THE DESMIDS OF OKLAHOMA*

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INTRODUCTION

This paper is an attempted taxonomic classification of some of the Desmids of Oklahoma. It was begun in September 1929, at which time plans were laid for a taxonomic study of both the Desmids and the Diatoms of the State. Due to the untimely death of Dr. E. C. Angst, the Diatoms are only partially completed at the present time.

For the past year and a half, active collecting has been carried on only during the following months; September 1929 to June 1930, September 1930 to April 1931. The summer months from June to September 1930 were devoted to the identification of species, drawings, and many other necessary tasks.

Collections which were made, roughly included the entire state, as the following localities indicate; Miami, Ottawa Co.; Pine Valley, LeFlore Co.; Winding Stair Mts., Leflore Co.; McAlester, Pittsburg Co.; Broken Bow, McCurtain Co.; Durant, Byran Co.; Arbuckle Mts., Murray Co.; Purcell, McClain Co.; Norman, Cleveland Co.; Horseshoe Lake at Harrah, Lincoln Co.; Edmond and Lake Overholser, Oklahoma Co.; Tulsa, Tulsa Co.; Wichita Mts., Comanche Co.; Mangum, Greer.; Caddo Canyon, Caddo Co.; Great Salt Plains, Alfalfa Co.

Due to the fact that Oklahoma possesses a wide range of climatic conditions, soils, and geological formations, these collections have varied to a great extent. This has made it possible to secure many forms which would not otherwise have appeared.

From these collections representatives of 20 genera have been identified. In this list there are 61 species, 11 varieties, and 6 forms making a total of 78 identified species, varieties and forms. One variety, *Staurastrum trihedrale* var. *glabra* is named as a new variety of that species. Throughout the collections, the genus Cosmarium has predominated in numbers, there being a total of 30 individuals identified. This is followed by the genus Closterium with a total of 11, and then by the genus Staurastrum with 8. The other genera follow with numbers of individuals ranging from one to four.

Many descriptions have been adapted from those used by West in the British Desmidiaceae. Much of the terminology is also the same.

This list does not represent the complete Desmid flora of the State. Much material, because of a lack of time, remains unexamined. Also, many forms sketched and partially identified have been omitted until such literature as in necessary for their identification is obtained.

I wish to express my appreciation for the kind assistance and encouragement given me by the late Dr. E. C. Angst, Dr. Paul B. Sears, Dr. E. T. Bodenberg and Dr. A. S. Foster. I also wish to thank the other members of the Department of Botany for collections which they have made. To Mr. Phillips, Oklahoma State Forester, I am greatly indebted for numerous collections and aid in transportation.

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KEY TO SUB-FAMILIES, TRIBES, AND GENERA

Page

1. (12) Cell-wall unsegmented, no pores. Point of cell division unknown until the actual division occurs. The young cell develops obliquely, and its walls are continuous with those of the parents.

SUB-FAMILY I.
SACCODERMAE

2. (4) Cells elongate, cylindrical, without constrictions. Cells remaining attached to form loose filaments. Cell-wall with a differentiated outer layer. This outer layer may be smooth, slightly rough, or spiny.

TRIBE I.
GONATOZYGAE

Gonatozygon 277

3. Chloroplasts axile, strap like.
4. (2) Cells solitary, short and mostly unconstricted. No differentiated outer layer of cell-wall.

TRIBE II.
SPIROTAENEAE

5. (9) One chloroplast in each cell 6
6. (7) Chloroplast axile or parietal, spirally twisted.

Spirotaenia 277

7. (6) Chloroplast axile and plain 8
8. Cells solitary.

Mesotaenium 278

9. (5) Cells with two chloroplasts 10
10. (11) Chloroplast star shaped and radiating from a central pyrenoid.

Cylindrocystis 278

11. (10) Chloroplasts having longitudinal ridges.

Netrium 279

12. (1) Cell-wall segmented, and having a differentiated outer layer. Cell division following a fixed type with the young halves interpolated between the parent halves. The younger halves are not continuous with the parent, but are joined obliquely to them.

SUB-FAMILY II.
PLACODERMAE

13. (18) Point of cell division variable, or sometimes fixed at the isthmus.

TRIBE III.
PENIEAE

14. (15) Cells of moderate length, straight and cylindrical. A slight central constriction may or may not be present. Point of cell division variable. Cell-wall with or without pores.

Penium 280

15. (14) Cells elongate, generally curved. Point of cell division at the middle of the cell.

TRIBE IV.
CLOSTEREAE

16. (17) Cells strongly attenuated toward each end, which contain apical vacuoles with one to many rapidly moving granules. Two chloroplasts present.

Closterium 281

17. (16) Cells cylindrical, scarcely attenuated. No end vacuoles. Chloroplasts single. Nucleus laterally placed.

Roya 285

18. (13) Point of division always fixed at the isthmus. Cells exhibiting a great diversity of form. Cell-wall of two thin layers with pores. The cells mature by the growth of the young interpolated semicell. No periodical growth 19
19. (44) Both old and new parts of the obliquely fitting cell-wall remain plain at the point of cell division. The cells may be either solitary or colonial 20
20. (35) Cells free and solitary after division 21

21. (26) Cells greatly elongated, cylindrical; constriction slight 22
22. (24) Apices of semicell truncate or rounded, or truncately rounded 23
23. Bases of semicells plain, or with a ring at the point of juncture.
Pleurotaenium 285
24. (22) Apices of cell cleft; cleft narrow or open 25
25. Apical angles rounded, incision narrow.
Tetmemorus 286
26. (21) Cells short, usually compressed or radiating. Constriction usually deep 27
27. (34) Cells compressed. The vertical view fusiform to elliptic 28
28. (29)(30) Cells with an apical incision and a moderately lobed margin. A central protuberance present.
Euastrum 287
29. (28) (30) Cells greatly compressed. Margin deeply incised.
Micrasterias 288
30. (28) (29) Cells with a more or less entire margin. Granules, warts, or spines may or may not be present 31
31. Cells having a central protuberance 32
32. (33) Cell-wall granular, punctate, warty, or verrucose. Central protuberance present or absent.
Cosmarium 290
33. (32) Cell-wall with regularly arranged, paired spines. Central protuberance always present.
Xanthidium 300
34. (27) Cells radiating; triangular, quadrangular, or to eleven radiate in vertical view. In rare cases fusiform.
Staurastrum 301
35. (20) Cells after division remain attached to form colonies 36
36. Cells joined by apices into long filamentous colonies 37
37. (40) Cells attached by apical processes 38
38. (39) Apical processes short; appearing as two small granules between the two adjacent cells.
Sphaerozosma 304
39. (38) Apical processes long and over lapping the apex of the adjacent cell.
Onychonema 304
40. (37) Apices of cells flat and plain; no processes 41
41. (43) Cells with a very deep constriction 42
42. Vertical view elliptical.
Spondolosium 305
43. (41) Cells with a very shallow constriction.
Hyalotheca 305
44. (19) The old and new portions of the cell-wall develop a girdle-like thickening at the point of division, which projects back into each of the old semicells during division. Cells forming long filamentous colonies 45
45. (44) Cells short. Vertical view triangular or quadrangular.
Desmidium 306

FAMILY DESMIDIACEAE

SUB-FAMILY I SACCODERMAE

GONATOZYGON DeBary, 1856.

Cells cylindrical or narrowly subfusiform, 10-20 times longer than the diameter, not constricted, truncate, generally slightly dilated and often subcapitate at the apices; usually remaining attached to each other in filaments of variable length, which readily dissociate into separate cells when disturbed, and always before conjugation; Chloroplasts two, rarely one, axile, generally undulate and rather narrow, containing from 4-16 equidistant pyrenoids.

Zygospores globose and smooth.

A. Cell-wall perfectly smooth. *G. Kinahani*

B. Cell-wall densely and more or less finely granulate; size of granules varying from indistinct to strong sharp spines. *G. monotaenium*

Gonatozygon monotaenium DeBary

Pl. 5, Fig. 3.

West, British Desmidiaceae, Vol. 1, p. 30, Pl. 1, Figs. 1-7; Pl. 5, Fig. 5.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 5, Pl. 52, Fig. 1.
Migula, Kryptogamenflora. Algen, p. 559, Pl. 29. B, Fig. 2.
Nordstedt, Index Desmidiacearum, p. 175; Suppl., p. 86.

Cells about 15-20 times longer than the diameter, cylindrical, apices slightly dilated; Cell-wall finely granulate, granules dense, easily seen; about six pyrenoids in each chloroplast.

Length 180μ ; Width 11-12 μ;Width of apices 16-17 μ.

Collected in Horseshoe Lake, Harrah, Nov. 26, 1930.

Gonatozygon Kinachani (Arch.) Rabenh.

Pl. 5, Figs. 7, 8.

West, British Desmidiaceae, Vol. 1, p. 35, Pl. 2, Figs. 1-3.
Cooke, British Desmids, p. 3, Pl. 1, Fig. 3.
Nordstedt, Index Desmidiacearum, p. 151; Suppl., p. 73.

Cells 13-20 times longer than the diameter, cylindrical; apices truncate; cell-wall smooth; chloroplast an axile ribbon with 5-6 pyrenoids. Cells solitary, or loosely joined into long filaments.

Length 216-300 μ; Width 15 μ.

Collected at the South Canadian River bridge, 3 miles southwest of Norman, Nov. 18, 1929; Shawnee Lake, near Miami, April 9, 1931.

SPIROTAENIA Bréb., 1848.

Cells straight or almost so, oblong-cylindrical or fusiform, not constricted, apices rounded, subacute or acute; chloroplast single, band-like and parietal, or axile and christate, spirally twisted; nucleus eccentric; cell-wall smooth and colorless.

This genus is extremely uncommon in the state, and was collected in only one locality, that being LeFlore county. The only member found was *S. condensata.* This one is the largest of all the group, and along with its perfectly straight cell, identification is relatively simple.

Spirotaenia condensata Bréb.

Pl. 4, Fig. 8.

West, British Desmidiaceae, Vol. 1, p. 38, Pl. 2, Figs. 7-10.
Wolle, Desmids of the U. S., p. 33, Pl. 3, Figs. 21, 22.
Cooke, British Desmids, p. 52, Pl. 19, Fig. 3.
Ralfs, British Desmidieae, p. 179, Pl. 34, Fig. 1.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 17. Pl. 1, Fig 39.
Migula, Kryptogamenflora. Algen, p. 358, Pl. 24, Fig 1.
Nordstedt, Index Desmidiacearum, p. 78, 275; Suppl., p. 39.

Cells large, 8-10 times longer than broad; poles rounded; chloroplast a broad, parietal, spiral band having 6-10 revolutions.

Length 216 μ; Width 21 μ.

Collected at Pine Valley, Ouachita Mts., Dec. 23, 1929.

MESOTAENIUM Näg., 1840.

Cells cylindrical or subcylindrical, usually straight but often curved, not constricted, apices rounded or subtruncate; chloroplast solitary, axile, flattened, and plate like; pyrenoids one to many; nucleus frequently eccentric.

This genus has appeared only once, and at that time was represented by members of only one species. A mucilaginous mass covering the surface of a plant crock in the departmental green house upon examination proved to be a pure culture of *M. macrococcum* var. *micrococcum.* It soon entirely disappeared, and since then I have not been able to find it.

Mesotaenium macrococcum (Kütz.) Roy & Bissett var. *micrococcum* (Kütz.) West & G. S. West

Pl. 6, Fig. 16.

West, British Desmidiaceae, Vol. 1, p. 52, Pl. 4, Figs. 1-3.
Nordstedt, Index Desmidiacearum, p. 162; Suppl., p. 79.

Cells shortly cylindrical, about 2 times longer than broad, sometimes slightly attenuated to the broadly rounded apices.

Length 16.5 μ; Width 8 μ.

Collected in the Departmental Greenhouse, Oct. 15, 1930.

CYLINDROCYSTIS Menegh., 1838.

Cells cylindrical, about twice as long as the diameter, often embedded in mucilage, unconstricted or with a slight median constriction, apices generally rounded; with one axile, substellate chloroplast in each semicell; pyrenoid large, one in the center of each chloroplast.

A. Cell cylindrical, unconstricted, 2-3 times longer than the diameter. *C. Brebissonii*
B. Cells oblong-cylindrical, unconstricted, 1½-2 times longer than the diameter *C. crassa*

Cylindrocystis crassa DeBary

Pl. 6, Fig. 4.

West, British Desmidiaceae, Vol. 1, p. 59, Pl. 4, Figs. 33-38.
Cooke, British Desmids, p. 46, Pl. 18, Fig. 6.
Migula, Kryptogamenflora. Algen, p. 354, Pl. 22, Fig. 5.
Nordstedt, Index Desmidiacearum, p. 86; Suppl., p. 43.

Cells rather small, about 1½ times longer than broad, oblong cylin-

drical, with obtusely rounded ends. End view subcircular. Chloroplasts axile and substellate, one in each semicell, with one large axile pyrenoid.

Length 27-42 μ; Width 18-27 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cylindrocystis Brébissonii Menegh.
Pl. 6, Fig. 6.

West, British Desmidiaceae, Vol. 1, p. 58, Pl. 4, Figs. 23-32; Pl. 5, Fig. 10.
Migula, Kryptogamenflora. Algen, p. 354, Pl. 24, Fig. 7.
Lindau, Kryptogamenflora für Angänger. Die Algen, p. 7, Pl. 1, Fig. 13.
Ralfs, British Desmidieae, p. 153, Pl. 25, Fig. 6.
Nordstedt, Index Desmidiacearum, p. 67, 275; Suppl., p. 34.

Cells cylindrical, no constriction, about 3 times longer than the diameter, apices rounded; chloroplasts indistinctly marked by longitudinal ridges.

Length 45 μ; Width 15 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

NETRIUM (Näg.) 1849.

Cells straight, cylindrical, or fusiform, no median constriction; cell-wall unsegmented, without pores, no differentiated outer layer, smooth; chloroplasts 2, one in each semicell (one species, N. interruptum has two), each chloroplast axile with about six radiating plates which are prominently notched at the edges; several pyrenoids in each chloroplast, arranged in a median series, or sometimes scattered.

1. (3) Cells slightly constricted ---------- 2
2. Cells 6-8 times longer than the diameter, constriction only a slight narrowing. *N. Digitus var. constrictum*
3. (1) Cells unconstricted ---------- 4
4. (6) Chloroplasts two, axile, with about six longitudinal, radiating plates, free margins notched ---------- 5
5. Cell size variable, about 3-4 times longer than the diameter ---------- *N. Digitus*
6. (4) Chloroplasts four, each with about eight longitudinal plates, free margins entire ---------- 7
7. Cells 4-6 times longer than the diameter, extremities conical, apices obtusely rounded; terminal vacuole with one large, solitary, moving granule. *N. interruptum*

Netrium Digitus (Ehrenb.) Itzigs. & Rothe.
Pl. 5, Fig. 6.

West, British Desmidiaceae, Vol. 1, p. 64, Pl. 6, Figs. 14-16.
Conn. Algae of the Freshwaters of Conn., p. 58, Pl. 44, Fig. 282.
Nordstedt, Index Desmidiacearum, p. 108, 276; Suppl., p. 52.

Cells large, variable in size, 3-4 times longer than the diameter, not constricted, oblong-elliptic, gradually attenuated from the middle to the rounded or rounded-truncate apices; chloroplasts axile with 5-7 radiating plates, which are deeply serrate at the outer margins; cell-wall smooth.

Length 216-264 μ; Width 69-72 μ.

Collected in the Arbuckle Mts., Wichita Mts., and at Indian Springs, during the years 1929 and 1930.

Netrium Digitus (Ehrenb.) Itzigs. & Rothe. var. *constrictum nob.*
Pl. 5, Fig. 5.

