JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY.

DECEMBER 1892.

TRANSACTIONS OF THE SOCIETY.

XI.—*Algæ of the English Lake District.*

By WM. WEST, F.L.S.

(Read 16th November, 1892.)

PLATES IX. AND X.

SEVERAL valuable papers have already appeared in this Journal relating to this subject; there was one by Mr. Bissett in 1884, and since that, two by Mr. A. W. Bennett in 1886 and 1888. As I have practically made collections yearly since 1879 from numerous localities, I am enabled to offer the following contribution to the already large

EXPLANATION OF PLATES.

(Explicatio iconum.)

a, a', a'' = front view (a fronte visa).
b, b' = vertical view (a vertice visa).
c = side view (a latere visa).
d = basal view of semicell (a basi visa).

PLATE IX.

- Fig. 1.—*Closterium abruptum* sp. n. × 520.
 „ 2. „ *turgidum* Ehrnb. var. *decoratum* var. n. Cell membrane × 830.
 „ 3.—*Sphærozoma vertebratum* (Bréb.) Ralfs forma *minor* West. × 520.
 „ 4.—*Spondylosium pygmaum* (Cooke) West var. *compressum* var. n. × 400.
 „ 5.—*Micrasterias denticulata* Bréb. var. *subnotata* var. n. × 220.
 „ 6.—*Euastrum binale* (Turp.) Ralfs var. *retusum* var. n. × 520.
 „ 7.—*Penium* sp. × 520.
 „ 8.—*Cosmarium obcuneatum* West forma. × 520.
 „ 9.—*Euastrum elegans* (Bréb.) Kütz. var. *ornatum* var. n. × 520.
 „ 10.—*Cosmarium morsum* sp. n. × 520.
 „ 11. „ *coarctatum* sp. n. × 520.
 „ 12. „ *Holmiense* Lund. var. *integrum* Lund forma. × 400.
 „ 13.—*Closterium obtusum* Bréb. forma. × 520.
 „ 14.—*Cosmarium Meneghini* Bréb. forma (c. zygosp.). × 520.
 „ 15. „ *obliquum* Nordst. forma *minima*. × 520.
 „ 16. „ *pseudarcuatum* Nordst. × 520.
 „ 17.—*Euastrum erosum* Lund. var. *notabile* var. n. × 520.
 „ 18.—*Cosmarium subpunctulatum* Nordst. var. *Boergesenii* West forma. × 520.
 „ 19. „ *cyclicum* Lund. var. *angulatum* West. × 520.
 „ 20. „ *Regnellii* Wille forma. × 520.
 „ 21. „ *pseudotlanthoideum* sp. n. × 520.
 „ 22. „ *subcylindricum* sp. n. × 520.

1892.

3 c

number of species on record. No species is here recorded for any locality in which it has been found previously; but almost every species recorded in the paper of Mr. Bissett and those by Mr. Bennett has been again seen from the same localities.

The gatherings covered most of the Lake District proper, and Mr. W. H. Youdale kindly made a few gatherings for me from near Cockermouth, Embleton, Crummock Water, and Bassenthwaite Water.

There are 589 species and 78 varieties in this paper, one genus, 21 species, and 23 varieties of which are here described for the first time, and in addition to the latter, there are 27 species and 10 varieties recorded as new to the British Isles (prefixed by an asterisk).

In the preparation of this paper—as in former papers—I have again to acknowledge the invaluable help of my son, G. S. West (National Scholar in Biology), who also assisted in making the collections from near Bowness. The locality “Bowness” includes pools near there with *Nymphæa alba* and *Utricularia*, small pools with the latter on Brant Fell, and other suitable places as far as Lindeth where many gatherings were made.

-
- Fig. 23.—*Cosmarium cymatophorum* sp. n. *a*, $\times 830$; *a'*, *a''*, *b*, et *c* $\times 520$.
 „ 24. „ *supraspeciosum* Wolle var. *emarginatum* var. n. $\times 520$.
 „ 25.—*Staurastrum arcuatum* Nordst. subsp. *subavicula* subsp. n. $\times 520$.
 „ 26. „ *Brebissonii* Arch. var. *brevispinum* var. n. $\times 400$.
 „ 27.—*Arthrodesmus glaucescens* Wittr. forma *convexa* West (c. *zygosp.*) $\times 520$.
 „ 28.—*Staurastrum ellipticum* sp. n. $\times 400$.
 „ 29.—*Cosmarium subcapitulum* sp. n. $\times 520$.
 „ 30. „ *Clepsydra* Nordst. $\times 520$.
 „ 31.—*Cosmarium ochthodes* Nordst. var. *amœbum* var. n. Verrucæ $\times 830$.
 „ 32. „ *microsphinctum* Nordst. $\times 520$.
 „ 33. „ *veratum* sp. n. $\times 520$.
 „ 34.—*Staurastrum sexcostatum* Bréb. subsp. *productum* subsp. n. $\times 520$.
 „ 35. „ *polymorphum* Bréb. var. *munitum* var. n. $\times 520$.
 „ 36. „ *gracile* Ralfs var. *coronulatum* Boldt. f. 3-gona. $\times 520$.
 „ 37. „ *Pseudosebaldi* Wille var. *simplicior* var. n. $\times 520$.
 „ 38. „ *vestitum* Ralfs var. *semivestitum* var. n. $\times 520$.
 „ 39.—*Dimorphococcus lunatus* A. Br. $\times 520$.

PLATE X.

- „ 40-42.—*Cylindrocapsa conferta* sp. n. $\times 520$.
 „ 43-46.—*Tetracoccus botryoides* gen. et sp. n. $\times 520$.
 „ 47-48.— „ „ „ Two groups of four cells. $\times 830$.
 „ 49.—*Nephrocytium lunatum* sp. n. $\times 520$.
 „ 50.—*Selenastrum obesum* sp. n. $\times 520$.
 „ 51. „ „ „ Two separate cells. $\times 830$.
 „ 52. „ „ „ $\times 520$.
 „ 53.—*Tetraëdron gigæ* (Wittr.) Hansg. var. *mamillata* var. n. $\times 520$.
 „ 54.—*Trochiscia uncinata* sp. n. $\times 520$.
 „ 55.—*Chlorococcum regulare* sp. n. $\times 520$.
 „ 56.—*Oocystis elliptica* sp. n. $\times 520$.
 „ 57.—*Schizochlamys delicatula* sp. n. $\times 520$.
 „ 58.—*Lyngbya subtile* sp. n. $\times 830$.
 „ 59 & 60.—*Chroococcus giganteus* sp. n. $\times 520$.
 „ 61-63. „ *schizodermaticus* sp. n. $\times 520$.
 „ 64.—*Cœlastrum sphaericum* Näg. $\times 520$.

G.S. West, ad nat. del.

West, Newman, lith.

