larger plant, with long simple stipe, and with the branching network ovate acuminate rather than broadly triangular; the branching is more regularly distichous, and there are several distinct annulations near the base of the stipe. *S. anastomosans* sometimes has one or two irregular branches to the stipe. *S. elegans* has been found in deep water dredging only.

Page 387, for Key to the species of Codium, substitute,

1. Forming a continuous expanded incrustation.	2.
1. Not forming a continuous incrustation.	3.
2. Utricles 50-100 μ diam., rarely more.	1. *C. dimorphum.*
2. Utricles 125-200 μ diam., rarely to 300 μ.	2. *C. difforme.*
3. Frond globose to pyriform.	3. *C. Ritteri.*
3. Frond branched, cylindric or compressed.	4.
4. Frond creeping.	5.
4. Frond erect.	6.
5. Utricles 150-300 μ diam.	4. *C. repens.*
5. Utricles 70-90 μ diam.	10. *C. intertextum.*
6. All or part of the utricles mucronate.	9. *C. fragile.*
6. Utricles blunt, smooth.	7.
7. Branches usually constricted at base; utricles 200-300 μ diam.	6. *C. isthmocladum.*
7. Branches not usually constricted at base.	8.
8. Frond normally cylindric throughout; utricles seldom reaching 200 μ diam.	5. *C. tomentosum.*
8. Frond normally more or less compressed.	9.
9. Utricles seldom less than 300 μ diam.; compression chiefly at axils.	7. *C. decorticatum.*
9. Utricles usually less than 250 μ diam.; often compressed throughout.	8. *C. Lindenbergii.*

Cancel paragraph beginning "1. C. ADHAERENS" and following paragraph, and substitute,

1. C. DIMORPHUM Svedelius, 1900, p. 300, Pl. XVII, figs. 16-19; A. M. Hurd, 1916, p. 211, Pl. XXXVII; *C. adhaerens* P. B.-A., No. 523, not of Agardh. Frond prostrate, dark green, about 5 mm. thick, margin irregularly lobed; interior of slender filaments, exterior of utricles 50-100 μ diam., commonly 75 μ, the end wall sometimes thin, sometimes much thickened, showing distinct stratification. No hairs present. Pacific coast from Alaska to San Diego. *Patagonia.*

It is unlikely that true *C. adhaerens* occurs in North America. All specimens from the Pacific coast as far as examined prove to be *C. dimorphum*, all from the Atlantic coast *C. difforme* or *C. intertextum*. In *C. dimorphum* the differentiation of the utricles as to the character of the end wall is quite marked, the two forms usually occurring on the same individual, and in different parts of the frond. *C. adhaerens* produces abundant hairs when young, no hairs are found on *C. dimorphum*. Other details of difference will be found in Svedelius' and Miss Hurd's papers.

Page 99 of supplement, after note on CODIUM DECORTICATUM, add,

Var. CLAVATUM Collins & Hervey, 1917, p. 56. Densely branched, firmer, less gelatinous; utricles very variable, mostly clavate, capitate, bell-shaped or turbinate, length 480-980 μ, diam. from 80 μ in the middle of the smallest utricle to 480 μ at the summit of the largest. Bermuda.

A large deep-water form, firm and not collapsing when fresh, but becoming papery when dried.

Page 99 of supplement, after notes on CODIUM FRAGILE, add,

10. C. INTERTEXTUM Collins & Hervey, 1917, p. 54; P. B.-A., No. 2018. Frond prostrate, subterete or flattened, closely adherent to the rock, but with tips usually free; with short irregular branches forming an almost continuous coating. Utricles long, cylindrical or subclavate, 70-90 μ diam., ends truncate or somewhat rounded. Color dark green, substance firm, not specially gelatinous. Forming a continuous belt a few dm. wide on upright or sloping rocks at low water mark. Bermuda, W. I.

As noted under *C. dimorphum*, Atlantic records of *C. adhaerens* on the North American coast should be mostly referred to this species.