West, British Desmidiaceae, Vol. 1, p. 65, Pl. 6, Fig. 17.
Nordstedt, Index Desmidiacearum, p. 108, 276; Suppl., p. 52.

Cells about 6 times longer than the diameter, slightly narrowed in the median portion.

Length 300 μ; Width 50-52 μ; Isthmus width 47 μ.

Collected in the Wichita Mts., April 26, 1930.

Netrium interruptum (Bréb.) Lütkem.

Pl. 5, Fig. 4.

West, British Desmidiaceae, Vol. 1, p. 68, Pl. 7, Figs. 1, 2.
Conn, Algae of the Freshwaters of Conn., p. 58, Pl. 44, Fig. 281.
Nordstedt, Index Desmidiacearum, Suppl., p. 71.

Cells large, 4½-5 times longer than the diameter, not constricted, cylindrical, ends sharply conical, apices obtusely rounded; chloroplasts four, two in each semicell, median ones cylindrical, apical ones slightly conical, each chloroplast with about eight longitudinal plates, with the free margins entire; apical vacuole conspicuous, with a solitary moving granule.

Length 190 μ; Width 42-44 μ.

Collected in the Wichita Mts., April 26, 1930.

SUBFAMILY II PLACODERMAE

PENIUM Bréb., 1844.

Cells straight, cylindrical, subcylindrical, ellipsoidal, or fusiform, unconstricted or with a slight median constriction, apices rounded, subtruncate or truncate; with one axile chloroplast in each semicell, consisting of a central mass with several radiating longitudinal plates which are entire at their free edges, pyrenoids one or more in each chloroplast, arranged in an axile series; cell-wall usually with pores and some form of granules or scrobiculations.

1. (3) Cells unconstricted, no distinct demarcation between the old and young semicells; walls smooth 2
2. Cells never cylindrical, attenuated towards each end. *P. Navicula*
3. (1) Cells rather distinctly constricted in the middle; with a distinct demarcation between old and young semicells. 4
4. Cell-wall either minutely or coarsely granular 5
5. Cell-wall granulate over entire surface. *P. margaritaceum*

Penium Navicula Bréb.

Pl. 6, Fig. 5.

West, British Desmidiaceae, Vol. 1, p. 75, Pl. 7, Figs. 12-15, 19.
Wolle, Desmids of the U. S., p. 76, Pl. 5, Fig. 16.
Migula, Kryptogamenflora, Algen, p. 365, Pl. 22 B, Fig. 11.
Cooke, British Desmids, p. 42, Pl. 16, Fig. 5.
Nordstedt, Index Desmidiacearum, p. 180; Suppl., p. 87.

Cells small, about 3½-4 times longer than broad, not constricted, fusiform, poles broadly rounded; cell-wall smooth; chloroplasts axile, with 5-7 radiating plates, and 1-2 axile pyrenoids. Apical vacuoles with several small moving granules.

Length 72 μ; Width 18-20 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Penium margaritaceum (Ehrenb.) Bréb.

Pl. 4, Fig. 7.

West, British Desmidiaceae, Vol. 1, p. 83, Pl. 8, Figs. 32-35.
Migula, Kryptogamenflora, Algen, p. 368, Pl. 22 B, Fig 5.
Wolle, Desmids of the U. S., p. 34, Pl. 5, Figs. 5, 6, 11.

Hylander, Algae of Conn., p. 67, Pl. 9, Fig. 31.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 7, Pl. 52, Fig. 6.
Ralfs, British Desmidieae, p. 149, Pl. 33, Fig. 3.
Cooke, British Desmids, p. 38, Pl. 17, Fig. 11.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 5, Pl. 1, Fig. 5.
Nordstedt, Index Desmidiacearum, p. 198; Suppl., p. 96.

Cells large, 6-8 times longer than the diameter, cylindrical, with a distinct median constriction, apices truncate to obtusely rounded; cell-wall reddish brown in color, furnished with longitudinal rows of rather coarse granules; chloroplast an axile mass in each semicell with 8-10 radiating plates, usually showing a definite median interruption.

Length 120-210 μ; Width 21-27 μ; Isthmus width 18-23 μ.

Collected in the Winding Stair Mts., Dec. 23, 1929.

Closterium Nitzsch, 1817.

Cells elongated, always more or less attenuated, generally curved and often strongly arcuate or lunate, unconstricted; poles obtuse, truncate, rostrate or attenuated to fine needle like points; cell-wall smooth or striated, often brown or yellow-brown in color; one chloroplast in each semicell, with a variable number of longitudinal ridges; pyrenoids few or many, in a single axile series or scattered through the chloroplast; with a terminal vacuole between the end of the chloroplast and the extremity of the cell, containing one or many crystals of gypsum which exhibit a constant motion.

1. Cells without a median girdle 2
2. (12) Cells strongly curved 3
3. (5) Ventral margin not tumid, cell-wall smooth 4
4. Cells small, strongly curved, outer margin about 175 degrees of arc *Cl. incurvum.*
5. (3) Ventral margin distinctly tumid, cell-wall smooth 6
6. (8) Apices acutely rounded 7
7. Cells medium size, 135-190 degrees of arc, inner margin strongly concave, gradually attenuated to the apices. *Cl. Leibleinii*
8. (6) Apices obtusely rounded 9
9. Cells moderately curved, 110-120 degrees or arc 10
10. (11) Pyrenoids 6-7 in number, arranged in a single axile series *Cl. moniliferum*
11. (10) Pyrenoids numerous, scattered throughout the chloroplast *Cl. Ehrenbergii*
12. (2) Cells not strongly curved 13
13. Ventral margin straight or slightly concave 14
14. (22) Cell-wall smooth 15
15. (18) (19) Cells lanceolate, gradually attenuated to subacute poles 16
16. (17) Cells large, inner margin straight or slightly convex, apices acutely rounded. *Cl. lanceolatum*
17. (16) Cells smaller, inner margin broadly tumid, apices truncately rounded. *Cl. tumidum*
18. (15) (19) Cells suddenly attenuated to obtusely rounded poles, curvature regular. *Cl. attenuatum var.?*
19. (15) (18) Poles greatly attenuated, acute, subacute, or rounded 20
20. (21) Cells distinctly curved, inner margin not tumid, outer margin 45-60 degrees of arc. *Cl. acutum*
21 (20) Cells distinctly curved, inner margin distinctly tumid, outer margin 25-45 degrees of arc. *Cl. subulatum*
22. (14) Cell-wall striated 23
23 (24) Cells not inflated at the median portion, poles incurved *Cl. lineatum*
24. (23) Median portion of cells inflated, suddenly attentuated into long colorless poles. *Cl. rostratum*

Closterium incurvum Bréb.

Pl. 1, Fig. 12.

West, British Desmidiaceae, Vol. 1, p. 136, Pl. 15, Figs. 28-30.
Nordstedt, Index Desmidiacearum, p. 144, 277; Suppl., p. 69.

Cells small, 5-6 times longer than the diameter, strongly curved, outer margin 175 degrees of arc, inner margin not tumid, strongly attenuated to the acute apices; cell-wall smooth and colorless; chloroplasts with 2-3 pyrenoids in a central series; terminal vacuoles with several small moving granules.

This specimen is much larger than the one drawn by West, and although I feel that it is the same species, it is quite possible that it may represent a larger variety.

Length 96-105 μ; Width 18-21 μ.

Collected in the Arbuckle Mts., Oct. 26, 1929.

Closterium Leibleinii Kütz.

Pl. 1, Fig. 6.

West, British Desmidiaceae, Vol. 1, p. 141, Pl. 53, Figs. 9-14.
Conn, Algae of the Freshwaters of Conn., p. 61, Pl. 25, Fig. 166.
Hylander, Algae of Conn., p. 71, Pl. 8, Fig. 16.
Cooke, British Desmids, p. 25, Pl. 8, Fig. 1.
Ralfs, British Desmidieae, p. 167, Pl. 28, Fig. 4.
Wolle, Desmids of the U. S., p. 46, Pl. 7, Figs. 13, 20.
Migula, Kryptogamenflora. Algen, p. 367, Pl. 23, Fig. 12.
Nordstedt, Index Desmidiacearum, p. 156, 278; Suppl., p. 76.

Cells variable in size, usually medium size, about 6-8 times longer than broad, strongly curved, outer margin about 130 degrees of arc, inner margin concave, with a slightly tumid condition at the middle, gradually attenuated to acute or subacuminate apices; cell-wall smooth and colorless; chloroplasts with 5-6 ridges, and a row of 2-8 pyrenoids; terminal vacuoles large, with numerous large, moving granules.

Length 45-121 μ; Width 9.5-20 μ.

Collected in Shawnee Lake, near Miami, April 4, 1930; at Muscle Shoals, Norman, Oct. 22, 1930.

Closterium moniliferum (Bory) Ehrenb.

Pl. 1, Fig. 3

West, British Desmidiaceae, Vol. 1, p. 142, Pl. 16, Figs. 15, 16.
Migula, Kryptogamenflora. Algen, p. 377, Pl. 22 C, Fig. 14.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 12, Pl. 1, Fig. 26.
Cooke, British Desmids, p. 24, Pl. 12, Fig 3.
Ralfs, British Desmidieae, p. 166, Pl. 28, Fig. 3.
Wolle, Desmids of the U. S., p. 45, Pl. 7, Fig. 16.
Hylander, Algae of Conn., p. 70, Pl. 8, Fig. 28.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 9, Pl. 52, Fig. 10.
Nordstedt, Index Desmidiacearum, p. 173, 278; Suppl., p. 85.

Cells medium size, about 5-6 times longer than the diameter, moderately curved, outer margin 115-133 degrees or arc, inner margin with a distinct inflation at the middle, uniformly narrowed to obtusely rounded apices; cell-wall smooth and colorless; chloroplasts with about 6-8 distinct ridges, and a single series of 5-8 pyrenoids; terminal vacuoles with several moving granules.

Length 192-216 μ; Width 36-48 μ.

Collected in the Arbuckle Mts., Oct. 26, 1929; Indian Springs, Norman, Nov. 2, 1929.

Closterium Ehrenbergii Menegh.

Pl. 1, Fig. 5.

West, British Desmidiaceae, Vol. 1, p. 143, Pl. 17, Figs. 1-4.
Migula, Kryptogamenflora. Algen, p. 377, Pl. 22 C, Fig. 15.
Cooke, British Desmids, p. 23, Pl. 12, Fig. 2.
Wolle, Desmids of the U. S., p. 45, Pl. 7, Fig. 16.
Ralfs, British Desmidieae, p. 166, Pl. 28, Fig. 2.
Hylander, Algae of Conn., p. 70, Pl. 9, Fig. 8.
Nordstedt, Index Desmidiacearum, p. 277; Suppl., p. 55.

Cells large, rather stout, 5-5½ times longer than the diameter, moderately curved, outer margin 111 degrees of arc, inner margin concave, slightly inflated at the middle, gradually attenuated to obtusely rounded apices; cell-wall smooth and colorless; chloroplasts with about 7-8 ridges, numerous scattered pyrenoids; terminal vacuole with several granules.

Length 210-270 μ; Width 40-50 μ.

Collected in the Wichita Mts., April 26, 1930.

Closterium lanceolatum Kütz.

Pl. 1, Fig. 2.

West, British Desmidiaceae, Vol. I, p. 149, Pl. 17, Figs 9, 10; Pl. 18, Fig. 2.
Migula, Kryptogamenflora. Algen, p. 378, Pl. 23 B, Fig. 4.
Cooke, British Desmids, p. 21, Pl. 19, Fig. 2.
Ralfs, British Desmidieae, p. 164, Pl. 28, Fig. 1.
Hylander, Algae of Conn., p. 75, Pl. 8, Fig. 32.
Nordstedt, Index Desmidiacearum, p. 155, 278; Suppl., p. 75.

Cells large, 5-7 times longer than the diameter, sublanceolate, apices forming almost a straight line, outer margin slightly curved, 49 degrees of arc, inner margin very slightly convex, gradually narrowed toward the acutely rounded apices; cell-wall smooth and colorless; chloroplasts with 8-10 ridges and a central row of 6-8 pyrenoids; terminal vacuole with a number of moving granules.

Length 264-288 μ; Width 38-48 μ.

Collected in the Arbuckle Mts., Oct. 26, 1929.

Closterium tumidum Johnson

Pl. 1, Fig. 4.

West, British Desmidiaceae, Vol. 1, p. 156, Pl. 19, Figs. 15-18.
Hylander, Algae of Conn., p. 74, Pl. 8, Fig. 21.
Nordstedt, Index Desmidiacearum, p. 262; Suppl., p. 129.

Cells medium size, about 8-9 times longer than broad, curvature usually slight, outer margin about 72 degrees of arc, inner margin broadly tumid in the middle, slightly concave toward the truncately rounded apices; cell-wall smooth and colorless; chloroplasts with 4-6 ridges, and a median row of pyrenoids; terminal vacuole with a solitary, rather large, moving granule.

Length 102-114 μ; Width 12-14 μ.

Collected in Cedar Creek, near Broken Bow, Dec. 23, 1929.

Closterium attenuatum Ehrenb. var.?

Pl. 1, Fig. 7.

West, British Desmidiaceae, Vol. 1, p. 169, Pl. 22, Figs. 1-3.
Ralfs, British Desmidieae, p. 169, Pl. 29, Fig. 5.
Homfeld, Kenntnis des Desmidiaceen Nordwestdeutschlands, Pflanzenforschung. Heft 12. p. 17, Pl. 1, Fig. 7.
Cooke, British Desmids, p. 32, Pl. 14, Fig. 1.
Wolle, Desmids, of the U. S., p. 41, Pl. 8, Fig. 5.
Migula, Kryptogamenflora. Algen, p. 383, Pl. 23, Fig. 13.
Nordstedt, Index Desmidiacearum, p. 54; Suppl., p. 28.

Cells rather large, about 7 times longer than the diameter, slightly curved, outer margin about 45 degrees of arc, inner margin not tumid, gradually attenuated towards each end which is suddenly narrowed to an obtuse cone; cell-wall smooth, colorless, or faintly tinged with yellow; chloroplasts massive, 14-18 ridged, ridges regularly and deeply incised; pyrenoids many, large, scattered throughout the chloroplast; terminal vacuoles with 9-12 moving granules.

This form varies from *Cl. attenuatum* Ehrenb. in the absence of a striated cell-wall, the massive chloroplast, and the length, which is almost twice that of the type form.

Length 730 μ; Width 100 μ.

Collected in Shawnee Lake, near Miami, April 6, 1931.

Closterium acutum (Lyngbye) Bréb.

Pl. 1, Fig. 9.

Smith, Phytoplankton of the Inland Lakes of Wis., p. 11, Pl. 53, Fig. 4.
Hylander, Algae of Conn., p. 78, Pl. 8, Fig. 3.
Ralfs, British Desmidieae, p. 177, Pl. 30, Fig. 5.
Wolle, Desmids of the U. S., p. 44, Pl. 7, Figs. 11, 12.
Cooke, British Desmids, p. 35, Pl. 14, Fig. 5.
Migula, Kryptogamenflora. Algen, p. 387, Pl. 23 D, Fig. 7.
West, British Desmidiaceae, Vol. 1, p. 177, Pl. 23, Figs. 9-14.
Nordstedt, Index Desmidiacearum, p. 39; Suppl., p. 21.

Cells moderately small, about 25 times longer than the diameter, slightly curved, outer margin about 76 degrees of arc, inner margin not distinctly tumid, gradually attenuated to acute apices; cell-wall smooth and colorless; each chloroplast with 2-3 small pyrenoids; terminal vacuoles with several small granules.

Length 163 μ; Width 6-7 μ.

Collected at Horseshoe Lake, Harrah, Nov. 2, 1930.

Closterium subulatum (Kütz) Bréb.

Pl. 1, Fig. 8.