The following contractions are used:—B. for Brother's Water; Bn. for Bowness; Bo. for Borrowdale; Bt. for Blea Tarn, Westmoreland; C. for Bogs around Cockley Beck (Lancashire); H. for Helvellyn; Hk. for pool, Hawkshead to Yewdale; Hp. for Harrop Tarn; L. for Loughrigg; R. for Rydal Fell; S. for Scandale; Sk. for near Stickle Tarn; W. for Wastdale and Wast Water.

ALGÆ.

Class FLORIDEÆ.

Order HELMINTHOCLOADIÆ.

Genus *Batrachospermum* Roth.

B. moniliforme Roth. Threlkeld.

Order LEMANEACEÆ.

Genus *Lemanea* Bory.

L. fluviatilis Ag. H., Foot of Bow Fell, near Angle Tarn.

L. torulosa (Roth.) Ag. S.

Class CONFEROIDEÆ HETEROGAMÆ.

Order COLEOCHÆTACEÆ.

Genus *Coleochæte* Bréb.

C. scutata Bréb. B., R., Crummock Water.

Order ŒDOGONIACEÆ.

Genus *Bulbochæte* Ag.; Pringsh.

? *B. setigera* (Roth.) Ag. (sterile). Bn., S., R., Bassenthwaite Water, Grisedale Tarn.

B. rectangularis Wittr. L.

Genus *Œdogonium* Link; Pringsh.

Œ. cryptoporum Wittr. Blea Tarn in Borrowdale.

var. *vulgare* Wittr. Forma cellulis longioribus. Bn.

Œ. Itzigsohnii De Bary. Hp.

Œ. undulatum (Bréb.). A., Br., S.

Œ. calcareum Cleve. Bn.

Class CONFEROIDEÆ ISOGAMÆ.

Order CONFERVACEÆ.

Genus *Conferva* (Linn.) Link; Wille.

**C. Wittrockii* Wille.

Lat. fil. 12–13 μ . Bo., Hawkshead.

**C. Raciborskii* Gutw. Bassenthwaite Water.

C. bombycina Ag.

forma *genuina* Wille. Bn., H., Deep Dale, Angle Tarn.

forma *minor* Wille. Common.

C. floccosa (Vauch.) Ag. B., H., Crummock Water.

Genus *Cladophora* Kütz.

C. crispata (Roth) Kütz. Embleton.

Genus *Chætophora* Schrank.

C. elegans (Roth) Ag. R.

Genus *Draparnaldia* Bory.

D. glomerata (Vauch.) Ag. Bn., Crummock Water.

D. plumosa Ag. Buttermere.

Genus *Stigeoclonium* Kütz.

S. fastigiatum (Ralfs) Kütz. Crummock Water.

Genus *Microthamnion* Näg.

M. vexator Cooke. Hk.

Genus *Aphanochæte* A. Br.

A. globosa (Nord.) Wille.

forma *minor* Nord.

Diam. cell 10–11 μ . Bn., Hp., R., Sk.

Order ULOTRICHACEÆ.

Genus *Ulothrix* Kütz.

U. parietina Kütz. Sk.

U. tenerrima Kütz. Langdale.

Genus *Schizogonium* Kütz.

S. murale Kütz. H.

Genus *Hormiscia* Aresch.

H. moniliformis (Kütz.) Rabh. S.

H. zonata (Web. and M.) Aresch. B., Crummock Water.

forma *major*.

Lat. cell. 47–50 μ . H.

H. æqualis (Kütz.) Rabh.

var. *catenæformis* (Kütz.) Near Cockermouth.

Class CONJUGATEÆ.

Order MESOCARPEÆ.

Genus *Mougeotia* (Ag.) Wittr.

M. nummuloides Hass. Scarf Gap Pass, Kirk Fell.

M. recurvus (Hass.) De Toni. Bo., Bassenthwaite Water.

M. parvula Hass.

forma sporis rotundo-ellipticis.

Long. spor. 15–16 μ ; lat. spor. 12·5–14 μ ; Bassen-
thwaite Water.

M. quadrangulata Hass. [*M. quadrata* (Hass.) Wittr.]

forma *minor*.

Crass. cell. veget. 7–7·5 μ ; diam. spor. 28–30 μ . Bassen-
thwaite Water.

M. viride (Kütz.) Wittr. Bn.

M. gracillima (Hass.) Wittr. B., H. (at 2400 ft.).

? *M. elegantula* Wittr.

Crass. cell. veget. 5 μ (sterile). Bn.

All the species of *Mougeotia* were in abundant conjugation except the last.

Order ZYGNEACEÆ.

Genus *Sirogonium* Kütz.

S. sticticum (Eng. Bot.) Kütz. H.

Genus *Spirogyra* Link.

S. tenuissima (Hass.) Kütz.

Forma cellulis fructiferis subtumidis.

Lat. cell. fruct. 27–30 μ ; long. zygosp. 60–64 μ ; lat.
zygosp. 23–25 μ . Bn.

This approaches var. *plena* Lagerh. (Contrib. Fl. Alg. del
Ecuador, p. 7).

S. flavescens (Hass.) Kütz.

forma. Lat. cell. veg. 14–16 μ ; long. zygosp. 53–55 μ ;
lat. zygosp. 22–23 μ . Esthwaite Water.

S. gracilis (Hass.) Kütz.

Forma zygosporis solum diametro 1½-plo longioribus.

Lat. cell. veg. 19 μ ; lat. cell. fruct. 39–41 μ ; long.
zygosp. 42–44 μ ; lat. zygosp. 27–30 μ . Bn.

S. varians (Hass.) Kütz. Black Sail Pass.

Forma cellulis sterilibus minoribus et zygosporis diametro
1½-plo longioribus.

Lat. cell. ster. 21 μ ; long. zygosp. 34 μ ; lat. zygosp.
25 μ . Bo.

**S. Lutetiana* P. Petit var. MINOR var. n.

Var. duplo minor quam forma typica, cellulis vegetativis
diametro 8-plo longioribus; zygosporis cylindrico-oblongis,
diametro 3–4-plo longioribus.

Lat. cell. veget. 19 μ ; long. zygosp. 50–63 μ ; lat.
zygosp. 18–19 μ . Bo.

S. nitida (Dillw.) Link. Bn.

Only occasional zygo-spores.

Genus *Zygnema* Ag.

Many sterile species, from various localities, were seen, but none were observed in conjugation.

Genus *Debarya* Wittr.

D. glyptosperma (De Bary) Wittr. R.

Order DESMIDIACEÆ.

Genus *Gonatozygon* De Bary.

G. Ralfsii De Bary. L., B., R., C., Brandreth.

G. Brebissonii De Bary. L., B., R., S., Brandreth.

G. minutum West. Bn., Sty Head Tarn.

**G. Kjellmani* Wille.

Forma minor et recta.