Page 389, and p. 99 of supplement, for Key to the Species of Avrainvillea, substitute,

1. Upper part a distinct flabellum. 2.
1. Upper part digitately lobed. 1. *A. Rawsoni.*
  2. Surface of flabellum smooth or smoothish. 3.
  2. Surface of flabellum velutinous, spongy or strigose. 6.
3. Filaments of flabellum of nearly uniform diam. throughout. 5. *A. Elliottii.*
3. Filaments distinctly tapering. 4.
  4. Filaments 30-40 μ diam. below, diminishing towards the surface, but ends clavate. 6. *A. Geppii.*
  4. Filaments smaller, tips not clavate. 5.
5. Filaments towards the surface torulose, densely matted. 7. *A. asarifolia.*
5. Filaments little or not at all torulose, not so dense near surface. 3. *A. levis.*

6. **Interior filaments moniliform.** 2. ***A. nigricans.***
6. **Interior filaments cylindrical, with basal constrictions.** 4. ***A. longicaulis.***

Page 391, after description of A. LONGICAULIS, add,

6. A. GEPPII Börgesen, 1913, p. 87, figs. 71-72. Frond 12 cm. high, rhizome erect, 2 cm. high, 1 cm. diam.; stipe ⅓ cm. diam., 5 cm. high, suddenly expanding into a transversely oblong flabellum, 5.5 cm. high, 8 cm. wide, of rather loose consistency, slightly zonate, becoming very thin near the edge; filaments cylindrical or sometimes here and there subtorulose, 30-40 μ diam., diminishing to 14-17 μ at the surface, apices stouter, subclavate or obtuse, 17-25, rarely 27 μ diam; color of dried specimen gray-green with dull yellow tinge. Dredged in about 16 meters, Virgin Islands, Börgesen.

Only a single specimen is known. As noted, Collins, 1909, p. 390 and 391, 1912, p. 100, the species of *Avrainvillea* leave much to be desired, both as to distinction of species and as to nomenclature.

7. A. ASARIFOLIA Börgesen, 1908, p. 34, fig. 4, Pl. III; 1913, p. 89, figs. 73-75; Gepp, 1911, p. 44. Rhizome terete, stipe cylindrical below, flattened above, 6-23 cm, long, 7 mm. diam.; flabellum oblong-reniform or cordate, to 10 cm. high and 14 cm. wide, entire or lobed, of rather firm consistency and usually distinctly zonate; surface subglabrous; filaments of the interior cylindrical or sometimes slightly moniliform, with a rather strong constriction above the dichotomy; diam. of filaments 20-30 μ, usually 24-27 μ; tapering towards the surface and becoming more torulose and more abundantly ramified, and firmly interwoven; outermost filaments 8-13 μ diam.; color of dried specimens dark olive green; substance firm. Dredged in 20-30 meters, Virgin Islands, Börgesen.

Quite close to *A. levis*, but considered distinct by Börgesen and Gepp.

Page 392, after description of PENICILLUS DUMETOSUS, add,

Forma EXPANSUS Börgesen, 1913, p. 101. Head larger and looser, its diam. much greater than length of stipe; stipe 2-4 cm. long, head 14-17 cm. diam. Dredged in about 30 meters, Virgin Islands, Börgesen.

Page 393, after description of P. PYRIFORMIS, add,

Forma EXPLANATUS Börgesen, 1913, p. 99, fig. 81. Filaments of head looser than in the typical form, horizontally expanded to a diameter of 10 cm. or more. Dredged in about 40 meters, Virgin Islands, Börgesen.

The horizontally expanded filaments of the head seem to be an adaptation to its deep water habitat; otherwise it is of the typical form.

Page 394 and p. 102 of supplement, for Key to the Species of Udotea, substitute,

1. Whole flabellum with a stony coating.		2.
1. No general stony coating.		3.
2. Branches forming the cortex of the flabellum capitate.	6.	*U. occidentalis*.
2. Cortical filaments not capitate.	5.	*U. Flabellum*.
3. Flabellum with a cortex of spinulose branches.		4.
3. Flabellum uncorticated.		5.
4. Spinulose branches in close whorls.	4a.	*U. verticillosa*.
4. Spinulose branches subsecund or irregular.	4.	*U. spinulosa*.
5. Flabellum plane.	2.	*U. conglutinata*.
5. Flabellum concavo-convex to cyathiform.	3.	*U. cyathiformis*.

Page 396, after description of UDOTEA ARGENTEA, add,

RHIPILIA Kützing, 1858, p. 12.

Uncalcified, green, cuneato-flabellate to excentrically subinfundibuliform, stipitate, stipe thin, flabellum thick or thin, sometimes zonate, composed of a lax felt of dichotomously branched filaments, often not cylindric, bearing rather short, pseudo-lateral branchlets, each terminating in a 2-6-parted tenaculum or crown.