West, British Desmidiaceae, Vol. 1, p. 179, Pl. 23, Figs. 16-19.
Nordstedt, Index Desmidiacearum, p. 248; Suppl., p. 123.

Cells small, slightly curved, 13-16 times longer than the diameter, outer margin 36 degrees of arc, inner margin slightly tumid, apices gradually attenuated from the middle, subtruncate to rounded; cell-wall smooth and colorless; chloroplasts with three pyrenoids; terminal vacuoles with several moving granules.

Length 148-150 μ; Width 9-11 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Closterium lineatum Ehrenb.

Pl. 1, Fig. 10.

West, British Desmidiaceae, Vol. 1, p. 181, Pl. 24, Figs. 1-5.
Hylander, Algae of Conn., p. 72, Pl. 8, Fig. 8.
Nordstedt, Index Desmidiacearum, p. 158, 278; Suppl., p. 77.

Cells large, long and narrow, about 14 times longer than the diameter, moderately curved, median portion of cell straight and cylindrical, inner margin faintly and widely tumid, gradually attenuated to the broad, truncately rounded apices; cell-wall striated, about 17 striae across cell, yellow-brown in color; chloroplasts 7-9 ridged, with a median row of about 8 pyrenoids; terminal vacuole with a number of small moving granules.

Length 324 μ; Width 24-27 μ.

Collected in the Winding Stair Mts., Dec. 23, 1929.

Closterium rostratum Ehrenb.
Pl. 1, Fig. 1.

West, British Desmidiaceae, Vol. 1, p. 188, Pl. 26, Figs. 1-5.
Conn, Algae of the Freshwaters of Conn., p. 61, Pl. 15, Fig. 168.
Johnson , Algae of Conn., p. 72, Pl. 8, Fig. 9.
Migula, Kryptogamenflora. Algen, p. 388, Pl. 23, Fig. 14.
Ralfs, British Desmidieae, p. 175, Pl. 30, Fig. 3.
Cooke, British Desmids, p. 33, Pl. 14, Fig. 3.
Wolle, Desmids of the U. S., p. p. 46, Pl. 8, Figs. 1, 2, 3.
Nordstedt, Index Desmidiacearum, p. 225; Suppl., p. 110.

Cells medium size, about 19 times longer than the diameter, slightly curved, median portion of cell fusiform, outer margin slightly less convex than the inner, apices prolonged into long colorless, slightly incurved processes, tips obtuse and slightly dilated cell-wall yellowish, finely striated, 25-26 striae showing; chloroplasts 5-6 idged, with a median series of 7-8 pyrenoids; terminal vacuoles large, at the base of the processes, and containing 12-15 moving granules.

Length 470 μ; Width 25 μ.

Collected in Shawnee Lake near Miami, April 9, 1930.

ROYA West & G. S. West, 1896.

Cells very slightly arcuate, almost exactly cylindrical, scarcely attenuated towards the extremities, apices subtruncate or obtusely rounded; cell-wall smooth and colorless; one chloroplast in each cell, generally with a small excavation in the middle of the concave side in which the nucleus is lodged; the extremities of the chloroplast are convex and extend almost to the extreme ends of the cell, there not being any apical vacuoles nor moving granules; pyrenoids 4-14 in a single series.

Roya obtusa (Bréb.) West & G. S. West
Pl. 4, Fig. 9.

West, British Desmidiaceae, Vol. 1, p. 107, Pl. 10, Fig. 27.
Nordstedt, Index Desmidiacearum, p. 278; Suppl., p. 91.

Cells small, cylindrical, 1½-8 times longer than the diameter, very slightly curved, apices obtusely rounded; chloroplast a long band the entire length of the cell, with an eccentric notch at the center, and containing 2-8 pyrenoids. Zygospore globose and smooth.

Length 22-120 μ; Width 12-15 μ.

Great quantities of this Desmid were collected in the condensation tank of the heating department of the University of Oklahoma, where they formed green gelatinous masses covering the cement bottom and sides of the tank. This was the only conjugating Desmid collected.

PLEUROTAENIUM Näg., 1849.

Cells straight, elongated and cylindrical, circular in end view, constriction slight, with a prominently projecting suture; semicells commonly with an inflated base, never plicate, lateral margins straight, undulate or nodulose; apices truncate or truncately rounded, usually furnished with a peripheral ring of tubercles; cell-wall rarely smooth, commonly punctate or finely scrobiculate, sometimes granulose or papillate. Chloroplasts numerous, parietal, arranged in regular longitudinal bands which frequently

break up into small rhomboidal or lanceolate masses, each having a single pyrenoid.

1. Cells cylindrical; end view circular ---------- 2
2. Cell-wall punctate or granulate ---------- 3
3. (5) Apices with tubercles ---------- 4
4. Cells narrow and elongate, having a single distinct basal inflation. *P. Ehrenbergii*
5 (3) Apices without tubercles ---------- 6
6. Cells subcylindrical, semicells subclavate, having one large basal inflation with small undulation above it. *P. Trabicula*

Pleurotaenium Trabicula (Ehrenb.) Nāg.
forma *clavata* (Kütz.) West & G. S. West
Pl. 5, Fig. 1.

West, British Desmidiaceae, Vol. 1, p. 211, Pl. 31, Figs. 8, 9.
Nordstedt, Index Desmidiacearum, p. 256; Suppl., p. 126.

Cells large, subcylindrical, about 10 times longer than the diameter; semicells with one large basal inflation, and a second smaller undulation above it, slightly tumid and subclavate; apices rounded truncate, no tubercles; cell-wall finely punctate.

Length 480 μ; Width 48 μ.

Collected at Indian Springs, Norman, throughout the fall and spring of 1929 and 1930.

Pleurotaenium Ehrenbergii (Bréb.) De Bary
Pl. 5, Fig. 2.

West, British Desmidiaceae, Vol. 1, p. 205, Pl. 29, Figs. 9-11; Pl. 30, Fig. 1.
Migula, Kryptogamenflora, Algen, p. 393, Pl. 23 E, Fig. 1.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 15, Pl. 54, Figs. 5, 6.
Nordstedt, Index Desmidiacearum, p. 205, 277; Suppl., p. 55.

Cells medium size, narrow and elongate, about 11-12 times longer than the diameter; semicells variable, slightly attenuated from base to apex, with a distinct basal inflation and a very slight undulation just above it; apices truncate, bordered by a ring of 7-8 tubercles; cell-wall punctate.

Length 384 μ; Width at base of semicells 27 μ; Width at middle of semicells 33 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Tetmemorus Ralfs, 1844.

Cells elongated, straight, cylindrical or fusiform-cylindrical, slightly compressed at the apices, constriction slight, with a very narrow incision in the middle of each apex, apical angles rounded; vertical view circular or broadly elliptical; cell-wall minutely scrobiculate, or punctate; chloroplast single with an axile row of pyrenoids.

Tetmemorus laevis (Kütz.) Ralfs.
Pl. 4, Fig. 13.

West, British Desmidiaceae, Vol. 1, p. 222, Pl. 32, Figs. 11-16.
Wolle, Desmids of the U. S., p. 91, Pl. 50, Fig. 35.
Hylander, Algae of Conn., p. 78, Pl. 10, Fig. 6.
Cooke, British Desmids, p. 49, Pl. 19, Fig. 2.
Ralfs, British Desmidieae, p. 146, Pl. 24, Fig. 3.
Nordstedt, Index Desmidiacearum, p. 153; Suppl., p. 74.

Cells medium size, about 5 times longer than broad, with a slight median constriction; semicells gradually attenuated toward the apices; apex broadly rounded in face view, with a deep median incision, apex in

side view sharply compressed; cell-wall minutely punctate; chloroplasts axile, with 3-4 axile pyrenoids.

Length 138 μ; Width 28-29 μ; Isthmus width 24-25 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Euastrum Ehrenb., 1832.

Cells of variable size, longer than broad, compressed. constriction deep, sinus generally linear; semicells commonly truncate-pyramidate, apex with an incision of variable depth, sometimes indistinct or absent, lateral margins entire, sinuate or variously lobed, at or near the center of the semicells with one or more somewhat hemispherical protuberances variously disposed; vertical view more or less elliptical with one or more protuberances on each side; chloroplast solitary in each semicell, often irregularly lobed or ridged, with a single, central pyrenoid in the small species, and a number of scattered ones in the larger species.

1. (6) Polar lobe with a median notch, often deep and linear 2
2. Cells rather small 3
3. Cell-wall smooth, granulate, spinous, polar lobe with a spine on external angles 4
4 (5) Lateral margins lobed. *E. bidentatum*
5. (4) Lateral margins usually without lobes. *E. pulchellum*
6. (1) Polar lobe entire, apex slightly retuse 7
7. Cells large 8
8. Margin distinctly three lobed 9
9. Cell-wall granulate *E. verrucosum*

Euastrum bidentatum Näg.

Pl. 2, Fig. 20.

West, British Desmidiaceae, Vol. 2, p. 39, Pl. 37, Figs. 16-19.
Migula, Kryptogamenflora. Algen, p. 498. (Given as a variety of *E. elegans*)
Hylander, Algae of Conn., p. 80, Pl. 10, Fig. 14.
Nordstedt, Index Desmidiacearum, p. 58; Suppl., p. 30.

Cells small, about 1 2/3 times longer than broad, deeply constricted, sinus narrowly linear with a dilated apex; semicells subpyramidate, with bilobulate sides, lower lobule furnished with one or two granules on either side; upper lobule rounded to rounded-truncate; apex slightly convex, with a deep median notch, which may be open or closed, with a blunt spine on each side; semicells with a granulated protuberance on each side above the isthmus. Side view of semicell pyramidate-ovate, with a granulate protuberance at the base; apex rounded.

Length 42-50 μ; Width 25-34 μ; Width of end lobe 15-34 μ; Isthmus width 5-6 μ.

Collected in the Winding Stair Mts., Dec. 23, 1929.

Euastrum pulchellum Bréb.

Pl. 6, Fig. 19.

West, British Desmidiaceae, Vol. 2, p. 46, Pl. 38, Figs. 14, 15.
Hylander, Algae of Conn., p. 80, Pl. 10, Fig. 20.
Nordstedt, Index Desmidiacearum, p. 211; Suppl., p. 103.

Cells small, 1 1/3 times longer than broad, very deeply constricted, sinus narrowly linear with a slightly dilated apex; semicells three lobed with a wide shallow sinus between the lobes; polar lobe widely rectangular, apex truncate with a deep, narrow incision, apical angles with a short divergent spine; lateral lobes rounded-quadrate, with three marginal acute granules; semicells with a protuberance in the center above the isthmus, and a large granule on each side of the apical incision.

Length 27-28 μ; Width 21 μ; Width of end lobe 12 μ; Isthmus width 4-5 μ.

Collected in the Winding Stair Mts., Dec. 23, 1929.

Euastrum verrucosum Ehrenb.

Pl. 3, Fig. 1.

West, British Desmidiaceae, Vol. 2, p. 64, Pl. 40, Fig. 1.
Migula, Kryptogamenflora. Algen, p. 489, Pl. 26, Fig. 6.
Lindau, Kryptogamenflora für Angfänger. Die Algen, p. 63, Pl. 5, Fig. 201.
Ralfs, British Desmidieae, p. 79, Pl. 11, Fig. 2.
Wolle, Desmids of the U. S., p. 100, Pl. 26, Figs. 1-5.
Hylander, Algae of Conn., p. 78, Pl. 10, Fig. 21.
Nordstedt, Index Desmidiacearum, p. 268, 281; Suppl., p. 132.

Cells moderately large, subhexagonal, somewhat longer than broad, deeply constricted, sinus narrowly linear; semicells three lobed, interlobular incisions deep but open; polar lobe widely cuneate, angles rounded and granulate, apex retuse; lateral lobes about as wide as the polar lobe, cuneate and bilobulate, lower lateral lobule subconical, rounded, granulate, and horizontally directed, upper lateral lobule granulate, divergent upward and outward; semicells with three large protuberances across the broadest part, the central one the largest, each protuberance with large granules in concentric circles; cell-wall granulate. Side view of semicell inflated at the lower part owing to the central protuberances. Apical portion slightly dilated, angles rounded, apex retuse. Vertical view elliptic, poles granulate, with three large protuberances on each side.

Length 84-90 μ; Width 72-81 μ; Width of end lobes 36-39 μ; Isthmus width 18-24 μ.

Collected in the Winding Stair Mts., Dec. 23, 1929.

Micrasterias Ag., 1827.

Cell size variable, often large, usually a little longer than broad, sometimes subcircular in outline, usually compressed, constriction deep, sinus usually linear, sometimes opening outwards; semicells subsemicircular, from three to five lobed; polar lobe widely cuneate, emarginate, or widely notched; lateral lobes usually bilobulate, lobules slightly lobed; median basal portion of semicells without protuberances; vertical view elliptic-lanceolate or linear lanceolate; one lobed chloroplast in each semicell, with many scattered pyrenoids.

1. (7) Polar lobe with a median incision of variable depth, four lateral lobes to each semicell, radially arranged, and opening outwards ---------- 2
2. Lateral lobes much divided, incisions narrow ---------- 3
3. (4) Interlobular incisions shallow, polar lobe widely cuneate, apex convex with a slight depression. *M. truncata*
4. (3) Interlobular incisions deep ---------- 5
5. (6) •Cells almost circular in outline. *M. Sol*
6. (5) Cell subelliptic or subcircular in outline. *M. papillifera* var. *glabra*
7. (1) Polar lobe with accessory processes; two lateral lobes. *M. americana*

Micrasterias truncata (Corda.) Bréb.

Pl. 3, Fig. 5.

West, British Desmidiaceae, Vol. 2, p. 84, Pl. 42, Figs. 1-8; Pl. 45, Figs. 5, 6.
Migula, Kryptogamenflora. Algen, p. 504, Pl. 25, Fig. 5.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 68, Pl. 6, Fig. 220.
Ralfs, British Desmidieae, p. 75, Pl. 8, Fig. 4; Pl. 10, Fig. 5.
Cooke, British Desmids, p. 60, Pl. 25, Fig. 2.

Wolle, Desmids of the U. S., p. 114, Pl. 38, Figs. 6-9.
Hylander, Algae of Conn., p. 82, Pl. 10, Fig. 28.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 43, Pl. 60, Figs. 1, 2.
Nordstedt, Index Desmidiacearum, p. 260, 281; Suppl., p. 128.

Cells somewhat small, slightly broader than long, elliptical with wide truncate poles, constriction deep, narrowly linear, opening slightly towards the outside; semicells five lobed, incisions below the polar lobe deep and linear, incisions between the lateral lobes shallow and open, each lateral lobe bilobulate with emarginate lobules; polar lobe widely cuneate, apex convex with a slight depression at the center. Side view flattened-ovate. Vertical view fusiform-elliptic, poles acute. Cell-wall finely punctate.

Length 93-102 μ; Width 107-110 μ; Isthmus width 12-23 μ.

Collected in the Wichita Mts., April 26, 1930.

Micrasterias Sol? (Ehrenb.) Kütz.

Pl. 3, Fig. 3.

West, British Desmidiaceae, Vol. 2, p. 95, Pl. 46, Figs. 1, 2.
Brown, Desmids of the Southeastern Coastal Plain Region of the U. S., p. 114, Pl. 12, Fig. 23.
Nordstedt, Index Desmidiacearum, p. 235; Suppl., p. 114.

Cells almost circular in outline, constriction deep, sinus reaching almost to the center of the cell, slightly open throughout; semicells five lobed, interlobular incisions slightly open; polar lobe with almost parallel sides, expanding outwards, apical margin retuse-emarginate, each angle with a small tooth within the apical margin; lateral lobes unequal in size, the upper ones larger and more divided; lower lateral lobe divided into four divisions, the central incision the deepest, each ultimate lobule furcate-dentate at the margin; upper lateral lobe divided into eight equal divisions, the central incision being the deepest, lobules furcate-dentate at the margins. Vertical view linear-fusiform, poles acute, with a flattened protuberance at the middle on each side. Cell-wall finely punctate.