Long. $58\ \mu$; lat. $6-6.5\ \mu$. Bo.

Genus *Sphærozosma* Corda.

S. vertebratum (Bréb.) Ralfs. B., R., Bassenthwaite Water.

forma *minor* West (Addit. to the Freshw. Alg. of W.

Yorks. in Naturalist, 1891, p. 244). Fig. 3. Hp., Sk.,

B., R.

S. excavatum Ralfs. Frequent.

S. granulatum Roy et Biss. Bn., W.

Genus *Spondylosium* Bréb.

S. pulchellum Arch. Hp., Grisedale Tarn.

S. pygmæum (Cooke) West (Contrib. Fr. Wat. Alg. of W. Ireland, p. 116).

var. *COMPRESSUM* var. n. Fig. 4.

Var. cellulis subquadrangularibus, compressis ad polos.

Long. cell. $5.5-6\ \mu$; lat. cell. $7\ \mu$; lat. isthm. $2.5\ \mu$. B.

Genus *Onychonema* Wallich.

O. filiforme (Ehrnb.) Roy et Biss. Bn.

Genus *Hyalotheca* Ehrnb.

H. dissiliens (Sm.) Bréb. Very frequent.

At 2400 ft. on Helvellyn. It was seen with zygospores from Harrop Tarn, Bowness, Loughrigg and Hawkshead.

forma *bidentula* (Nordst.) Boldt., B., Bn., L., Sk.

var. *hians* Wolle. Bt., Sk., C., Hk., Lake Side.

*var. *tatricea* Racib. (Nonn. Desm. Polon., p. 8, t. xiv. f. 5).

Long. cell. $20\ \mu$; lat. $16-16.5\ \mu$. Hk.

H. mucosa (Dillw.?) Ehrnb. B., R., S.

Genus *Gymnozyga* Ehrnb.

G. moniliformis Ehrnb. Hp., W., Sk., C., Hk.

Genus *Desmidium* Ag.

D. cylindricum Grev. L.

D. Swartzii Ag. W., B., R., Hk., Deepdale, H. (at 2400 ft.).

D. aptogonum Bréb. L., S.

var. *acutius* Nordst. Bn.

Genus *Pleurotænium* Näg.

P. coronatum (Bréb.) Rabh. B.

var. *nodulosum* (Bréb.) West. [*Docidium coronatum*

Bréb. var. *nodulosum* (Bréb.) Roy]. Bo.

P. Ehrenbergii (Ralfs.) De Bary. Frequent.

P. clavatum (Kütz.) De Bary. B.

P. maximum (Reinsch) Lund.

var. OCCIDENTALE var. n. [*P. maximum* West (Contrib.

Freshw. Alg. of W. Ireland, p. 119)].

Var. ad formam typicam similis sed ter minor est. W.,

Bn., Hk.

This is $2\frac{1}{2}$ to $3\frac{1}{2}$ times smaller, but in form it agrees exactly with the species described by Reinsch (Alg. Fl. von Mitt. Frank., p. 184, t. 12, f. iv.). It is quite distinct from *P. Ehrenbergii* (Ralfs) De Bary.

P. truncatum (Bréb.) Näg. Bo.

Genus *Closterium* Nitzsch.

C. didymotocum Corda. C., Hk.

C. ABRUPTUM sp. n. Fig. 1.

Cl. anguste lanceolatum, circiter decies longius quam latius, leve curvatum, latere ventrali non (vel levissime) tumidum, sensim æqualiter attenuatum utrimque in apicem truncatum; membrana luteola et non-striata; pyrenoidibus 8-10 in unica serie.

Long. 127-156 μ ; lat. ad medium 12-15.5 μ ; lat. apic. 6-7 μ . C., Hk., Esthwaite Water, Ennerdale.

This is similar in shape to some forms of *Cl. intermedium* Ralfs, but differs in its much smaller size and in its membrane not being striolated.

forma PUNCTATA.

Forma membrana irregulariter punctata. C.

C. obtusum Bréb.

Forma apicibus subtruncatis.

Long. 41 μ ; lat. 7.5 μ . Fig. 13. H.

C. lunula (Müller) Nitzsch. Frequent.

C. lanceolatum Kütz. Bo., Bn., near Cockermouth.

C. turgidum Ehrnb. Bo., C., Hk.

Long. 750–791 μ ; lat. 66–75 μ .

var. DECORATUM var. n. Fig. 2.

Cl. striis prope medium punctorum factis, apices versus irregulariter punctatum (nec in lineis).

Long. 510 μ ; lat. 43 μ . Bn.

C. praelongum Bréb. Bn.

C. strigosum Bréb. S.

C. gracile Bréb. Hk.

C. Ehrenbergii Menegh. Bo., H. (at 2400 ft.), Deepdale, Crummock Water, Vale of Newlands.

C. moniliferum (Bory) Ehrnb. H. (at 2400 ft.), near Cockermouth, Vale of Newlands.

C. Jenneri Ralfs. Bo., L., Hk., Brandreth.

C. Leibleinii Kütz. B.

C. Dianæ Ehrnb. Frequent. Occurs up to 2400 ft. on Helvellyn.

C. parvulum Näg. Hk.

C. Venus Kütz. B., L., Bn., Hk.

C. Cynthia De Not. Hk.

C. Archerianum Cleve. Bn.

C. costatum Corda. W., S., B., Deepdale.

C. striolatum Ehrnb. Frequent.

var. *orthonotum* Roy. W., Grisedale Tarn.

C. intermedium Ralfs. W., R., C., Grisedale Tarn.

C. angustatum Kütz. Bt., C., Hk.

C. juncidum Ralfs. Bo., C., Hk., Brandreth.

C. lineatum Ehrnb. W., Hk.

C. attenuatum Ehrnb. Hk.

C. Ralfsii Bréb.

var. *hybridum* Rabh. Bn., L., Hk.

Long. 600–616 μ ; lat. 41–43 μ .

C. rostratum Ehrnb. Bn. (cum zygos.), Derwent Water (cum zygos.), near Blea Tarn.

C. setaceum Ehrnb. W.

C. Kützingerii Bréb. Bt. (cum zygos.), Hk.

C. Cornu Ehrnb. S., Bn., H., Derwent Water.

forma *major* Wille. Bn.

C. acutum Bréb. B., Threlkeld.

C. linea Perty. B., Bn.

Genus *Penium* Bréb.; De Bary.