Differs from *Udotea* by the absence of incrustation; from *Avrainvillea* by the terminal tenacula.

R. TOMENTOSA Kützing, 1858, p. 12, Pl. XXVIII, fig. 1; Gepp, 1911, p. 55, Pl. XV, figs. 126-128; *Udotea tomentosa* Collins, 1909, p. 394; *Avrainvillea laetevirens* Mazé, No. 233. Fig. 28. Guadeloupe.

Forma ZONATA Gepp, 1911, p. 55, Pl. XV, fig. 129; Börgesen, 1913, p. 93, fig. 76. Stipe more slender than in the typical form, frond round-flabellate or reniform, thin, translucently zonate. Dredged in about 30 meters, Virgin Islands, Börgesen.

Page 399, after description of HALIMEDA GRACILIS, add,

Var. OPUNTIOIDES Börgesen, 1913, p. 108, fig. 87. Segments large, up to 14 mm. wide and 9 mm. high, suboval-reniform, often distinctly crenulate on the upper margin or even trilobed. Dredged in about 30 meters, Virgin Islands, Börgesen.

Shape of segments very much as in *H. Opuntia*, but all in one plane.

Page 403 after description of BRYOPSIS DUCHASSAINGII, add,

Var. FILICINA Collins & Hervey, 1917, p. 61. Outline of frond broadly or narrowly lanceolate; main axis not divided; secondary axes closely and uniformly set, often opposite, densely beset from the base with very fine ramuli of equal length. Bermuda.

The very regularly pinnate branching gives the fronds in this variety an appearance quite different from that of the typical form.

Page 406, for Key to the Species of Derbesia, substitute,

1. Filaments 100-600 μ diam.	3. *D. Lamourouxii.*
1. Filaments less than 100 μ diam.	2.
2. Sporangia ovoid to subspherical.	2. *D. marina.*
2. Sporangia obovoid to broadly pyriform.	3.
3. Pedicel cell 2-4 diam. long.	1. *D. vaucheriaeformis.*
3. Pedicel cell 1 diam. long or less.	4. *D. turbinata.*

Page 407, after description of D. LAMOUROUXII, add,

4. D. TURBINATA Howe & Hoyt, 1916, p. 107, Pl. II, figs. 10-16. More or less prostrate: filaments 15-95 μ diam., mostly 38-53 μ, sparingly branched, branches subdichotomous or oftener lateral; lateral branches without septum; dichotomies with or without 1 or 2 septa; sporangia broad-pyriform or turbinate, 112-182 μ long, 104-156 wide; pedicel 14-32 μ long, rarely up to 70 μ, 15-21 μ diam.; pedicel cell cuboidal, 18-21 μ, or shorter, 10-21 μ. Dredged in 28 meters depth on reef 23 miles off Beaufort, N. C., Lewis Radcliffe.

Page 427, after account of VAUCHERIA GEMINATA var. RACEMOSA, add,

Var. DEPRESSA Transeau, 1917, p. 228. Fertile branch short, oogonial branches longer than in the type, and depressed, bringing the oogonia to the level of the filament or below. Ill., Mich., Transeau.

Perhaps to be compared with *V. uncinata* Kütz. and *V. Woroniniana* forma *pendula* Heering.

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EXPLANATION OF PLATES.

PLATE I

1. (*a*) Peroniella planctonica, after Smith. × 1200.
1. (*b*) " " " " × 1200.
2. (*a*) Mischococcus confervicola, after Nägeli. × 450.
2. (*b*) " " " " × 900.
2. (*c*) " " " " × 900.
3. Cryptoglena americana, after Davis. × 1125.
4. Spondylomorum quaternarium, after Stein. × 800.

5. Pyramimonas tetrarhynchus, after Stein. × 1000.
6. (*a*) Dicranochaete reniformis, after Hieronymus. × 400.
6. (*b*) " " " " × 600.
7. Gloeochaete Wittrockiana, after Nordstedt. × 1000.
8. Closteriopsis longissima, var. tropica, after West. × 520.
9. Quadrigula closterioides, after Printz. × 1000.