Length 134-137 μ; Width 120-123 μ; Width of the polar lobe at the apex 31-33 μ; Isthmus width 18 μ.

Collected in the Wichita Mts., April 9, 1929.

Micrasterias papillifera Bréb. var. *glabra* Nordst.

Pl. 3, Fig. 2.

West, British Desmidiaceae, Vol. 2, p. 93, Pl. 44, Figs. 4, 5.
Nordstedt, Index Desmidiacearum, p. 194, 279; Suppl., p. 94.

Cells rather large, somewhat longer than broad, subcircular, constriction deep with a narrowly linear sinus, apex not inflated; semicells five lobed, lobes equal in size and shape, interlobular incisions narrowly linear; polar lobe cuneate with concave sides, apex concave with a slight median concavity, each angle produced into two processes with a pair of teeth on each side of the concavity; lateral lobes cuneate, almost equal in breadth, each divided into two lobules by a rather deep incision, the lobules are again divided, resulting in four emarginate divisions. Cells without the granules along the incisions as in *M. papillifera*.

Length 156 μ; Width 135 μ; Isthmus width 33 μ.

Collected in the Winding Stair Mts., Dec. 23, 1929.

Micrasterias Americana (Ehrenb.) Ralfs
Pl. 3, Fig. 4.

West, British Desmidiaceae, Vol. 2, p. 117, Pl. 53, Figs. 4, 5; Pl. 54, Figs. 1, 3.
Migula, Kryptogamenflora. Algen, p. 509, Pl. 25 B, Fig. 5.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 67, Pl. 6, Fig. 216.
Cooke, British Desmids, p. 56, Pl. 30, Fig. 1.
Wolle, Desmids of the U. S., p. 112, Pl. 32, Figs 2-5.
Hylander, Algae of Conn., p. 82, Pl. 11, Fig. 7.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 52, Pl. 63, Fig. 5; Pl. 64, Fig. 2.
Nordstedt, Index Desmidiacearum, p. 42, 274; Suppl., p. 22.

Cells medium size, about 1¼ times longer than broad, subhexagonal, constriction deep, acute at the apex, opening outwards; semicells distinctly five lobed, end lobe about as wide as the combined width of the two lateral lobes, expanded from the base outward, apical margins widely retuse, each angle being produced into a thick divergent process with the ends truncately toothed, a secondary similar process arises at the base of each primary process and is asymmetrically located on each side of the polar lobe; incisions on each side of the polar lobe deep and wide open; two small papillae like projections at the base of each incision, one on each side of the apex, lateral lobes separated by an open, shallow incision, whose apex is rounded or obtuse; each lobe divided again into two smaller lobes by an open shallow incision, each small lobe with 4-7 acute teeth at their extremity; chloroplast axile, five lobed, end lobe retuse or incised.

Length 150 μ; Maximum width 120 μ; Maximum width of end lobe 63-66 μ; Isthmus width 33-36 μ.

Collected in the Winding Stair Mts., Dec. 23, 1929.

Cosmarium Corda, 1834.

Cells varying in size, usually slightly longer than broad, rarely twice as long as broad, generally compressed, symmetrical in three planes at right angles to each other; median constriction varying in depth; semicells elliptical, subcircular, semicircular, subquadrate, or truncate-pyramidate, apex rounded, truncate or subtruncate, no apical incision, center sometimes protuberant; vertical view elliptic, subelliptic, oblong, or sometimes circular, often having one or more central protuberances on either side. Chloroplasts usually axile, with four curved longitudinal plates, and one or two central pyrenoids, parietal in some forms with one pyrenoid in each of the 4-8 masses. Cell-wall smooth, punctate, scrobiculate, granulate, or papillate, and having the sculpturing in some definite pattern.

1. (61) Cell-wall smooth, or very finely punctate, marginal outline never granular or warty, undulations sometimes present ---- 2
2. (15) (36) (55) Semicells semicircular, subsemicircular, or circular ---- 3
3. (5) (11) Semicells semicircular ---- 4
4. Cells of medium size, almost circular, deeply constricted, margin entire. *C. circulare*
5. (3) (11) Semicells subcircular ---- 6
6. Constriction slight ---- 7
7. (9) Cell-wall smooth ---- 8
8. Semicells widely subovate; vertical view subcircular. *C. pseudarctoum*
9. (7) Cell-wall punctate ---- 10
10. Semicells semielliptic; vertical view circular. *C. pseudoconnatum*
11. (3) (5) Semicells circular ---- 12
12. Cells small, constriction deep, sinus open and acute; both vertical and side views of cell circular ---- 13
13. (14) Cell-wall smooth. *C. moniliforme*
14. (13) Cell-wall punctate. *C. moniliforme* forma *punctata*

15. (2) (36) (55) Semicells semielliptic, subelliptic, narrowly elliptic, elliptic-reniform, or transversely-hexagonal 16
16. (19) (21) (27) (30)Semicells semielliptical 17
17. (18) Cells large, about 1 1/3 times longer than broad, widely semielliptic, constriction very deep. *C. pachydermum var. aetheopicum*
18. (17) Cells about twice as long as broad, broadly elliptic, constriction moderately deep. *C. subcucumis*
19. (16) (21) (27) (30) Semicells subelliptic 20
20. Cells rather small, about 1 1/5 times longer than broad, constriction very deep, with the sinus opening rapidly outward, wall smooth. *C. contractum var. ellipsoidum*
21. (16) (19) (27) (30) Semicells narrowly elliptic 22
22. Cells rather small, length slightly (more or less) than the breadth. 23
23. (25) Semicells strongly depressed, transversely subelliptic 24
24. Apex convex-truncate; cell-wall finely punctate. *C. depressum*
25. (23) Semicells subhexagonal-elliptic 26
26. Apex rather broad and truncate. *C. depressum var. achondrum*
27. (16) (19) (21) (30)Semicells elliptic reniform 28
28. Semicells with a slight protuberance on either side at the middle 29
29. Cells small, about 1¼ times longer than broad, semicells reniform. *C. Phaseolus*
30. (16) (19) (21) (27)Semicells transversely hexagonal 31
31. Semicells in vertical view showing a distant central protuberance on each side 32
32. (34) Lateral angles slightly produced and rounded 33
33. Sides retuse, apex retuse, cell-wall smooth. *C. polygonum*
34. (32) Lateral angles not produced and not rounded 35
35. Apex broadly truncate, cell-wall smooth. *C. Schliephackeanum*
36. (2) (15) (55) Semicells pyramidate 37
37. (50) Marginal outline of semicells entire 38
38. (47) Lateral margin of the truncate-pyramidate semicell retuse 39
39. (42) Basal angles broadly rounded, cell-wall smooth 40
40. (41) Cells moderate in size, vertical view elliptic. *C. Hammeri*
41. (40) Cells small, vertical view with a median tumor on each side. *C. Hammeri* var. *protuberans*
42. (39) Basal angles sharply rounded, lateral angles at the base almost parallel 43
43. (45) Cell-wall finely punctate 44
44. Cells medium size, apex rounded to straight. *C. granatum*
45. (43) Cell-wall smooth 46
46. Semicells six angled, the upper angles obtuse forming a broadly convex apex. *C. angulatum*
47 (38) Lateral margins of the pyramidate semicell convex 48
48. Cells large, 1¾-2 times longer than broad 49
49. Lateral margins slightly convex, lower angles sharply rounded, upper broadly rounded, apex rounded to straight. *C. pyramidatum*
50 (37) Marginal outline of semicells undulate to crenate 51
51. (53) Lateral margins of semicells constricted just below the apices 52
52. Apex broadly truncate, produced and biundulate. Side view of semicell rectangular. *C. Holmiense*
53. (51) Lateral margins of semicells not constricted just below the apices, but four undulate 54
54. Semicells subquadrate, tapering slightly toward the apices, which are slightly undulate. *C. tetragonum*
55. (2) (15) (36) Semicells rectangular 56
56. (58) Superior angles of semicells rounded 57
57. Cells moderately large, 1 5/6-1 2/3 times longer than broad, constriction deep, lateral margins slightly convex. Cell-wall minutely punctate. *C. plicatum* forma *major*
58. (56) Superior angles of semicells not rounded 59
59. Cells very small, about 1 1/5 times longer than broad 60
60. Semicells transversely rectangular, sides and apices flat, cell-wall smooth. *C. minimum*
61. (1) Cell-wall in marginal outline granular, verrucose or warty 62
62. (69) (78) Semicells reniform or elliptical 63
63. (66) Semicells renifrom 64

64. Cells large, almost 1½ times longer than broad, wall distinctly and coarsely papillate ---- 65
65. Constriction deep, lower angles broadly rounded, apices not produced. *C. reniforme*
66. (63) Semicells elliptical ---- 67
67. Cells rather small, about 1½ times longer than broad ---- 68
68. Semicells coarsely granular, granules in rows. Isthmus more or less elongated. *C. Portianum*
69. (62) (78) Semicells pyramidate ---- 70
70. (74) Cells small to medium size, slightly longer than broad ---- 71
71. Apex truncate, straight, slightly undulate or retuse ---- 72
72. (72a) Semicells in vertical view with central protuberance ---- 73
72a. (72) Semicells in vertical view with two central protuberances. *C. Turpini*
73. Basal and upper angles obtuse, sides slightly convex, surface coarsely punctate, punctae in concentric rows, smaller at the margins. *C. vexatum*
74. (70) Cells large, about 1 1/3 times longer than broad ---- 75
75. Apex subtruncate, apical angles rounded ---- 76
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Cosmarium circulare Reinsch
Pl. 2, Fig. 2

West, British Desmidiaceae, Vol. 2, p. 136, Pl. 56, Figs. 11, 13, 14.
Migula, Kryptogamenflora. Algen, p. 421, Pl. 23 F, Fig. 2.
Nordstedt, Index Desmidiacearum, p. 73; Suppl., p. 37.

Cells medium size, almost circular in outline, slightly longer than broad, constriction deep, sinus narrow, linear, and closed, with a slightly dilated apex; semicells semicircular, basal angles rounded. Vertical view narrowly elliptic. Cell-wall finely punctate; chloroplasts axile, each with two axile pyrenoids.

Length 51 μ; Width 45-47 μ; Isthmus Width 17 μ.

Collected in the Wichita Mts., April 26, 1930.

Cosmarium pseudarctoum Nordst.
Pl. 6, Fig. 11.

West, British Desmidiaceae, Vol. 3, p. 33, Pl. 68, Figs. 12-14; Pl. 72, Figs. 40, 41.
Nordstedt, Index Desmidiacearum, p. 207; Suppl., p. 101.

Cells very small, about 1 1/5 times longer than broad, very slightly constricted, sinus only a shallow depression; semicells subovate with slightly convex apices. Vertical view subcircular. Cell-wall smooth; chloroplast single, axile, with one pyrenoid.

Length 24 μ; Width 21 μ; Isthmus width 15 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium pseudoconnatum Nordst.
Pl. 2, Fig. 3.

West, British Desmidiaceae, Vol. 3, p. 36, Pl. 67, Figs. 19-21.
Cooke, British Desmids, p. 124, Pl. 44, Fig. 3.
Migula, Kryptogamenflora. Algen, p. 413, Pl. 23 H, Fig. 9.
Hylander, Algae of Conn., p. 86, Pl. 8, Fig. 22.
Nordstedt, Index Desmidiacearum, p. 208; Suppl., p. 101.

Cells moderate size, about 1 1/3 times longer than broad, very slightly constricted by a broad shallow sinus; semicells semielliptic, outline about 2/3 the circumference of a circle. Vertical view circular. Cell-wall punctate; chloroplasts parietal, four in each semicell, each with one pyrenoid.

Length 59-62 μ; Width 45-47 μ;Isthmus width 42 μ.
Collected in the Wichita Mts., April 26, 1930.

Cosmarium moniliforme (Turp.) Ralfs
Pl. 6, Fig. 14.

West, British Desmidiaceae, Vol. 3, p. 20, Pl. 67, Figs. 1-3.
Ralfs, British Desmidieae, p. 107, Pl. 17, Fig. 6.
Wolle, Desmids of the U. S., p. 60, Pl. 15, Figs. 16-19.
Migula, Kryptogamenflora. Algen, p. 414, Pl. 23 H, Fig. 5.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 38, Pl. 3, Fig. 105.
Cooke, British Desmids, p. 119, Pl. 43, Fig. 2.
Nordstedt, Index Desmidiacearum, p. 173, 278; Suppl., p. 85.

Cells small, about 2 times longer than broad; semicells almost circular; constriction deep, sinus wide open and usually acute. Side view of semicell circular. Vertical view circular. Cell-wall smooth; one axile chloroplast in each semicell, with a solitary, large, axile pyrenoid.

Length 12-15 μ; Width 6-8 μ; Isthmus width 6 μ.
Collected in the Arbuckle Mts., Oct. 26, 1929.

Cosmarium moniliforme (Turp.) Ralfs
forma *punctata* Lagerh.
Pl. 2, Fig. 22.

West, British Desmidiaceae, Vol. 3, p. 22, Pl. 67, Fig. 4.
Nordstedt, Index Desmidiacearum, p. 173, 278; Suppl., p. 85.

Cells rather small, almost 2 times longer than broad, deeply constricted, sinus wide open and acute; semicells circular. Vertical view circular. Cell-wall finely punctate; chloroplast single in each semicell, with one axile pyrenoid, and about 4-6 radiating vertical plates.

Length 39-40 μ; Width 22-23 μ;Isthmus width 6-8 μ.
Collected in Panther Creek, Wichita Mts., Sept. 11, 1930.

Cosmarium pachydermum Lund. var. *aethiopicum nob.*
Pl. 2, Fig. 1.

West, British Desmidiaceae, Vol. 2, p. 140, Pl. 57, Figs. 8, 9.
Nordstedt, Index Desmidiacearum, Suppl., p. 94.

Cells large, broadly elliptic, about 1 1/3 times longer than broad, constriction very deep, sinus narrowly linear, apex dilated; semicells widely semielliptic, apices broadly rounded, basal angles broadly rounded. Vertical view elliptic. Cell-wall thinner than in the species, finely punctate; chloroplast an axile plate.

Length 92 μ; Width 73-75 μ; Isthmus width 29 μ.
Collected in Panther Creek, Wichita Mts., Sept. 11, 1930.

Cosmarium subcucumis Schmidle
Pl. 2, Fig. 13.

West, British Desmidiaceae, Vol. 2, p. 155, Pl. 60, Figs. 1-3.
Migula, Kryptogamenflora. Algen, p. 423, Pl. 23 F, Fig. 7.
Nordstedt, Index Desmidiacearum, p. 244; Suppl., p. 119.

Cells rather large, broadly elliptic, about twice as long as broad, constriction fairly deep, sinus linear, dilated at the apex; semicells elliptic, basal angles rounded, apex broadly convex. Vertical view elliptic; cell-wall smooth; chloroplast axile, each with 2 pyrenoids.

Length 78 μ; Width 33-39 μ; Isthmus width 28 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium contractum Kirchn. var. *ellipsoideum* (Elfv.) West & G. S. West
Pl. 6, Fig. 9.

West, British Desmidiaceae, Vol. 2, p. 172, Pl. 61, Figs. 28-35.
Nordstedt, Index Desmidiacearum, p. 80; Suppl., p. 40.

Cells small, only slightly longer than broad, deeply constricted, with the sinus rapidly opening outward; semicells elliptical; cell-wall smooth and colorless; chloroplasts axile, single, with one axile pyrenoid.

Length 18 μ; Width 15 μ; Isthmus width 8-9 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium depressum (Näg.) Lund.
Pl. 2, Fig. 6.