P. margaritaceum (Ehrnb.) Bréb. C.

P. cylindrus (Ehrnb.) Bréb. H., Hk.

P. spirostriolatum Bark. Hp., S., C., Hk.

P. digitus (Ehrnb.) Bréb. Very frequent.

- P. interruptum* Bréb. Hk.
P. closterioides Ralfs. W., S., Hk., near Cockermouth.
 forma INTERRUPTA.
 Forma massa chlorophyllacea in partibus quattuor divisa.
 Long. 122–125 μ ; lat. 24–26 μ . Black Sail Pass.
P. Navicula Bréb. Bo., Hp., W., L., C., Buttermere.
 Forma Wille (Bidrag til Kundsk. om Norges Ferskv.
 Alg., p. 49, t. ii. f. 32). Bn., H., Langdale.
P. curtum Bréb.
 forma *minor* Wille. H.
 forma *minuta*.
 Long. 22 μ ; lat. 10·5 μ ; lat. isthm. 10 μ . C.
P. truncatum Ralfs. C.
P. didymocarpum Lund.
 Long. 31–34 μ ; lat. 13–14 μ ; long. zygosp. 22–24 μ ;
 lat. zygosp. 31–33 μ . Hk.
P. polymorphum Perty. Hp., Hk., Buttermere, Grisedale Tarn,
 Scarf Gap Pass, Brandreth, Blea Tarn in Borrowdale.
P. Clevei Lund.
 Long. 96 μ ; lat. 42 μ ; lat. isthm. 39 μ . Bn.
P. cucurbitinum Biss. H., Trough at Ambleside.
P. minutum (Ralfs) Cleve. W., Hk.
P. sp. Long. 27–30 μ ; lat. 10 μ . Fig. 7. Pike of Bliscoe.

Genus *Cylindrocystis* Menegh.

- C. Brébissonii* Menegh. Very frequent. Zygospores seen from
 Stickle Tarn.
C. crassa De Bary. H., H., Sk., Kirk Fell.
C. diplospora Lund. Sk., Hk.

Genus *Tetmemorus* Ralfs.

- T. Brébissonii* (Menegh.) Ralfs. Hp., Sk., C., Buttermere,
 Scawfell.
 var. *minor* De Bary. Hk., Brandreth.
T. granulatus (Bréb.) Ralfs. Common.
 f. *minor* Nordst. Sk.
 var. *attenuatus* West. Sk., Bt., Hk.
T. lævis (Kütz.) Ralfs. Common.

Genus *Spirotænia* Bréb.

- S. condensata* Bréb. Bo., Hk.

Genus *Mesotænium* Näg.

- M. micrococcum* (Kütz.) Kirchn. Sk.
M. mirificum Arch. Sk.
M. De Greyi Turn. Bn.

Genus *Micrasterias* Ag.

M. mucronata (Dixon) Rabh. Bo., Sk., Kirk Fell, Grisedale Tarn.

M. Crux-Melitensis (Ehrnb.) Ralfs. f. *punctulata*.

Forma *membrana* irregulariter punctulata (subgranulosa).
Bn.

The punctulations cause the margin of this form to appear minutely papillate.

M. Americana (Ehrnb.) Ralfs. Deepdale.

M. angulosa Hantzsch. C.

M. denticulata Bréb. Frequent.

*var. *angustosinuata* Gay (Essai d'une monograph. des Conjug., p. 52, pl. i. fig. 4). L.

var. *SUBNOTATA* var. n. Fig. 5.

Semicellulæ a vertice visæ cum elevatione mediana latissime conica, lobi polari medio dentibus duobus parvis.

Lat. 170 μ ; crass. 50 μ . Bn.

Compare with *M. denticulata* var. *notata* Nordst. (Freshw. Alg. of New Zeal. and Austr., p. 29, t. 2, f. 13).

M. rotata (Grev.) Ralfs. Bo., B., S., C., H. (at 2400 ft.), Deepdale.

M. Thomasiana Arch. C.

M. radiosa Ralfs. Bn.

M. apiculata (Ehrnb.) Menegh. subsp. *fimbriata* (Ralfs) Nordst.
Bn.

M. papillifera Bréb. Bo., Hk.

M. truncata (Corda) Bréb. Frequent.

forma *punctata* West. Bo., C.

forma *granulata* Racib. Hk.

M. Jenneri Ralfs. Sk.

var. *simplex* West. (*M. Jenneri* f. *brasiliensis* Boerg.)
Sk.

Genus *Euastrum* Ehrnb.

E. verrucosum Ehrnb. B., W., S., R., Hk.

E. oblongum (Grev.) Ralfs. Frequent.

E. crassum (Bréb.) Kütz. W., C., Kirk Fell.

E. ventricosum Lund. Hk.

E. pinnatum Ralfs. Hk.

E. humerosum Ralfs. Bt.

E. affine Ralfs. Bt., B., C., Scawfell, Brandreth, Kirk Fell, Black Sail Pass.

E. ampullaceum Ralfs. Bt., Hk., Brandreth, Kirk Fell, Black Sail Pass.

E. insigne Hass. Frequent.

E. didelta Ralfs. W., B., C., Hk., H. (at 2400 ft.), Black Sail Pass, Deepdale.

E. cuneatum Jenner. Hp., C., Hk., Black Sail Pass, Scawfell, Kirk Fell.

E. ansatum Ehrnb. Frequent.

E. circulare Hass. H.

E. sinuosum Lenorm. W., L., Hk., Bt.

E. pectinatum Bréb. Frequent.

E. gemmatum Bréb. Hk.

E. rostratum Ralfs. B., Hk.

E. elegans (Bréb.) Kütz. Very frequent.

var. *bidentatum* Näg. H., B., S., Hk.

var. *ORNATUM* var. n. Fig. 9.

Semicellulæ verrucis sex ad medium, in seriebus transversis duabus, cum granulo intus extraque ad angulos inferiores ornatæ, etiam cum granulis binis prope basem incisionis polaris.

Long. 47 μ ; lat. 29 μ ; lat. isthm. 8 μ ; crass. 14 μ .

Hp., Sk., Bn.

E. erosum Lund. var. *NOTABILE* var. n. Fig. 17.

Semicellulæ lateribus bilobulatis, lobo polari quadrato-truncato, anguste vel sublate inciso, intra marginem granulis instructis, duo ad apicem, quattuor prope incisionem, et unum supra medium; a vertice visæ angustiores quam forma typica, lateribus subrectis.

Long. 31–33 μ ; lat. 20–21 μ ; lat. isthm. 4–6 μ ; crass. 10 μ . H., S., Sk., L.

E. pyramidatum West. L.

E. binale (Turp.) Ralfs. Frequent.

forma *hians* West. C.

var. *elobatum* Lund. Bo., H., B., C., Bassenthwaite Water.

var. *RETUSUM* var. n. Fig. 6.

Var. semicellulis distincte punctatis, inflatione medio granulato, apice late retusa (nec incisa).

Long. 27 μ ; lat. 21 μ ; lat. isthm. 8 μ ; crass. 12 μ . Kirk Fell.

E. denticulatum (Kirchn.) Gay. Frequent.

Genus *Cosmarium* Corda; Ralfs.