PLATE II

10. Glaucocystis nostochinearum, after West. × 1000.
11. Micractinium radiatum, after Chodat. × 800.
12. Franceia ovalis, after Pascher. × 500.
13. Acanthosphaera Zacharaisi, after Pascher. × 800.
14. (*a*) Elakatothrix gelatinosa, after Wille. × 224.
14. (*b*) " " " " × 570.
14. (*c*) " " " " × 570.
14. (*d*) " " " " × 242.
14. (*e*) " " " " × 570.
15. Phytomorula regularis, after Kofoid. × 1125.
16. Tetradesmus wisconsinensis, after Smith. × 3300.
17. (*a*) Westella botryoides, after West. × 780.
17. (*b*) " " " " × 1245.
18. Tetrastrum staurogeniaeforme, after Chodat. × 1500.
19. Euastropsis Richteri, after Schmidle. × 1000.
20. Chaetonema irregularis, after Huber. × 300.

PLATE III

21. Geminella scalariformis, after West. × 780.
22. (*a*) Oedocladium albemarlense, after Lewis. × 200.
22. (*b*) " " " " × 200.
23. Phaeophila floridearum, after Hauck. × 300.
24. (*a*) Chlorosarcina lacustris, after Snow. × 500.
24. (*b*) " " " " × 500.
24. (*c*) " " " " × 500.
25. Gloeocystopsis limneticus, after Smith. × 1000.
26. (*a*) Coccomyxa dispar, after Schmidle. × 800.
26. (*b*) " " " " × 800.
27. Ernodesmis verticillata, after Börgesen. × 2.
28. Rhipilia tomentosa, after Gepp. × 40.

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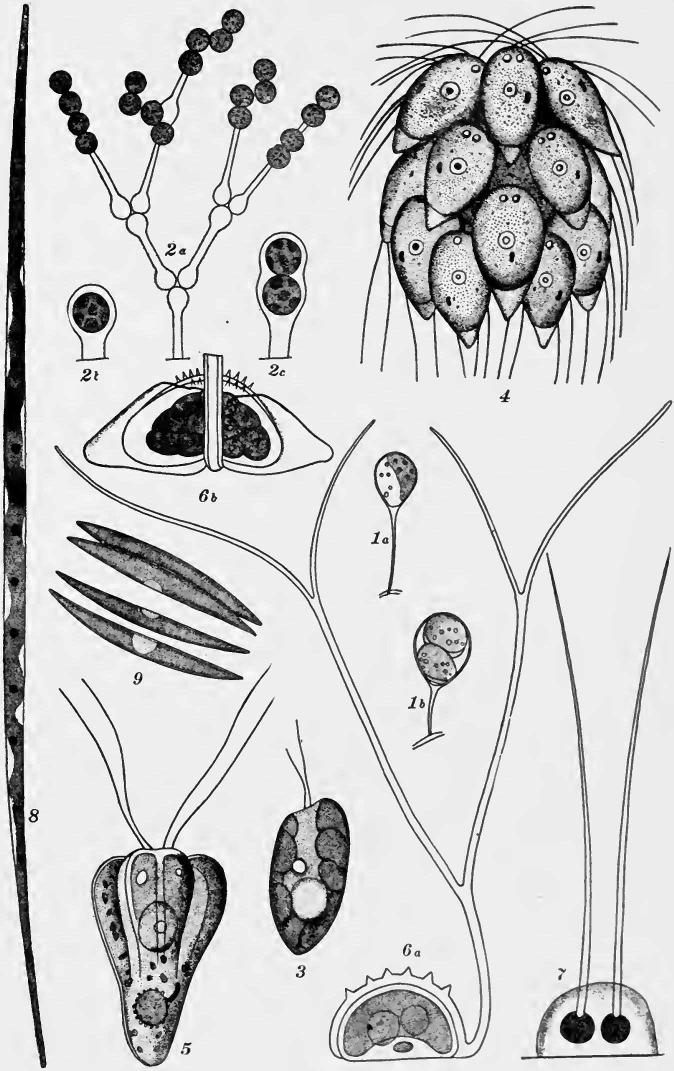
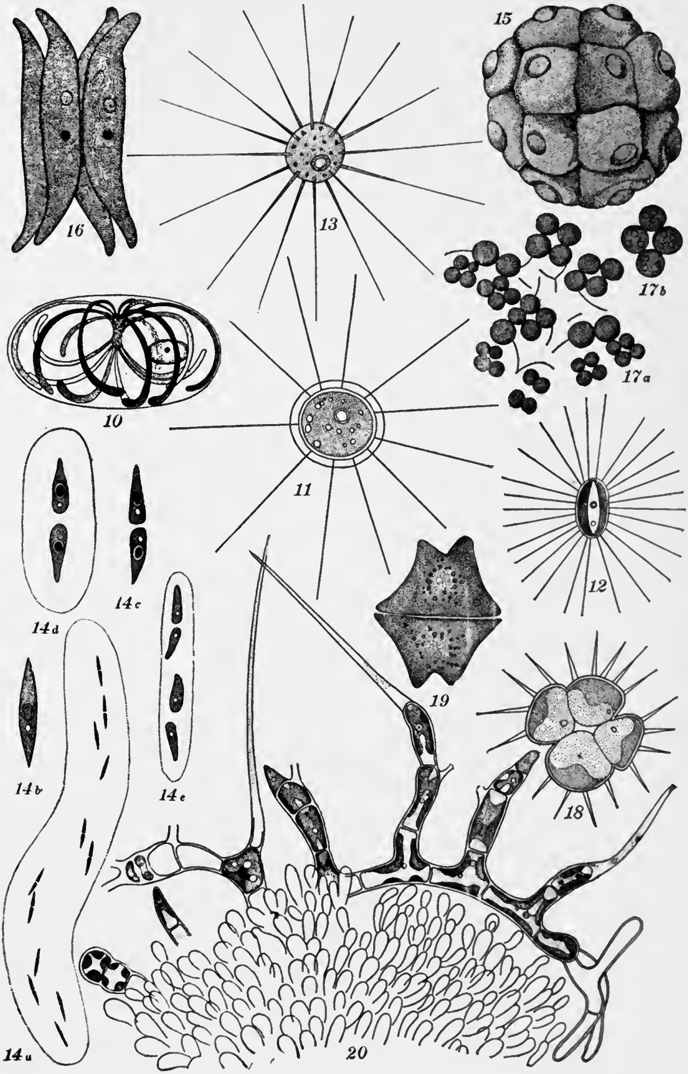