West, British Desmidiaceae, Vol. 2, p. 176, Pl. 62, Figs. 2-5.
Wolle, Desmids of the U. S., p. 64, Pl. 50, Figs. 10-12.
Hylander, Algae of Conn., p. 89, Pl. 11, Fig. 12.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 29, Pl. 57, Fig. 4.
Migula, Kryptogamenflora. Algen, p. 416, Pl. 23 F, Fig. 10.
Nordstedt, Index Desmidiacearum, p. 101; Suppl., p. 50.

Cells rather small, as broad or slightly broader than long, constriction deep, sinus narrowly linear, opening outwards; semicells strongly depressed, transversely subelliptic, apex convex-truncate, sides of semicell rounded. Side view of semicell circular. Vertical view elliptic. Cell-wall finely punctate; chloroplasts axile, each with one rather large pyrenoid.

Length 28 μ; Width 26-29 μ; Isthmus width 9-11 μ.

Collected at Horseshoe Lake, Harrah, Nov. 26, 1930.

Cosmarium depressum (Näg.) Lund. var. *achondrum*
(Boldt) West & G. S. West
Pl. 2, Fig. 7.

West, British Desmidiaceae, Vol. 2, p. 177, Pl. 62, Figs. 6-9.
Nordstedt, Index Desmidiacearum, Suppl., p. 50.

Cells as long as broad, or slightly longer; semicells subhexagonal-elliptic, apex broader and more truncate than *C. depressum*.

Length 37 μ; Width 32-34 μ; Isthmus width 8 μ.

Collected in Panther Creek, Wichita Mts., Sept. 11, 1930.

Cosmarium Phaseolus Bréb.
Pl. 6, Fig. 7.

West, British Desmidiaceae, Vol. 2, p. 158, Pl. 60, Figs. 12-14.
Migula, Kryptogamenflora. Algen, p. 416, Pl. 23 H, Fig. 20; Pl. 23 G, Fig. 6.
Wolle, Desmids of the U. S., p. 81, Pl. 18, Figs. 28-32.
Cooke, British Desmids, p. 88, Pl. 37, Fig. 3.
Ralfs, British Desmidieae, p. 106, Pl. 32, Fig. 5.
Nordstedt, Index Desmidiacearum, p. 199, 279; Suppl., p. 96.

Cells small, slightly longer than broad, constriction deep, sinus closed, apex slightly dilated; semicells reniform. Vertical view narrowly elliptic, with a slight protuberance at the middle on either side. Cell-wall finely punctate; chloroplasts single, axile, with one axile pyrenoid.

Length 30 μ; Width 24-27 μ; Isthmus width 8-9 μ.

Collected in Cedar Creek, near Broken Bow, Dec. 23, 1929.

Cosmarium polygonum (Näg.) Arch.

Pl. 6, Fig. 10.

Migula, Kryptogamenflora. Algen, p. 439, Pl. 23 K, Fig. 16.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 46, Pl. 4, Fig. 143.
West, British Desmidiaceae, Vol. 3, p. 76, Pl. 71, Figs. 32-34.
Nordstedt, Index Desmidiacearum, p. 203; Suppl., p. 98.

Cells small, slightly longer than broad, deeply constricted, sinus very narrowly linear; semicells transversely hexagonal, angles rounded; lateral ones slightly produced, sides slightly retuse, apex somewhat retuse. Vertical view elliptic, with a pronounced inflation at the middle on each side. Cell-wall smooth; chloroplast an axile plate with a single central pyrenoid.

Length 21 μ; Width 15 μ; Isthmus width 3-5 μ.

Collected in a pond on the South Canadian River Bottom, six miles northwest of Norman, Dec. 4, 1929.

Cosmarium Schliephackeanum Grun.

Pl. 6, Fig. 13.

Migula, Kryptogamenflora. Algen, p. 432, Pl. 23 K, Fig. 9.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 43, Pl. 4, Fig. 133.
Nordstedt, Index Desmidiacearum, p. 230; Suppl., p. 111.

Cells small, about 1¼ times longer than broad, rather deeply constricted, sinus narrowly linear, and open, apex not inflated; semicells transversely-hexagonal, angles not rounded, apex broadly truncate. Vertical view narrowly elliptic, with a rather sharp central protuberance on each side. Chloroplast an axile plate in each semicell, with one axile pyrenoid.

Length 15 μ; Width 12 μ; Isthmus width 3-4 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium Hammeri Reinsch.

Pl. 2, Fig. 8.

West, British Desmidiaceae, Vol. 2, p. 181, Pl. 62, Figs. 20-21.
Cooke, British Desmids, p. 81.
Wolle, Desmids of the U. S., p. 79, Pl. 18, Fig. 27.
Migula, Kryptogamenflora. Algen, p. 432, Pl. 23 F, Fig. 3.
Hylander, Algae of Conn., p. 87, Pl. 13, Fig. 1.
Nordstedt, Index Desmidiacearum, p. 137; Suppl., p. 65.

Cells rather small, about 1½ times longer than broad, subhexagonal, deeply constricted, sinus narrowly linear with a slightly dilated apex; semicells truncate-pyramidate, basal angles well rounded, upper parts of the lateral margins converging and retuse, upper angles rounded, apex truncate, almost straight. Side view of semicell elliptic ovate. Vertical view elliptic. Cell-wall smooth; chloroplasts axile with one pyrenoid.

Length 51-52 μ; Width 33 μ; Isthmus width 17-19 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium Hammeri Reinsch var. *protuberans* West & G. S. West
Pl. 6, Fig. 8.

West, British Desmidiaceae, Vol. 2, p. 183, Pl. 62, Figs. 24, 25.
Nordstedt, Index Desmidiacearum, p. 137; Suppl., p. 65.

Cells small; vertical view with a median tumor on each side; cell-wall smooth.

Length 27 μ; Width 24 μ; Isthmus width 8μ.

Collected in Panther Creek, Wichita Mts., Sept 11. 1930.

Cosmarium granatum Bréb.
Pl. 2, Fig. 10.

West, British Desmidiaceae, Vol. 2, p. 186, Pl. 63, Figs. 1-3.
Cooke, British Desmids, p. 83, Pl. 36, Fig. 9.
Ralfs, British Desmidieae, p. 96, Pl. 13, Fig. 15.
Hylander, Algae of Conn., p. 88, Pl. 13, Fig. 15.
Migula, Kryptogamenflora. Algen, p. 429, Pl. 23 J, Fig. 2.
Nordstedt, Index Desmidiacearum, p. 133, 277; Suppl., p. 64.

Cells medium size, about 1 1/3-1 ½ times longer than broad, subrhomboid-elliptic, deeply constricted, sinus narrow, linear, with a dilated apex; semicells subpyramidate, basal angles rounded to rectangular, sides at base almost parallel, converging toward the apex, apex truncate or slightly convex, upper angles obtuse. Vertical view narrowly elliptic. Cell-wall finely punctate; chloroplasts axile, each with one pyrenoid.

Length 27-45 μ; Width 21-31 μ; Isthmus width 4-7 μ.

Collected in the Arbuckle Mts., Oct. 26, 1929; Wichita Mts., April 26, 1930.

Cosmarium angulatum (Perty.) Rabenh.
Pl. 6, Fig. 12.

Migula, Kryptogamenflora. Algen, p. 419, Pl. 23 H, Fig. 18.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 39, Pl. 3, Fig. 111.
Nordstedt, Index Desmidiacearum, p. 44, 274; Suppl., p. 24.

Cells rather small, about 1 2/3 times longer than broad, very slightly constricted, sinus open, apex rounded acute; semicells rectangular-pyramidate, six angled, the two upper angles obtuse, apex broadly convex, lateral angles rounded, basal angles sharply rounded. Cell-wall smooth; chloroplast axile, with a single axile pyrenoid in each.

Length 33 μ; Width 18 μ; Isthmus width 14-16 μ.

Collected in the Arbuckle Mts., Oct. 26, 1929.

Cosmarium pyramidatum Bréb.
Pl. 2, Fig. 11.

Cooke, British Desmids, p. 86, Pl. 36, Fig. 13.
Wolle, Desmids of the U. S., p. 69, Pl. 14, Figs. 16-17.
Ralfs, British Desmidieae, p. 94, Pl. 15, Fig. 4.
Nordstedt, Index Desmidiacearum, p. 215; Suppl., p. 105.

Cells large, about 1¾ to 2 times longer than broad, elliptic, constriction deep, sinus narrowly linear, apex inflated; semicells pyramidate, lateral margins slightly convex, apex rounded to almost straight, lower angles rather sharply rounded, upper angles broadly rounded. Side view of semicell oblong. Vertical view elliptic. Cell-wall finely punctate; chloroplasts single and axile, with one axile pyrenoid.

Length 81-83 μ; Width 45 μ; Isthmus width 15 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium Holmiense Lund.

Pl. 2, Fig. 9.

West, British Desmidiaceae, Vol. 3, p. 1, Pl. 65, Figs. 1, 2.
Migula, Krytpogamenflora. Algen, p. 442, Pl. 23 L, Fig. 2.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 48, Pl. 4, Fig. 149.
Cooke, British Desmids, p. 96, Pl. 37, Fig. 15.
Nordstedt, Index Desmidiacearum, p. 140; Suppl., p. 67.

Cells of medium size, about 1½ times longer than broad, rather deeply constricted, sinus narrowly linear, apex very slightly dilated; semicells broadly pyramidate, basal angles rounded, apex broadly truncate, produced and biundulate. Side view of semicells rectangular, base tumid on either side, apex truncate to slightly convex. Cell-wall smooth; chloroplasts axile, massive, each with one pyrenoid.

Length 48 μ; Width 30-35 μ; Isthmus width 12-15 μ.

Collected 10 miles north of Broken Bow, Dec. 23, 1929.

Cosmarium tetragonum (Näg.) Arch.

Pl. 2, Fig. 12.

West, British Desmidiaceae, Vol. 3, p. 17, Pl. 66, Figs. 20, 21.
Nordstedt, Index Desmidiacearum, p. 253, 281; Suppl., p. 125.

Cells medium size, 1 2/3-2 times longer than broad, constriction deep and linear, apex slightly dilated; semicells subquadrate, tapering slightly toward the apices, lateral margins four undulate (including angles), apices undulate. Vertical view elliptic. Chloroplast an axile plate with one axile pyrenoid.

Length 42-45 μ; Width 24-25 μ; Isthmus width 6-7 μ.

Collected 10 miles north of Broken Bow, Dec. 23, 1929.

Cosmarium plicatum Reinsch forma *major* Reinsch

Pl. 2, Fig. 5.

West, British Desmidiaceae, Vol. 3, p. 60, Pl. 70, Fig. 11.
Nordstedt, Index Desmidiacearum, p. 202, 279; Suppl., p. 98.

Cells moderately large, about 1 5/8-1 2/3 times longer than broad, deeply constricted, sinus narrowly linear with a slightly dilated apex; semicells truncate-pyramidate, sides slightly convex, lower angles rather sharply rounded, upper angles broadly rounded, apex slightly convex. Vertical view elliptic. Cell-wall very minutely punctate; chloroplasts axile, with one large pyrenoid.

Length 78-80 μ; Width 48 μ; Isthmus width 21-23 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium minimum West & G. S. West

Pl. 6, Fig. 15.

West, British Desmidiaceae, Vol. 3, p. 66, Pl. 71, Figs. 1, 2.
Nordstedt, Index Desmidiacearum, p. 171; Suppl., p. 83.

Cells very small, about 1 1/5 times longer than broad, constriction deep, linear, and open; semicells transversely rectangular, sides and apices flat, angles only slightly rounded. Vertical view elliptical. Cell-wall smooth; chloroplasts axile with one axile pyrenoid.

Length 9-12 μ; Width 7-10 μ; Isthmus width 3-4 μ.

Collected in the Arbuckle Mts., Oct. 26, 1929.

Cosmarium reniforme (Ralfs) Arch. forma?
Pl. 2, Fig. 14.

West, British Desmidiaceae, Vol. 3, p. 157, Pl. 79, Figs. 1, 2; Pl. 82, Fig. 15.
Nordstedt, Index Desmidiacearum, p. 223; Suppl., p. 109.

Cells tending to be slightly above medium size, about 1 1/3 times longer than broad, constriction deep, sinus closed, opening outwards, apex greatly dilated, semicells reniform. Side view of each semicell circular. Vertical view elliptic. Cell-wall coarsely granular or even warty, granules in oblique series; chloroplasts axile, with two pyrenoids.

Length 75 μ; Width 54 μ; Isthmus width 18 μ.

Collected at Indian Springs Falls, Nov. 2, 1930.

Cosmarium Portianum Arch.
Pl. 2, Fig. 21.

West, British Desmidiaceae, Vol. 3, p. 165, Pl. 80, Figs. 4-7.
Migula, Kryptogamenflora. Algen, p. 448, Pl. 23 L, Fig. 11.
Hylander, Algae of Conn., p. 92, Pl. 12, Fig. 15.
Nordstedt, Index Desmidiacearum, p. 204, 279; Suppl., p. 99.

Cells somewhat small, about 1½ times longer than broad, deeply constricted; semicells elliptic to subquadrate, coarsely granular, granules in rows. Sinus opening outwards, quadrate. Isthmus more or less elongated. Vertical view elliptic. Chloroplasts axile, with one large central pyrenoid.

Length 34-36 μ; Width 24 μ; Isthmus width 9-11 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium vexatum West forma? West
Pl. 2, Fig. 4.

West, British Desmidiaceae, Vol. 3, p. 187, Pl. 92, Fig. 4.
Migula, Kryptogamenflora. Algen, p. 474.
Nordstedt, Index Desmidiacearum, p. 270; Suppl., p. 133.

Cells medium size, slightly longer than broad, constriction deep, sinus narrowly linear, apex dilated; semicells pyramidate-truncate, basal and upper angles obtuse, sides slightly convex, with 5-6 equal undulations, apex truncate, straight or slightly undulate, surface coarsely punctate, punctae in concentric rows, smaller in size at the center than at the margins. Vertical view oblong-elliptic, central portion with a broad inflation on either side. Chloroplasts axile with two pyrenoids.

Length 48-51 μ; Width 46-48 μ; Isthmus width 12-15 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium Botrytis Menegh.
Pl. 2, Fig. 17.

West, British Desmidiaceae, Vol. 4, p. 1, Pl. 94, Figs. 1, 2, 5, 15.
Migula, Kryptogamenflora. Algen, p. 459, Pl. 230, Fig. 15.
Cooke, British Desmids, p. 105, Pl. 39, Fig. 4.
Ralfs, British Desmidieae, p. 99, Pl. 16, Fig. 1.
Wolle, Desmids of the U. S., p. 74, Pl. 13, Figs. 5-7.
Hylander, Algae of Conn., p. 91, Pl. 12, Fig. 5.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 33, Pl. 57, Fig. 22.
Nordstedt, Index Desmidiacearum, p. 64, 275; Suppl., p. 32.

Cells rather large, about 1 1/3 times longer than broad, constriction deep, sinus narrowly linear with a dilated apex; semicells ovate-pyramidate from a broad flat base, basal angles rounded, sides convex, apex subtruncate, apical angles rounded. Vertical view elliptic. Cell-wall granulate, granules small, and without a definite arrangement, 25-28 visible at the

margin of the semicell; chloroplasts axile, with two pyrenoids in each semicell.

Length 66-69 μ; Width 52-53 μ; Isthmus width 13-15 μ.

Collected in a Permian Red Bed spring, 6 miles east of Norman.

Cosmarium Ungerianum (Näg.) DeBary var. *subtriplicatum* West & G. S. West

Pl. 2, Fig. 16.

West, British Desmidiaceae, Vol. 3, p. 195, Pl. 91, Fig. 7.
Nordstedt, Index Desmidiacearum, p. 266; Suppl., p. 131.