C. quadratum Ralfs. H., Hk., Deepdale.

C. plicatum Reinsch. Near Blea Tarn.

C. sublobatum (Bréb.) Arch. H., Bo., Scarf Gap Pass.

C. tatricum Racib. var. *novizelandicum* Nordst. (Freshw. Alg. of New Zeal. and Austr., p. 56, t. 6, f. 6).

Long. 46 μ ; lat. 25 μ ; lat. isthm. 14 μ ; crass. 12 μ . Kirk Fell.

C. Nymannianum Grun. Hp.

C. Hammeri Reinsch. H., Bt., Bo., Deepdale, Bassenthwaite Water, Sty Head Tarn.

**C. Clepsydra* Nordst. (Desm. Brasil., tab. iii. fig. 29. *C. bicardia* Reinsch.).

Long. $21\ \mu$; lat. $21\ \mu$; lat. isthm. $4.5\ \mu$; crass. $16\ \mu$.
Fig. 30. Bn.

C. COARCTATUM sp. n. Fig. 11.

C. parvum, paullo longius quam latius, leviter constrictum, sinu subaperto et obtuso; semicellulæ obtrapezicæ, marginibus lateralibus subrectis, apice late truncatæ; a vertice visæ ellipticæ; a latere visæ subcirculares, apice truncatæ; membrana lævis et subincrassata ad apices.

Long. $16\ \mu$; lat. ad bas. semicell. $12-12.5\ \mu$; lat. ad apic. $13.5-14.4\ \mu$; lat. isthm. $7\ \mu$; crass. $8\ \mu$. Bo.

This seems at first sight very similar to *C. contractum* Kirchn. var. *cracoviense* Racib. (Nonn. Desm. Polon., p. 28, t. 1, f. 10) but is much smaller and has more truncate ends, a relatively wider isthmus, and a different lateral view.

C. Holmiense Lund. var. *integrum* Lund. H.

Forma cellulis a latere visis pyramidatis et a vertice visis nec late ellipticis.

Long. $52\ \mu$; lat. $30\ \mu$; lat. isthm. $16\ \mu$; crass. $17.5\ \mu$.
Fig. 12. B.

C. anceps Lund. Bn., R.

C. granatum Bréb. B., Bo., L., C., Hk., Esthwaite Water.

C. trilobulatum Reinsch. Bn.

Long. $23\ \mu$; lat. $15.4\ \mu$; lat. isthm. $5\ \mu$.

C. tetragonum Näg. H.

var. *Lundellii* Cooke. B.

C. variolatum Lund. Hk., L.

C. obsoletum (Hantzsch) Reinsch. Bn., Hk.

The vertical view was somewhat pointed at each pole just as in Nordst. Alg. et Char. I., tom. xvi. fig. 9*b*, and not as in Reinsch, Algenflora von Mitt. Frank., taf. ix. fig. 5*d*.

C. cymatopleurum Nordst. Bn.

* var. *tyrolicum* Nordst. in Wittr. et Nordst., Desm. et Edog. in Tyrol, p. 30, tab. xii. fig. 5. Hk., not uncommon.

C. pachydermum Lund. Bo., H., C.

C. perforatum Lund. Bn.

C. pyramidatum Bréb. Frequent.

C. pseudopyramidatum Lund. Frequent.

**C. microsphinctum* Nordst. in Wittr. et Nordst., l.c. p. 33, t. f. 9.

Long. $39\ \mu$; lat. $26\ \mu$; lat. isthm. $17.5\ \mu$; crass. $18.5\ \mu$.
Fig. 32. Bo.

- C. nitidulum* De Not. H., Bo., Wythburn, Kirk Fell.
C. subtumidum Nordst. H.
C. tumidum Lund. L.
C. Phaseolus Bréb. H., Scawfell, Scarf Gap Pass, Sty Head Tarn.

C. PSEUDATLANTHOIDEUM sp. n. Fig. 21.

C. parvum, $1\frac{1}{2}$ -plo longius quam latius, profunde constrictum, sinu lineari; semicellulæ subtriangulares, angulis inferioribus latissime rotundatis, lateribus concavis, apice angusto rotundato; a vertice visæ anguste ellipticæ; membrana glabra.

Long. $19\cdot5\ \mu$; lat. $13\cdot5\ \mu$; lat. isthm. $4\ \mu$; crass. $6\cdot5\ \mu$. L.

This differs from *C. atlanthoideum* Delp. in being relatively narrower and in its different vertical view.

- C. scenedesmus* Delp. B., Bn.
C. rectangulare Grun. Bt., Hk.
C. bioculatum Bréb. Sk., B., Hk.

*forma *depressa* Schaar. B.

C. tinctum Ralfs. Frequent.

*var. *intermedium* Nordst.

Long. $14\text{--}15\ \mu$; lat. $10\text{--}12\ \mu$; lat. isthm. $6\ \mu$; crass. $8\ \mu$; Bo. Frequent.

C. exiguum Arch. Hk.

- **C. Regnellii* Wille (Bidrag til Sydam. Algfl., p. 16, t. i. f. 34). Hk., common.

Long. $11\text{--}12\ \mu$; lat. $11\text{--}14\ \mu$; lat. isthm. $3\cdot5\text{--}4\ \mu$; crass. $6\ \mu$. Fig. 20.

The forms of this varied considerably. Perhaps *C. abruptum* Lund. var. *gostyniense* Racib. (Nonn. Desm. Polon., p. 24, t. ii. f. 13) may be another form of this species.

C. SUBCAPITULUM sp. n. Fig. 29.

C. parvum, paullo latius quam longius, profunde constrictum, sinu acutangulo aperto; semicellulæ elliptico-angulares; latera inferiora et superiora recta angulum subrectangularem formantia; apicibus truncatis et subretusis; a vertice visæ ellipticæ polis acutis; a latere visæ rotundo-ellipticæ; membrana lævis.

Long. $17\ \mu$; lat. $19\ \mu$; lat. isthm. $4\ \mu$; crass. $7\cdot5\ \mu$. Bn.

This differs from *C. capitulum* Roy et Biss. (Jap. Desm. in Journ. Bot., 1886, vol. 25, p. 195, t. 268, f. 9) in the truncate subretuse ends, the acute angles of the semicells, in the non-acuminate sinus, and in the subacute poles of the vertical view.