F. D. Lambert, del.

GREEN ALGAE OF NORTH AMERICA



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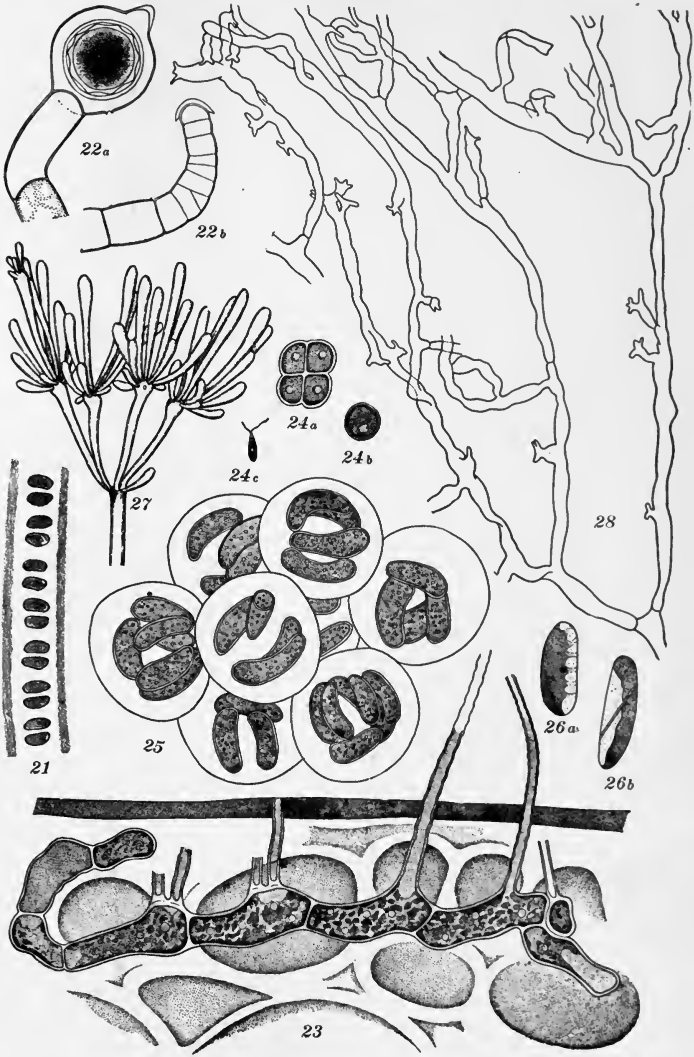

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