Cells rather small, about 1 1/3 times longer than broad, constriction deep, sinus linear, apex dilated; semicells oblong-rectangular, basal angles obtuse, lower parts of sides convex, superior angles rounded, apex almost straight; cell-wall granulate, granules of slightly unequal size, with four large ones on the upper lateral margins and two just within, with three smaller ones on the lower lateral margins and two just within the basal angle, and a row of four across the base just above the isthmus, and one large one just below the middle of the apex; (West describes the variety as having a number of smaller variably disposed granules in the center of the semicells. In the single specimen which I had I was unable to locate these, although undoubtedly they were present). Vertical view elliptic. Chloroplasts axile, with two pyrenoids.

Length 50 μ; Width 38-39 μ; Isthmus width 13 μ.

Collected in the Wichita Mts., April 26, 1930.

Cosmarium Broomei Thwaites

Pl. 2, Fig. 19.

West, British Desmidiaceae, Vol. 4, p. 24, Pl. 100, Fig. 12.
Migula, Kryptogamenflora. Algen, p. 465, Pl. 23 P, Fig. 4.
Ralfs, British Desmidieae, p. 103, Pl. 16, Fig. 6.
Cooke, British Desmids, p. 109, Pl. 40, Fig. 1.
Wolle, Desmids of the U. S., p. 86, Pl. 17, Figs. 6-9.
Nordstedt, Index Desmidiacearum, p. 70; Suppl., p. 35.

Cells small, almost as long as broad, nearly quadrate, constriction deep, sinus narrowly linear, apex slightly dilated; semicells transversely rectangular, angles rounded, sides straight or slightly convex, apex straight. Vertical view narrowly elliptic, central portion with a distinct protuberance. Cell-wall densely granular, granules small; chloroplast axile, single, with two pyrenoids in each.

Length 33 μ; Width 30 μ; Isthmus width 12 μ.

Collected 10 miles west of McAlester, Dec. 23, 1929.

Cosmarium crenatum Ralfs forma *Boldtiana* (Gutw.) *nob.*

Pl. 2, Fig. 18.

West, British Desmidiaceae, Vol. 4, p. 37, Pl. 98, Figs. 13-14.
Nordstedt, Index Desmidiacearum, p. 88, 246; Suppl., p. 76.

Cells rather small, about 1 2/3 times longer than broad, moderately deeply constricted, sinus linear, open; semicells pyramidate-quadrate. Basal angles slightly rounded, sides 5-6 crenate, apex convex to truncate, about 4 crenate. Side view of semicell rectangular, Chloroplasts axile, with one pyrenoid in each.

Length 42-44 μ; Width 24-25 μ; Isthmus width 15 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Cosmarium margaritatum (Lund) Roy & Bissett forma *minor* (Boldt) W. & G. S. West.

Pl. 2, Fig. 15.

West, British Desmidiaceae, Vol. 4, p. 19, Pl. 99, Fig. 9.
Nordstedt, Index Desmidiacearum, p. 165; Suppl., p. 81.

Cells moderately large, about 1 2/3 times longer than broad, constriction deep, sinus narrow, linear, with a dilated apex; semicells subrectangular, apex slightly convex, lateral margins slightly convex, basal angles rounded, apical angles broadly rounded; cell-wall granulate, about 23-25 granules showing around the margin of the semicell; granules arranged in an oblique series. Vertical view elliptic with convex sides. Cell-wall punctate between the granules; chloroplasts axile, each with two pyrenoids.

Length 48-51 μ; Width 30-33 μ; Isthmus width 15-17 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

XANTHIDIUM Ehrenb., 1837.

Cells varying greatly in size, somewhat longer than broad, compressed, symmetrical in three planes at right angles to each other; constriction deep; semicells varying in outline from elliptical, elliptic-hexagonal, trapeziform, or polygonal, generally with a flattened apex, center of the semicell with a scrobiculated protuberance, vertical view elliptic with a protuberance at the middle on either side. Cell-wall with simple or furcate spines arranged on each side of the median plane. Chloroplasts generally parietal, arranged in four masses, which may be both parietal and axile; each mass with one or more pyrenoids; in some forms the chloroplast is axile with one central pyrenoid.

Xanthidium antilopaeum (Bréb.) Kg.

Pl. 3, Fig. 6.

West, British Desmidiaceae, Vol. 4, p. 63, Pl. 108, Figs. 7-18.
Wolle, Desmids of the U. S., p. 94, Pl. 23, Figs. 1, 2.
Migula, Kryptogamenflora. Algen, p. 516, Pl. 27 D, Fig. 3.
Cooke, British Desmids, p. 132, Pl. 46, Fig. 2.
Hylander, Algae of Conn., p. 94, Pl. 16, Fig. 21.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 57, Pl. 65, Figs. 5, 6.
Nordstedt, Index Desmidiacearum, p. 47, 274; Suppl., p. 25.

Cells medium size, about 1 1/3 times longer than broad, deeply constricted, sinus linear, open, apex only slightly dilated; semicells transversely subelliptic-hexagonal, all angles slightly rounded, sides and apex usually straight, each of the four exposed angles furnished with a pair of simple, slightly curved, and rather long spines, the central area variously sculptured. "Side view of semicell circular or subcircular, with a slight thickening at each side, and a pair of diverging spines on the apical margin. Vertical view elliptic, with a slight thickening at the middle on each side, and with a pair of slightly divergent spines on each polar margin; cell-wall finely punctate."[1] Chloroplasts four in each semicell, parietal, with one pyrenoid in each.

Length without spines 66-68 μ; Width without spines 48-54 μ; Isthmus width 15-18 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

[1]West—British Desmidiaceae, Vol. 4, p. 64.

STAURASTRUM Meyem, 1829; em. Ralfs.

Cells varying greatly in size, generally somewhat longer than broad, and having a radical symmetry; constriction varying in depth; semicells varying in outline, subcircular, elliptic, subtriangular, campanulate, trapeziform, with the angles sometimes produced into hollow processes of varying length; vertical view variable, generally 3-5 angled, sometimes 2-11 angled. Cell-wall smooth, punctate, scrobiculate, granulate, variously spined, or with flattened, emarginate, or spiny verrucae. Chloroplasts axile, one in each semicell, consisting of a central mass with lobes radiating into the angles or processes, seldom parietal. Pyrenoids single and axile.

1. (21) Angles of semicells not continued into processes 2
2. (9) (12) (16) Cells smooth or punctate, without spines or granules in any form 3
3. (6) Cell-wall smooth 4
4. Semicell pyramidate, sides retuse, apex convex 5
5. Vertical view triangular, sides strongly concave, angles broadly rounded. *S. trihedrale* var. *glabra*
6. (3) Cell-wall smooth or punctate 7
7. Semicells subsemicircular, apex slightly depressed, basal angles broadly rounded 8
8. Vertical view triangular, sides concave. *S. orbiculare*
9. (2) (12) (16) Semicells granular, granules generally covering entire cell-wall 10
10. Granules almost covering entire cell 11
11. Semicells transversely oblong-elliptic, apex flattened, vertical view 3-5 angled, angles of opposite semicells alternate. *S. dilatatum*
12. (2) (9) (16) Semicells with one spine at each angle 13
13. Cells with a long cylindrical isthmus 14
14. Semicells fusiform, lateral angles with one stout spine 15
15. Vertical view triangular, sides strongly concave, each angle with one straight spine. *S. cuspidatum*
16. (2) (9) (12) Semicells with numerous spines 17
17. (19) Spines all similar, distributed over cell surface 18
18. Semicells subsemicircular, vertical view triangular, sides only slightly concave. *S. hirsutum*
19. (17) Spines of two kinds 20
20. Spines near angles stouter than others over cell surface. *S. setigerum*
21. (1) Angles of semicells continued into processes 22
22. (24) Semicells in vertical view two angled 23
23. Processes slightly attenuated, ends curving away from the isthmus, basal inflation of the semicell with a row of small granules. *S. Leptocladum*
24. (22) Semicells in vertical view three angled 25
25. Cells small, broader than long 26
26. Semicells cup shaped, dorsal margin convex, processes short, stout and converging; cell-wall granulate. *S. cyrtocerum*

Staurastrum trihedrale Wolle var. GLABRA Taft

Pl. 6, Fig. 3.

Wolle, Desmids of the U. S., p. 123, Pl. 40, Figs. 12-14.
Nordstedt, Index Desmidiacearum, p. 258; Suppl., p. 127.

Cells rather small, about 1¼ times longer than broad, constriction deep, narrowly linear, with a very slight dilation at the apex; semicells pyramidate, apex rather narrowly truncate to slightly convex, sides retuse, basal angles broadly rounded, upper angles rounded. Vertical view triangular, sides strongly concave, angles broadly rounded; cell-wall smooth.

Wolle named this species after a specimen collected at Mount Everett, Mass. The drawings which he made are very poor, and give only a general idea of the cell. This is especially true in regard to the isthmus. He states that the cell-wall was punctate-granulate. This last does not correspond to the specimens which I collected, as they had perfectly smooth walls. Because

of this difference in wall structure I am naming the form *S. trihedrale* var. *glabra.*

Length 39 μ; Width 30-32 μ; Isthmus width 8-9 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

Staurastrum orbiculare Ralfs

Pl. 4, Fig. 4.

West, British Desmidiaceae, Vol. 4, p. 155, Pl. 124, Figs. 10, 11.
Migula, Kryptogamenflora. Algen, p. 525, Pl. 28, Fig. 29.
Ralfs, British Desmidieae, p. 125, Pl. 21, Fig. 5.
Cooke, British Desmids, p. 156, Pl. 56, Fig. 7.
Wolle, Desmids of the U. S., p. 120, Pl. 39, Figs 9, 10.
Nordstedt, Index Desmidiacearum, p. 189, 278; Suppl., p. 92.

Cells medium size, generally about 1 1/5 times longer than broad, (length may even reach 1 2/3 times the breadth) deeply constricted, sinus narrowly linear, with a slightly dilated apex; semicells subsemicircular, apex may be slightly depressed, basal angles rounded. Vertical view triangular, sides distinctly concave. Cell-wall smooth or finely punctate.

Length 43-57 μ; Width 35-37 μ; Isthmus width 6-12 μ.

Collected in Cedar Creek, near Broken Bow, Dec. 22, 1929.

Staurastrum dilatatum Ehrenb.

Pl. 4, Fig. 5.

West, British Desmidiaceae, Vol. 4, p. 172, Pl. 126, Figs. 10-15.
Hylander, Algae of Conn., p. 98, Pl. 14, Fig. 10.
Nordstedt, Index Desmidiacearum, p. 109, 276; Suppl., p. 56.

Cells small, slightly broader than long, constriction deep, sinus opening outwards; semicells elliptic-fusiform, dorsal margin slightly convex, ventral margin convex, sides rounded; cell-wall finely granular, granules arranged in concentric rows about the angles. Vertical view triangular, angles of one semicell alternating with those of the other, sides deeply concave, angles rounded.

Length 22 μ; Width 25-26 μ; Isthmus width 8-9 μ.

Collected in the Wichita Mts., April 26, 1930.

Staurastrum cuspidatum Bréb.

Pl. 6, Fig. 1.

West, British Desmidiaceae, Vol. 5, p. 23, Pl. 132, Fig. 13-15.
Hylander, Algae of Conn., p. 99, Pl. 15, Fig. 10.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 74, Pl. 68, Figs. 27-34.
Cooke, British Desmids, p. 141, Pl. 49, Fig. 5.
Ralfs, British Desmidieae, p. 122, Pl. 33, Fig. 10.
Wolle, Desmids of the U. S., p. 123, Pl. 40, Figs. 23-25.
Migula, Kryptogamenflora. Algen, p. 535, Pl. 28, Fig. 7.
Nordstedt, Index Desmidiacearum, p. 94, 276; Suppl., p. 46.

Cells small, about as long as broad or slightly longer, not including the spines, deeply and broadly constricted, with a long cylindrical isthmus, almost as long as a single semicell, sinus broad and obtuse, opening outward; semicells fusiform, ventral margin slightly more convex than the dorsal, lateral angles terminating in a stout spine. Vertical view triangular, sides concave, angles inflated, each with a straight spine.

Length 22-23 μ; Width without spines 20 μ; Width with spines 26-28 μ; Isthmus width 4 μ.

Collected in Panther Creek, Wichita Mts., Sept. 11, 1930.

Staurastrum hirsutum Bréb.

Pl. 4, Fig. 3.

Hylander, Algae of Conn., p. 100, Pl. 15, Fig. 18.
Migula, Kryptogamenflora. Algen, p. 532, Pl. 28 H, Fig. 10.
Ralfs, British Desmidieae, p. 127, Pl. 22, Fig. 3.
Nordstedt, Index Desmidiacearum, p. 140; Suppl., p. 67.

Cells medium size, almost as long as broad, constriction deep, sinus acute, opening outwards; semicells oblong-elliptic, apex broadly convex, ventral margin of about the same convexity as the apex; cell-wall covered with rather long delicate spines which are arranged in concentric rows about the angles. Vertical view triangular. Sides noticeably concave, angles rounded.

Length 42 μ; Width 39 μ; Isthmus width 18 μ.

Collected in the Winding Stair Mts., Dec. 23, 1929.

Staurastrum setigerum Cleve

Pl. 4, Fig. 1.

Smith, Phytoplankton of the Inland Lakes of Wis., p. 79, Pl. 70, Figs. 19-25.
West, British Desmidiaceae, Vol. 5, p. 52, Pl. 136, Figs. 13, 14.
Wolle, Desmids of the U. S., p. 141, Pl. 45, Figs. 26, 27.
Nordstedt, Index Desmidiacearum, p. 232; Suppl., p. 112.

Cells medium size, width (without processes) slightly greater than the length, deeply constricted, sinus opening outwards, with an acute apex, isthmus rather narrow; semicells sub-elliptic, apex flattened or slightly retuse, lateral margins with two stout spines, dorsal margin with a few rather more delicate spines along the apex. Vertical view triangular, sides deeply concave; angles with a stout spine at the tip, and two smaller spines on each side. One pyrenoid.

Length without spines 33 μ; Width without spines 33 μ; Width with spines 47-49 μ; Isthmus width 12 μ.

Collected in Panther Creek, Wichita Mts., Sept. 11, 1930.

Staurastrum Leptocladum Nordst.

Pl. 4, Fig. 2.

Smith, Phytoplankton of the Inland Lakes of Wis., p. 102, Pl. 78, Figs. 1-7.
Wolle, Desmids of the U. S., p. 136, Pl. 44, Figs. 4-6.
Johnson, Some New and Rare Desmids of the United States, Bull. Torr. Bot. Club, 21: 289, Pl. 211, Fig. 3.
Nordstedt, Index Desmidiacearum, p. 157; Suppl., p. 76.

Cells quite large, width including processes about the same as the length, constriction slight, isthmus relatively broad; semicells with base inflated and apex tumid; angles continued in slightly attenuated processes whose ends curve away from the isthmus, both margins of processes crenulate with a bispinate end; basal inflation with a transverse row of small granules, dorsal margin with a row of rather large granules. Vertical view narrowly elliptic, angles continuing into long, straight, attenuated processes having undulate margins, ends with two spines lying in the same vertical plane; lateral margins with a row of emarginate granules just within the margins.

Length 45-94 μ; Width (with processes) 84-90 μ; Isthmus width 11 μ;
Collected in Panther Creek, Wichita Mts., Sept. 11, 1930.

Staurastrum cyrtocerum Bréb.

Pl. 6, Fig. 2.

Ralfs, British Desmidieae, p. 139, Pl. 12, Fig. 10.
Hylander, Algae of Conn., p. 102, Pl. 15, Fig. 15.
West, British Desmidiaceae, Vol. 5, p. 135, Pl. 149, Fig. 9.
Nordstedt, Index Desmidiacearum, p. 96; Suppl., p. 47.