- C. impressulum* Elfv. B., Hk.
C. venustum (Bréb.) Arch. L., C., Brandreth, Grisedale Tarn.
 var. *hypohexagonum* West. Kirk Fell.
 f. *incrassata* West. Sk.
C. Meneghinii Bréb. Very frequent.
 f. *octangularis* Wille. Frequent.
 forma. Fig. 14. Diam. zygosp. sine spin. 22–23 μ , c.
 spin. 33–35 μ . Bn.
 f. *Boldtii* nob. [*C. Meneghinii* Bréb. forma h. Boldt
 (Desmid. fr. Grönland, p. 13, t. i. fig. 15.)] Bt., Hk.,
 common.
C. obliquum Nordst. f. *major* Nordst. Hk.
 f. *minor* Nordst. Bn., Langdale.
 f. *minima*.
 Long. 11 μ ; lat. 9 μ ; crass. 4 μ . Fig. 15. H., Pike of
 Bliscoe.
C. Regnesii Reinsch. B., Esthwaite Water.
C. CYMATONOTOPHORUM sp. n. Fig. 23.
C. parvum, tam longum quam latum, modicè constrictum,
 sinu aperto cum extremo obtuso; semicellulæ late subrectan-
 gulares, lateribus subtruncatis subretusisve, dorso truncato et
 quadriundulato; a vertice visæ ellipticæ, in utroque latere
 papilla instructæ; a latere visæ suborbiculares, medio utrobique
 papilla ornate.
 Long. 13·5–14·5 μ ; lat. 13·5–14·5 μ ; lat. isthm.
 5·5–6 μ ; crass. 9·8 μ . Hk.
 This seems a very distinct species; it has some resemblance in
 front view on first sight to *C. Regnesii* Reinsch.
C. substriatum Nordst. Bn., Sty Head Tarn.
 **C. subnotabile* Wille (Ferskv. Alg. fr. Nov. Sem., p. 36, tab. xii.
 fig. 16). Trough at Ambleside.
C. crenatum Ralfs. Frequent.
C. Nuttallii West. Bt.
C. undulatum Corda. H.
C. monomazum Lund. B.
C. tetraophthalmum (Kütz.) Bréb. Frequent. The zygospore
 was seen from Lake Side.
 var. *Lundellii* Wittr. Bo., Bn., R., C., Hk., Blea Tarn
 in Borrowdale.
C. Brebissonii Menegh. W., Bo., Hp., B., S., C.
 forma *erosa* West. W., Hp., Bn., S., L., C., Bt.
C. conspersum Ralfs. Bo., B., L., C., Hk.
C. Quadrum Lund.
 Long. 73 μ ; lat. 70 μ ; lat. isthm. 28 μ . Bn., Hk.
C. margaritifera (Turp.) Menegh. H. (at 2400 ft.). B.
 Scawfell, Crummock Water.

C. Portianum Arch. B., Bo., H., R, Bt., Hk., Blea Tarn, in Borrowdale.

C. reniforme (Ralfs.) Arch. B., Hk., Bassenthwaite Water.
*var. *compressum* Nordst. (Freshw. Alg. of New Zeal. and Austr., p. 46, t. 5, f. 5).
Long. 48 μ ; lat. 47 μ ; lat. isthm. 13 μ ; crass. 24 μ .
Hk.

C. Logiense Biss. Frequent.

C. punctulatum Bréb. B., H., Crummock Water, Trough at Ambleside.

C. subpunctulatum Nordst. var. *Borgesenii* West.

Forma semicellulis ad apices leviter convexis, in medio granulis paullo majoribus (7 periphericis et 1 centrali).

Long. 33 μ ; lat. 30 μ ; lat. isthm. 11 μ ; crass. 19 μ .
Fig. 18. C., Hk., Langdale.

The centre granules in var. *Borgesenii* West (Contrib. Freshw. Alg. of W. Ireland, plate 21, fig. 9) have been drawn like the others by the artist; they should have been made larger.

C. Blyttii Wille. Hp., Wythburn.

Forma paullo minor. Lat. 10 μ ; crass. 7 μ . H. (at 2400 ft.).

C. orthostichum Lund.

*var. *pumilum* Lund. (Desm. Suec., p. 25, t. ii. f. 10).

Long. 25 μ ; lat. 20 μ ; lat. isthm. 5 μ ; crass. 12.5 μ .

Bo., H.

C. Botrytis (Bory) Menegh. Very frequent.

C. Turpinii Bréb. var. *Lundellii* Gutw. Near Cockermouth.

C. VEXATUM sp. n. Fig. 33.

C. mediocre, paullo longius quam latius, profunde constrictum, sinu lineari extremo ampliato; semicellulæ subtrapezicæ, lateribus convexis, angulis inferioribus rotundatis et minute undulatis, angulos superiores versus cum undulis majoribus, dorso truncato et levissime subundulato; a vertice visæ oblongo-ellipticæ, medio glabro tumidæ; a latere visæ subcirculares; membrana grosse granulata, granulis subconcentrice et subradiatim ordinatis, glabra ad medium; pyrenoidibus binis.

Long. 41-43 μ ; lat. 36-38 μ ; lat. isthm. 13.5-14 μ ; crass. 20-21 μ . Ambleside, not uncommon.

At first sight this appears like some forms of *C. Botrytis* (Bory) Menegh., but it is much smaller, it has truncate and almost smooth apices, the lateral undulations are larger towards the apex as in *C. Quasillus* Lund., and the vertical view has a *glabrous inflated centre*. It differs from *C. Quasillus* Lund. and *C. subquasillus* Boldt in its smaller size and in the smaller central inflation of the vertical view being without undulations, as well as in other particulars. It

is quite distinct from *C. præmorsum* Bréb. (see Nordst. Norges Desm., tab. i. fig. 1), and *C. formosulum* Hoff.

C. præmorsum Bréb. B., near Windermere, Crummock Water, Embleton, near Cockermouth, Blea Tarn in Borrowdale.

C. Broomei Thwaites. L., Crummock Water.

C. ochthodes Nordst. Frequent. Occurs up to 2400 ft. on Helvellyn.

var. *AMÆBUM* var. n. Fig. 31.

Var. semicellulis subtruncatis, verrucis depressis irregularibus et sinuatis angulis 3-5.

Long. 87 μ ; lat. 60 μ ; lat. isthm. 21 μ ; crass. 40 μ . Bn., Hk. Frequent.

C. confusum Cooke var. *regularius* Nordst. Hp., Bn.

subsp. *ambiguum* West. Hk., Bt.

C. amœnum Bréb. H.

C. cylindricum Ralfs. H.

C. SUBCYLINDRICUM sp. n. Fig. 22.

C. submediocre, diametro $1\frac{3}{4}$ -plo longius quam latius, leviter constrictum; semicellulæ semi-ellipticæ cum lateribus subrectis, irregulariter et dense granulosæ, cum annulo granulorum majorum ad basem; a vertice visæ circulares.

Long. 37 μ ; lat. 21 μ ; lat. isthm. 18 μ . L.

It differs from *C. cylindricum* Ralfs in the semicells not being subquadrate, in being wider towards the base, in the rounded ends, in the granules not being arranged in lines, and in the basal ring of larger granules.

C. annulatum (Näg.) De Bary.

var. *elegans* Nordst.

Long. 46-52 μ ; lat. 17-18 μ . Hk., Bt., Bo., Pike of Bliscoe.