Cells small, slightly broader than long, deeply constricted, sinus broad, apex acuminate; semicells cupshaped, ventral margin tumid, dorsal margin strongly convex, upper angles produced into short stout converging processes gradually tapering toward the apices, which are tipped with two or three minute spines; cell-wall rough with small granules, arranged in concentric circles about the processes, and in longitudinal rows across the face, Vertical view triangular, sides strongly concave, angles produced into short processes, which are all bent in one direction.

Length 21 μ; Width 24 μ; Isthmus width 6 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

SPHAEROZOSMA Corda, 1835.

Cells usually very small, flattened and deeply constricted; sinus open, or narrow or linear; semicells elliptical, oblong or subrectangular, cells united to form long filaments by means of special apical appendages, often twisted and enveloped in a mucus investment; apex of each semicell provided with one or two pairs of small rounded tubercles or short capitate processes, which are closely applied to the corresponding processes of the next cell. Chloroplasts axile, one in each semicell, with a central pyrenoid.

Sphaerozosma excavatum Ralfs

Pl. 6, Fig. 17.

Migula, Kryptogamenflora. Algen, p. 563, Pl. 21, Fig. 7.
Ralfs, British Desmidieae, p. 67, Pl. 7, Fig. 2.
Cooke, British Desmids, p. 4, Pl. 2, Fig. 2.
West, British Desmidiaceae, Vol. 5, p. 211, Pl. 160, Figs. 1-3.
Wolle, Desmids of the U. S., p. 29, Pl. 4, Figs. 8, 9, 10-12.
Nordstedt, Index Desmidiacearum, p. 121; Suppl., p. 59.

Cells small, about as long as broad, constriction moderately deep, sinus very broad, obtuse; semicells ovate to slightly rectangular; lateral view of cell oblong-elliptic, sides slightly concave; vertical view oblong with rounded ends and four small processes; cell-wall smooth; chloroplasts single, axile, with one central pyrenoid.

Length 11-12 μ; Width 10-12 μ; Isthmus width 3-5 μ.

Collected in Panther Creek, Wichita Mts., Sept. 9, 1930.

ONYCHONEMA Wallich, 1860.

Cells small, forming simple filamentous colonies, compressed, deeply constricted, sinus narrow; semicells elliptic or reniform, sometimes with strong lateral spines; each semicell with two capitate processes disposed asymetrically, and overlapping the adjacent cell. Chloroplasts axile, one in each semicell, with a central pyrenoid. Filaments long and twisted, and often embedded in a mucus sheath.

Onychonema laeve Nordst. var. *micracanthum* Nordst.
Pl. 4, Figs. 6, 10.

Johnson, Some new and rare Desmids of the U. S., Bull. Torrey Bot. Club, Vol. 21, 1894. pp. 285-291.
West, British Desmidiaceae, Vol. 5, p. 218, Pl. 160, Fig. 17.
Nordstedt, Index Desmidiacearum, p. 153; Suppl., p. 74.

Cells medium size, slightly broader than long, constriction very deep, sinus closed for most of the length, dilated at the apex and opening widely at the outer margin; semicells oblong, sharply attenuated toward the lateral angles and ending in a short blunt spine; apical processes longer than the lateral spines; Vertical view elliptic. No mucilage.

Length 18-20 μ; Width 21-24 μ; Width including spines 26-28 μ; Isthmus width 3.5-5 μ.

Collected in the Wichita Mts., Sept. 11, 1930.

SPONDYLOSIUM Bréb., 1844.

Cells usually small, or of a medium size, flattened and often deeply constricted with a narrow or open sinus; semicells variable in shape, often with broadly truncate or concave apices; in vertical view elliptical triangular or trilobed; chloroplasts axile. Cells united to form long filamentous colonies by the simple close apposition of their apices, sometimes twisted and often enveloped in mucilage.

Spondylosium planum (Wolle) W. & G. S. West
Pl. 6, Fig. 18.

West, British Desmidiaceae, Vol. 5, p. 222, Pl. 160, Figs. 23-25.
Hylander, Algae of Conn., p. 105, Pl. 15, Fig. 23.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 140, Pl. 87, Figs. 1, 2.

Cells rather small, about as long as broad, subquadrangular, angles rounded, deeply constricted, sinus open and obtuse; semicells transversely oblong, angles broadly rounded, apices flat, side view subcircular; cell-wall smooth; cells united into filaments, not twisted, no gelatinous sheath.

Length 7-10 μ; Width 7-9 μ; Isthmus width 4.5 μ.

Collected 10 miles north of Broken Bow, Dec. 22, 1929.

HYALOTHECA Ehrenb., 1840.

Cells subcylindrical, shorter or longer than broad, very slightly constricted, semicells trapezoid, subquadrate or oblong, with straight or slightly convex lateral margins; cells united by their broadly truncate apices to form long filamentous colonies, which are sometimes twisted and almost invariably enveloped in a gelatinous sheath. Chloroplasts axile, one in each semicell, usually with a central pyrenoid, and several radiating ridges.

Hyalotheca dissiliens (Smith) Bréb.
Pl. 4, Fig. 11.

West, British Desmidiaceae, Vol. 5, p. 229, Pl. 161, Figs. 16-27.
Migula, Kryptogamenflora. Algen, p. 558, Pl. 21, Fig. 1.
Ralfs, British Desmidieae, p. 51, Pl. 1, Fig. 1.
Cooke, British Desmids, p. 7, Pl. 3, Fig. 1.
Wolle, Desmids of the U. S., p. 22, Pl. 1, Figs. 3-5.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 142, Pl. 87, Figs. 8, 9.
Nordstedt, Index Desmidiacearum, p. 10, 276; Suppl., p. 53.

Cells medium size, about 1 1/5 times broader than long, constriction slight, consisting of only a slight concavity in the lateral margin, apices of

cells truncate, almost as broad as the isthmus; vertical view circular; cells united to form long filaments, filaments embedded in a gelatinous sheath about as wide as the cells; chloroplasts axile, one in each semicell, with one central pyrenoid, and 5-6 radiating plates, star-like in vertical view.

Length 15 μ; Width 18 μ.

Collected in Cedar Creek, near Broken Bow, Dec. 23, 1929.

Desmidium Agardh., 1824.

Cells united to form twisted filamentous colonies, sometimes embedded in a thick gelatinous sheath; cells often extremely depressed, usually much broader than long, with a distinct but only moderately deep constriction; in vertical view either elliptical with mammillate poles, or 3-4 angled; chloroplasts axile, one in each semicell, with a massive lobe, containing a pyrenoid, radiating from the center to each angle, or sometimes opposite to each face, with a pair of plates extending into each angle. The cells are attached to each other in forms with an elliptical vertical view merely by the close apposition of ridge like thickenings on the adjacent apices, and in the angular forms by short truncate processes projecting from the apices of the cell, one in each angle, thereby leaving a space of varying size between the apices of adjoining cells.

Desmidium Swartzii Ag.

Pl. 4, Fig. 12.

West, British Desmidiaceae, Vol. 5, p. 246, Pl. 163, Figs. 5-8.
Ralfs, British Desmidieae, p. 61, Pl. 4.
Wolle, Desmids of the U. S., p. 26, Pl. 2, Figs. 1-5.
Cooke, British Desmids, p. 10, Pl. 5, Fig. 2.
Hylander, Algae of Conn., p. 106, Pl. 16, Fig. 4.
Smith, Phytoplankton of the Inland Lakes of Wis., p. 144, Pl. 88, Figs. 1, 2.
Brown, The Desmids of the Southeastern Coastal Plain Region of the U. S., p. 126, Pl. 14, Fig. 69.
Lindau, Kryptogamenflora für Anfänger. Die Algen, p. 73, Pl. 6, Fig. 230.
Migula, Kryptogamenflora. Algen, p. 560, Pl. 21, Fig. 4.
Nordstedt, Index Desmidiacearum, p. 249, 250; Suppl., p. 123.

Cells rather large, about 2-2¼ times broader than long, united into long twisted filaments without gelatine, constriction moderately deep, sinus linear near the apex, rapidly widening outwards; semicells narrowly oblong, apex broadly truncate, with a short connecting process at each angle of the cell; middle of apex slightly concave; spaces between cells only slightly visible. Vertical view triangular, angles acute, sides slightly concave. Chloroplasts axile, one in each semicell, with two lobes radiating from the center to each angle of the semicell, pyrenoid single and opposite each face.

Length 19-20 μ Greatest width 40-45 μ; Width of apices 37-38 μ.

Collected in the Wichita Mts., April 26, 1930.

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EXPLANATION OF LETTERING USED ON PLATES

Unless otherwise stated on the explanation sheet that faces each Plate, the following system of lettering is used.

a. Face view of the cell.

b. Vertical or end view of the cell.

c. Side view of the cell.

PLATE I

Figs.		Mag.	Page
1.	*Closterium rostratum*	x 425	285
2.	*Closterium lanceolatum*	x 425	283
3.	*Closterium moniliferum*	x 425	282
4.	*Closterium tumidum*	x 297	283
5.	*Closterium Ehrenbergii*	x 425	283
6.	*Closterium Leibleinii*	x 425	282
7.	*Closterium attenuatum* var.?	x 85	283
8.	*Closterium subulatum*	x 297	284
9.	*Closterium acutum*	x 425	284
10.	*Closterium lineatum*		
	a. entire cell	x 85	
	b. semicell	x 297	
	c. striations	x 297	284
11.	*Closterium tumidum?*	x 297	283
12.	*Closterium incurvum*	x 297	282

PLATE 1

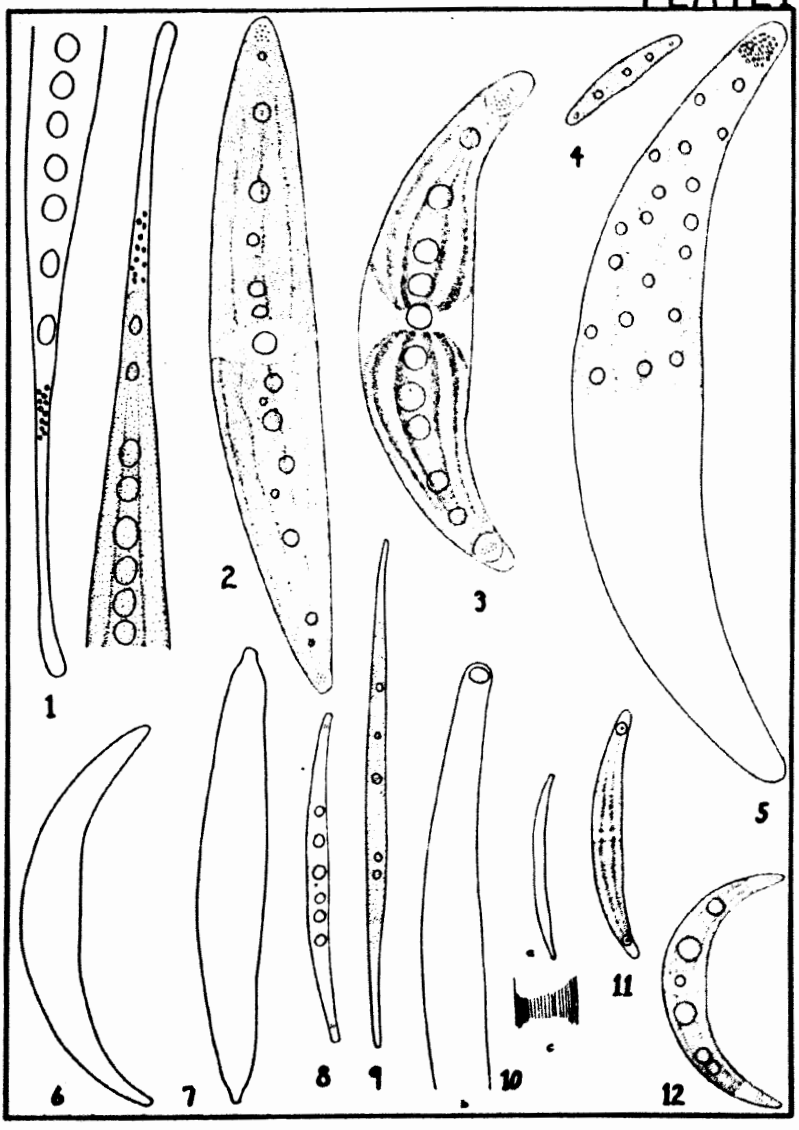

PLATE 2

Figs.		Mag.	Page
1.	*Cosmarium pachydermum* var. *aethiopicum*	x 425	293
2.	*Cosmarium circulare*	x 425	292
3.	*Cosmarium pseudoconnatum*	x 425	293
4.	*Cosmarium vexatum* forma?	x 425	298
5.	*Cosmarium plicatum* forma *major*	x 297	297
6.	*Cosmarium depressum*	x 425	294
7.	*Cosmarium depressum* var. *achondrum*	x 425	294
8.	*Cosmarium Hammeri*	x 297	295
9.	*Cosmarium Holmiense*	x 297	297
10.	*Cosmarium granatum*	x 425	296
11.	*Cosmarium pyramidatum*	x 297	296
12.	*Cosmarium tetragonum*	x 425	297
13.	*Cosmarium subcucumis*	x 297	294
14.	*Cosmarium reniforme* forma?	x 297	298
15.	*Cosmarium margaritatum* forma *minor*	x 425	300
16.	*Cosmarium Ungerianum* var. *subtriplicatum*	x 425	299
17.	*Cosmarium Botrytis*	x 297	298
18.	*Cosmarium crenatum* forma *Boldtiana*	x 297	299
19.	*Cosmarium Broomei*	x 297	299
20.	*Euastrum bidentatum*	x 425	287
21.	*Cosmarium Portianum*	x 425	298
22.	*Cosmarium moniliforme* forma *punctata*	x 425	293

PLATE 2

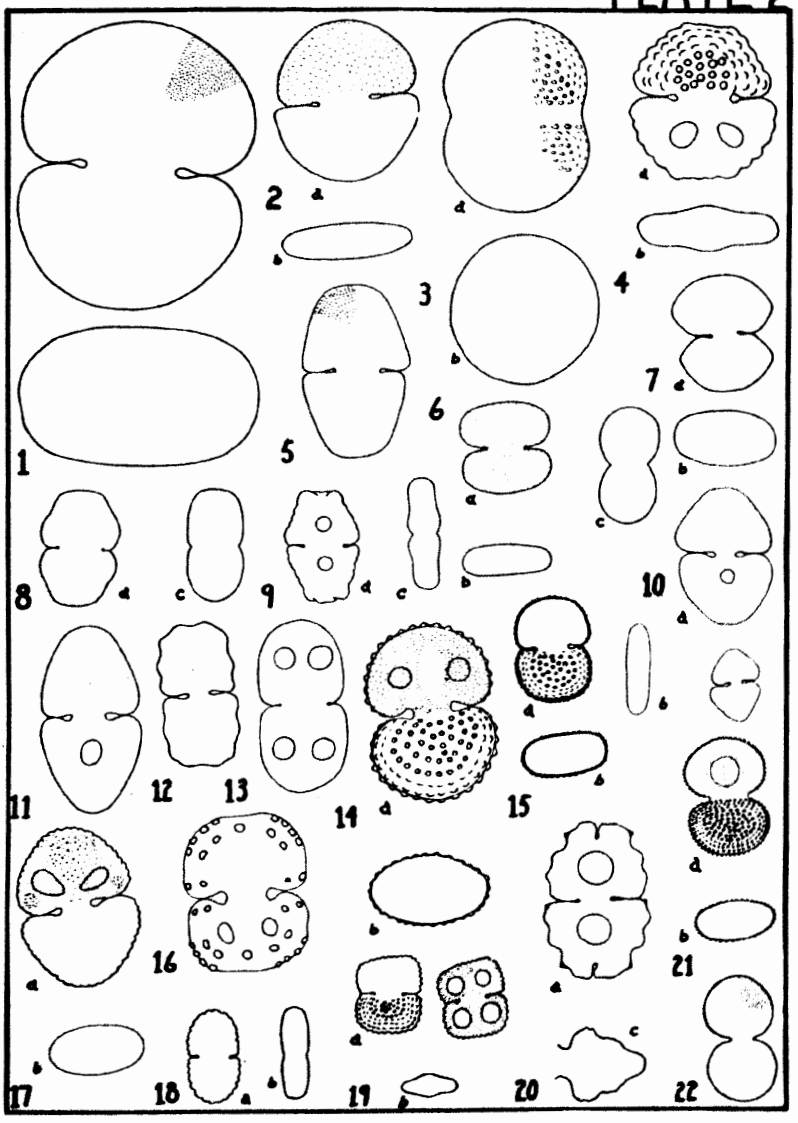

PLATE 3

Figs.		Mag.	Page
1.	*Euastrum verrucosum*	x 297	288
2.	*Micrasterias papillifera* var. *glabra*	x 297	289
3.	*Micrasterias Sol?*	x 425	289
4.	*Micrasterias Americana*	x 297	290
5.	*Micrasterias truncata*	x 425	288
6.	*Xanthidium antilopeum*	x 297	300