C. subcostatum Nordst. Bo., Esthwaite Water.

C. subprotumidum Nordst. B.

C. Bæckii Wille. H., B., W., near Cockermouth.

C. sphalerostichum Nordst. Bo., H., Sk., Bt., C., Blea Tarn in Borrowdale.

C. cœlatum Ralfs. Very frequent.

C. ornatum Ralfs. B., H., W., Hp., near Cockermouth.

C. quinarium Lund. B., Bn.

C. cyclicum Lund. Bo., H.

var. *angulatum* West, Freshw. Alg. of N. Yorks. in Journ. Bot., Oct. 1889, t. 291, f. 2. [*C. Nordstedtii* Reinsch., Contrib. Alg. et Fung., t. 10, f. 11.]

Long. 48 μ ; lat. 54 μ ; lat. isthm. 19 μ ; crass. 23 μ .

Fig. 19. Bo.

C. speciosum Lund.

*var. *biforme* Nordst. Kirk Fell.

C. subspeciosum Nordst. H.

**C. supraspeciosum* Wolle.

var. *EMARGINATUM* var. n. Fig. 24.

Var. minor, crenis distincte emarginatis, sinu extremo ampliato. Pyrenoidibus binis.

Long. $61\ \mu$; lat. $52\ \mu$; lat. isthm. $18\ \mu$. B.

C. isthmium West. L.

C. moniliforme (Turp.) Ralfs. B., Crummock Water, Ennerdale.

*forma *panduriformis* Heimerl (Desmidiaceæ Alpinae, p. 12, tab. v. f. 11). B.

C. contractum Kirchn. Bn.

C. globosum Buln. Sk., near Cockermouth.

C. MORSUM sp. n. Fig. 10.

C. mediocre, diametro circiter duplo longius, leviter constrictum, incisura mediana semicirculari; semicellulæ semiellipticæ, angulis inferioribus subacutis; a vertice visæ latissime ellipticæ; a latere visæ subcirculares lateribus subcompressis; membrana lævis.

Long. $40\cdot5\ \mu$; lat. $23\cdot2\ \mu$; lat. isthm. $15\cdot5\ \mu$; crass. $20\cdot2\ \mu$. Bn.

C. connatum Bréb. Bo., C., Hk., Bassenthwaite Water.

var. *truncatum* West. Hk.

C. pseudoconnatum Nordst. L.

C. viride (Corda) Joshua. Ennerdale.

C. pseudarctoum Nordst. Fig. 16. Hk., W., H., L., Pike of Bliscoe.

C. cucurbita Bréb. Common.

Forma major et latior.

Long. $42\ \mu$; lat. $27\ \mu$. L., Grisedale Tarn, Kirk Fell, Brandreth.

C. palangula Bréb.

var. *De Baryi* Rabh. Hk.

C. obeuneatum West.

Forma minor latior lateribus leviter concavis. Membrana lævis.

Long. $30\ \mu$; lat. $16\text{--}17\ \mu$; lat. isthm. $13\text{--}14\ \mu$. Fig. 8. H., Bn., L., Grisedale Tarn, Pike of Bliscoe.

C. Thwaitesii Ralfs. H., S.

C. turgidum Bréb. Hk.

var. *SUBROTUNDUM* var. n.

Var. duplo longius quam latius; semicellulis subrotundis.

Long. $140\ \mu$; lat. $77\ \mu$; lat. isthm. $60\ \mu$. Bn.

C. Ralfsii Bréb. Sk., Hk., Brandreth, Grisedale Tarn.

C. Cucumis Corda. Very frequent. Occurs up to 2400 ft. on Helvellyn.

forma *major* Nordst. H. (at 2400 ft.).

C. De Baryi Arch. B., S., L.

C. elegantissimum Lund.

forma *minor* West. Bo., Bn., H., C.

Genus *Xanthidium* Ehrnb.; Ralfs.

X. armatum Bréb. W., Hk., Kirk Fell.

X. aculeatum Ehrnb. B., Bn., C., H. (at 2400 ft.), Deepdale,
Black Sail Pass.

X. Brébissonii Ralfs. B., Deepdale.

var. *varians* Ralfs. Deepdale.

X. antilopæum (Bréb.) Kütz. H., B., S., C., Hk., Bassenthwaite
Water.

X. cristatum Bréb. Hk.

var. *uncinatum* Bréb. Hk.

Genus *Arthrodemus* Ehrnb.; Arch.

A. octocornis Ehrnb. Hp., Sk., L.

A. Incus (Bréb.) Hass. W., B., R., C., Hp. (cum zygosps.),
Ennerdale.

Diam. zygosps. s. spin. $20\ \mu$; c. spin. $34\ \mu$.

var. *intermedius* Wittr. Sk., Hk.

A. Ralfsii West. Bn.

A. convergens Ehrnb. Bo., R., Hk., Bassenthwaite Water.

A. bifidus Bréb.

var. *truncatus* West. Bn.

A. glaucescens Wittr.

forma *convexa* West. Hk., W. (cum zygosps.).

Zygosporæ globosæ, aculeis simplicibus longis ornatae.

Diam. zygosps. s. spin. $16\cdot5\ \mu$; c. spin. $29\ \mu$. Fig. 27.

Gen. *Staurostrum* Meyen; Ralfs.

S. defectum Bréb. S., B., Ennerdale.

Forma 4-gona. Bo., S., Hk.

var. *patens* Nord. B.

S. apiculatum Bréb. L., Bassenthwaite Water.

S. mucronatum Ralfs. W.

S. Dickiei Ralfs. S., R., B., Hk.

forma *punctata* West. Bn.

S. brevispinum Bréb., Bn., Hk.

S. cuspidatum Bréb. R., B., H., Sk.

var. *maximum* West. B.

S. aristiferum Ralfs. B.

S. O'Mearii Arch. S., Sk.

S. megacanthum Lund. W.

S. lunatum Ralfs. B., Buttermere.

S. cristatum (Näg.) Arch. Hk., not uncommon.

S. avicula Bréb. B.

- S. furcatum* (Ehrnb.) Bréb. S., L.
 var. *armigerum* (Bréb.) Rabh. W., C., Hk.
 **S. senarium* (Ehrnb.) Ralfs. Bn.
S. Reinschii Roy. Sk., Hk.
S. hirsutum (Ehrnb.) Bréb. W., B., H., Bt., C., Hk., Blea Tarn in Borrowdale.
S. pilosum (Näg.) Arch. Bn., C., Bo., Hk., Wythburn, Black Sail Pass.
S. Brebissonii Arch. var. *BREVISPINUM* var. n. Fig. 26.
 Var. *spinis brevioribus et validioribus*.
 Long. $49\ \mu$; lat. s. spin. $42\cdot5\ \mu$; lat. c. spin. $45\ \mu$;
 lat. isthm. $17\cdot5\ \mu$. B.
S. Hystriæ Ralfs. B.
S. teliferum Ralfs. Frequent.
S. polytrichum (Perty) Rabh. Bn.
S. asperum Bréb. C.
S. muticum Bréb. S., Kirk Fell.
S. orbiculare (Ehrnb.) Ralfs. Common.
 forma *major*.
 Long $61\ \mu$; lat. $50\ \mu$; lat. isthm. $17\cdot5\ \mu$. Bo.
 *var. *extensum* Nordst. A small form.
 Long. $38\text{--}39\ \mu$; lat. $25\cdot5\text{--}28\ \mu$; lat. isthm. $8\text{--}10\ \mu$.
 R., Lake Side, Sty Head Tarn.
 var. *depressum* Roy. et Biss. Bn., Hk.
S. Bieneanum Rabh. B.
S. Hibernicum West.