PLATE 3

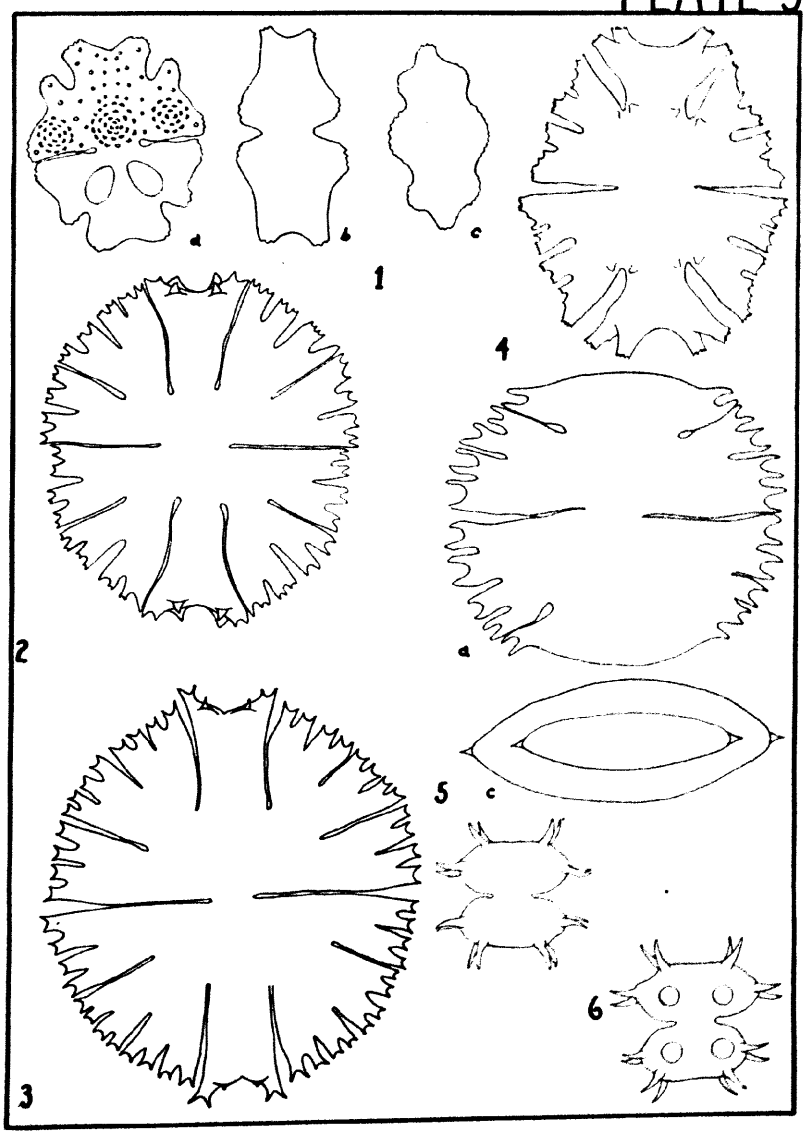

PLATE 4

Figs.		Mag.	Page
1.	*Staurastrum setigerum*	x 425	303
2.	*Staurastrum Leptocladum*	x 425	303
3.	*Staurastrum hirsutum*	x 297	303
4.	*Staurastrum orbiculare*	x 297	302
5.	*Staurastrum dilatatum*	x 425	302
6, 10.	*Onychonema laeve* var. *micracantha*	x 425	305
7.	*Penium margaritaceum*	x 297	280
8.	*Spirotaenia condensata*	x 297	278
9.	*Roya obtusa*	x 425	285
	a. vegetative cells.		
	b. zygospore formation.		
11.	*Hyalotheca dissiliens*	x 297	305
12.	*Desmidium Swartzii*	x 425	306
13.	*Tetmemorus laevis*	x 297	286

PLATE 4

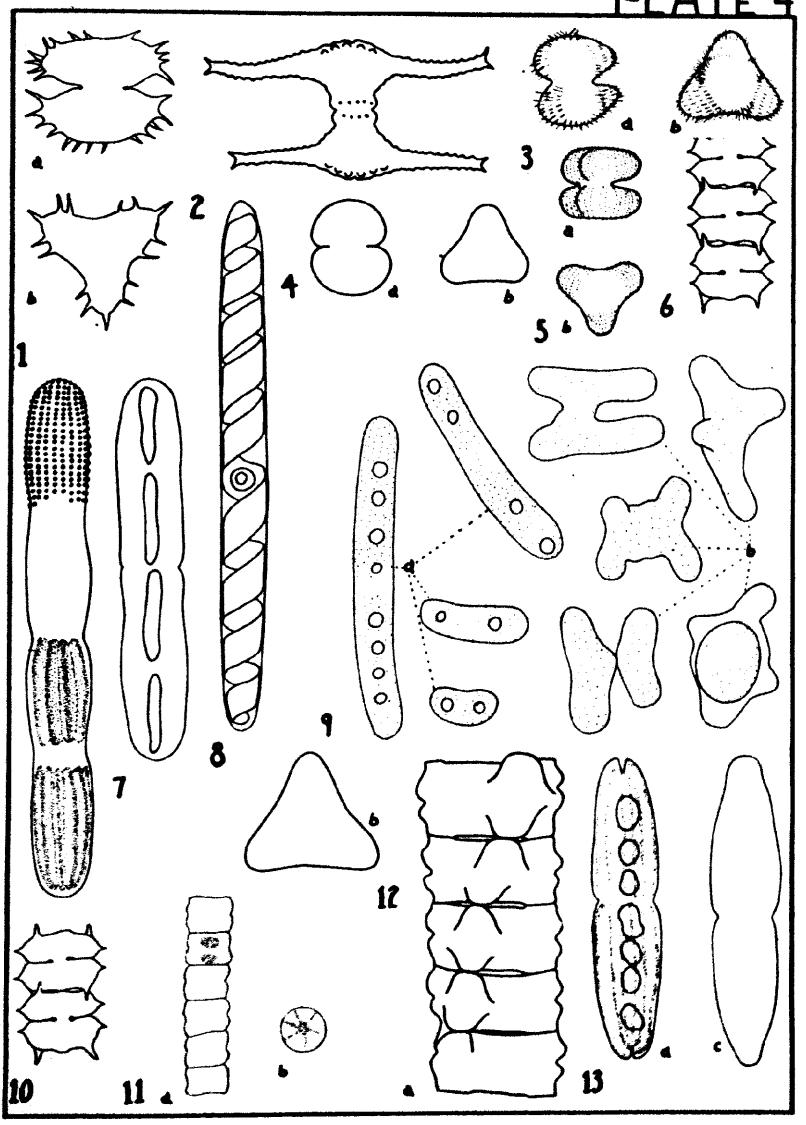

PLATE 5

Figs.		Mag.	Page
1.	*Pleurotaenium Trabicula* forma *clavata*	x 425	286
2.	*Pleurotaenium Ehrenbergii*	x 297	286
3.	*Gonatozygon monotaenium*		
	a. entire cell	x 425	
	b. cell-wall with granules	x 425	277
4.	*Netrium interruptum*	x 425	280
5.	*Netrium Digitus* var. *constrictum*	x 425	279
6.	*Netrium Digitus*	x 297	279
7, 8.	*Gonatozygon Kinahani*	x 297	277

PLATE 5

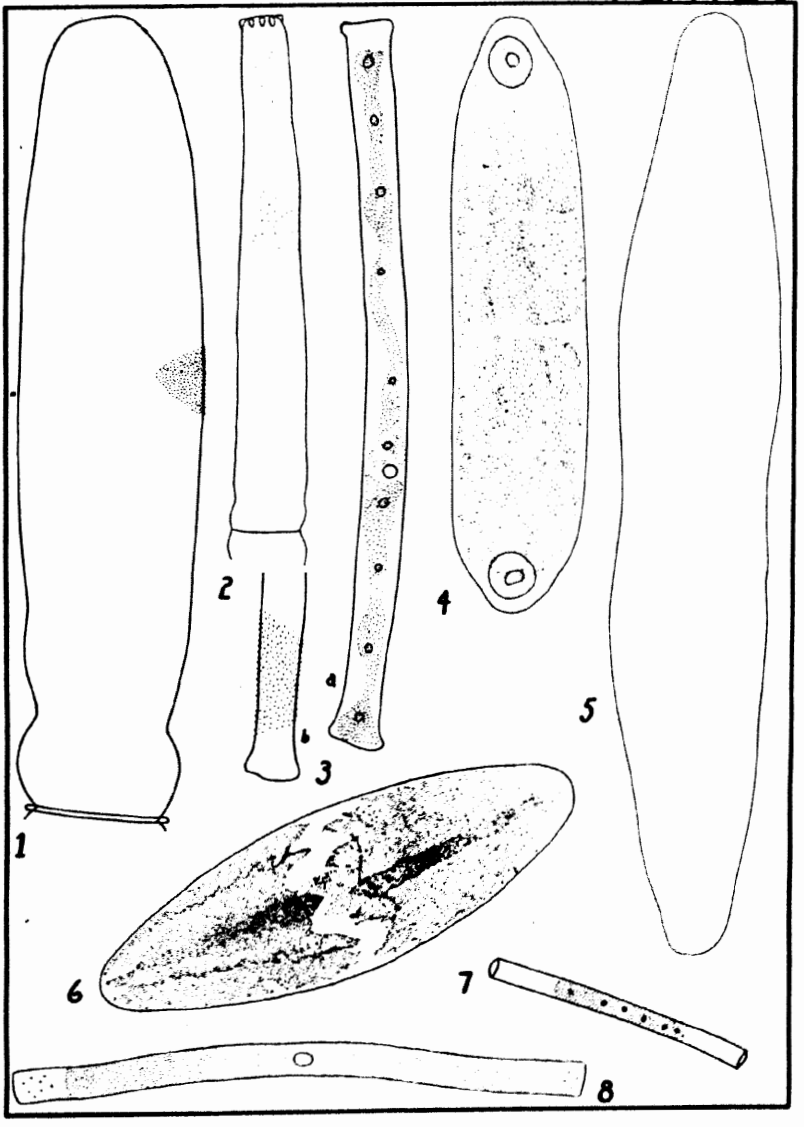

PLATE 6

Figs.		Mag.	Page
1.	*Staurastrum cuspidatum*	x 850	302
2.	*Staurastrum cyrtocerum*	x 594	304
3.	*Staurastrum trihedrale* var. *glabra*	x 594	301
4.	*Cylindrocystis crassa*	x 594	278
5.	*Penium Navicula*	x 594	280
6.	*Cylindrocystis Brébissonii*	x 594	279
7.	*Cosmarium Phaseolus*	x 594	294
8.	*Cosmarium Hammeri* var. *protuberans*	x 850	296
9.	*Cosmarium contractum* var. *ellipsoideum*	x 594	294
10.	*Cosmarium polygonum*	x 594	295
11.	*Cosmarium pseudarctoum*	x 594	292
12.	*Cosmarium angulatum*	x 594	296
13.	*Cosmarium Schliephackeanum*	x 594	295
14.	*Cosmarium moniliforme*	x 594	293
15.	*Cosmarium minimum*	x 594	297
16.	*Mesotaenium macrococcum* var. *micrococcum*	x 1955	278
17.	*Sphaerozosma excavatum*	x 850	304
18.	*Spondylosium planum*	x 850	305
19.	*Euastrum pulchellum*	x 594	287

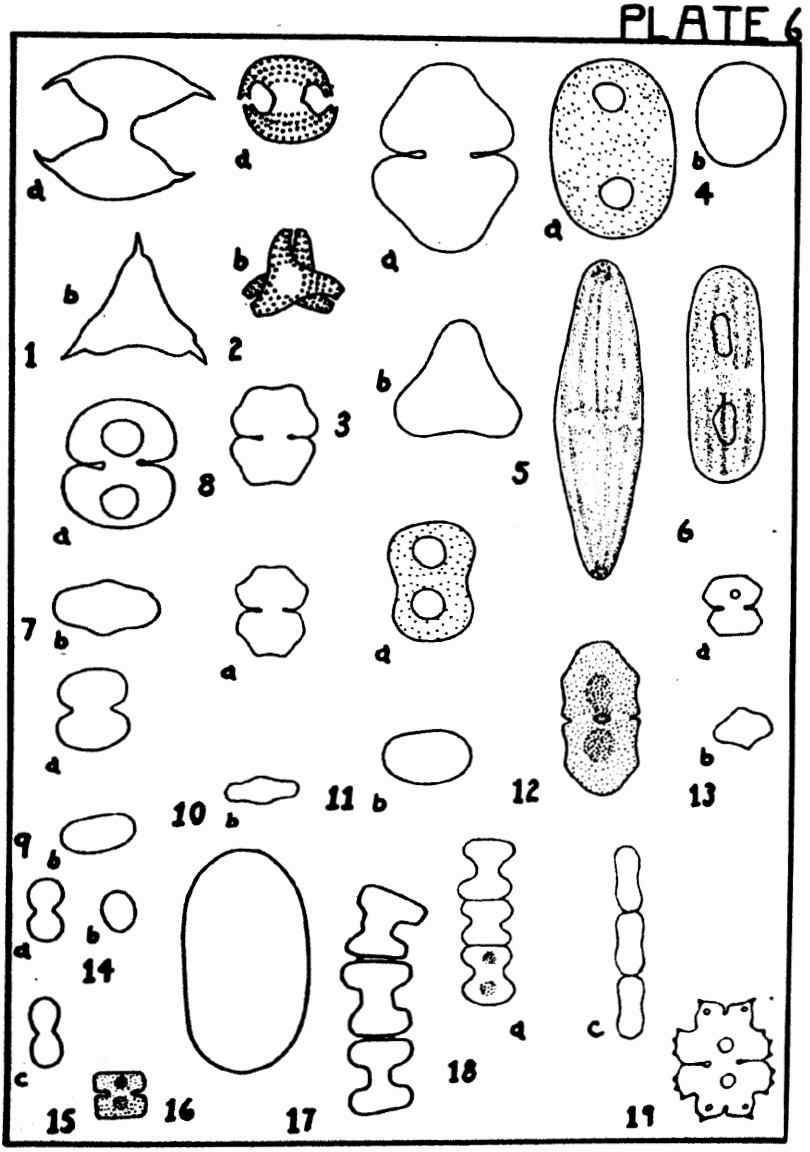
PLATE 6
a
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