Forma membrana irregulariter punctata.

Long. $63\ \mu$; lat. $56\ \mu$; lat. isth. $19\cdot5\ \mu$. L.

S. ELLIPTICUM sp. n. Fig. 28.

S. mediocre, circiter $1\frac{1}{2}$ -plo longius quam latius, modice constrictum, sinu acutangulo et ampliato; semicellulæ ellipticæ; a vertice visæ trigonæ lateribus leviter convexis, angulis late rotundatis; membrana lævis; pyrenoidibus singulis magnis.

Long. $42\cdot5\text{--}46\ \mu$; lat. $29\text{--}30\ \mu$; lat. isthm. $13\text{--}15\ \mu$. Bo.

The front view is similar in form to *S. turgescens* De Not., but the membrane is smooth and the vertical view is different. It differs from *S. vesiculatum* Wolle (Freshw. Alg. of U.S., p. 42, pl. liv. f. 6, 7) in its broader sinus and elliptical semicells.

S. Kjellmani Wille. Sk., H., Bt., Blea Tarn in Borrowdale.

S. pygmæum Bréb. Frequent.

S. turgescens De Not. Trough at Ambleside, Buttermere, Blea Tarn in Borrowdale.

S. muricatum Bréb. Bo., B., Hp., Kirk Fell.

A form of this species occurred at an elevation of 2400 ft. on Helvellyn, which was just as long as broad, and very similar to figs. 19 and 20, tab. vi. in Nordst., Desmidieer från Bornholm.

- S. pyramdatum* West. Bn., H.
S. punctulatum Bréb. Common. Zygosporos from Lake Side.
S. amœnum Hilse. Sk., Scawfell, Easedale.
S. Meriani Reinsch. H., Bt., C., Blea Tarn in Borrowdale.
S. alternans Bréb. B., S., W., Bassenthwaite Water.
S. dilatatum Ehrnb. B., Bo., Hk., H. (at 2400 ft.), Crummock Water.
S. quadrangulare Bréb.
 Long. $25\ \mu$; lat. s. spin. $25\ \mu$, c. spin. $32\ \mu$; lat. isthm. $8\ \mu$. L.
S. tumidum Bréb., S., C.
S. grande Buln. Bo., Bn. L.
S. tricornis (Bréb.) Menegh. Frequent.
S. cyrtocentrum Bréb. f. 3-gona. B., W., Deepdale.
 f. 4-gona. Bn.
S. arcuatum Nordst. Brandreth.
 subsp. SUBAVICULA subsp. n. Fig. 25.
 Semicellulæ a fronte et a vertice visæ ut in *S. avicula*, cum processibus bifurcatis radiantibus sex ad apicem.
 Long. s. proc. $29\ \mu$; lat. $32\cdot5\ \mu$; lat. isthm. $9\cdot5\ \mu$. Hp.
S. inflexum Bréb. B.
S. polymorphum Bréb. W., Hp., Bt., Deepdale, near Ambleside.
 var. MUNITUM var. n. Fig. 35.
 Var. processibus seriebus transversis spinularum munitis; semicellulæ a vertice visæ triangulares lateribus rectis.
 Long. $31\ \mu$; lat. c. proc. $36\ \mu$. Esthwaite Water, not uncommon.
S. gracile Ralfs. W., Hp., C.
 var. nanum Wille. Hp.
 *var. coronulatum Boldt (Siber. Chlor., taf. v. fig. 28).
 Forma trigona; corona verrucis emarginatis sex.
 Long. $21\ \mu$; lat. $32\cdot5\ \mu$; lat. isthm. $6\ \mu$. Fig. 36. Bn.
S. paradoxum Meyen. B., Hp., Crummock Water.
S. controversum Bréb. Hk., Buttermere.
S. aculeatum (Ehrnb.) Menegh. W., L., Hk.
S. vestitum Ralfs. L., Hk., Deepdale.
 var. SEMIVESTITUM var. n. Fig. 38.
 S. minor quam forma typica; semicellulæ apicibus subrectis; a vertice visæ triradiatæ processibus curvatis trifurcatis (ut in *S. cyrtocero*), cum spina furcata una ad basem lateris convexi processus uniuscujusque.
 Long. c. spin. $21\text{--}28\ \mu$; lat. $34\cdot5\text{--}42\ \mu$; lat. isthm. $4\cdot5\text{--}8\ \mu$. L., Brandreth.
S. oxyacanthum Arch. L.
S. Sebaldi Reinsch. Bn.

S. Pseudosebaldi Wille var. *SIMPLICIUS* var. n. Fig. 37.

Var. minor, spinis aculeatis—nec bifurcatis—dorso, apicibus processuum breviorum longius tricuspidatis.

Long. c. spin. $32\ \mu$; lat. $46\ \mu$; lat. isthm. $9\ \mu$.
Brandreth.

S. eustephanum (Ehrnb.) Ralfs. Bn., L.

S. furcigerum Bréb. B., L.

S. seacostatum Bréb. B.

subsp. *PRODUCTUM* subsp. n. Fig. 34.

S. circiter tam longum quam latum (cum processibus);
semicellulæ processibus brevibus sex (*non* lobis),
cum apicibus processuum truncatis et sexdentatis,
cum annulo granulorum aculeatorum ad basem semi-
cellularum; apices verrucis emarginatis irregulariter
dispersis ornati; a vertice sexradiatis, radiis semi-
cellulæ utriusque alternantibus.

Long. $40\text{--}43\ \mu$; lat. $43\ \mu$; lat. isthm. $16\text{--}17\ \mu$. Bn.,
B., H. (at 2400 ft.).

S. margaritaceum (Ehrnb.) Menegh. Very frequent.

Forma cum annulo punctorum (circiter 14) ad basem
semicellularum.

Long. $32\ \mu$; lat. $30\ \mu$; lat. isthm. $10\cdot5\ \mu$. Hp., Grey
Knotts.

S. tetracerum (Kütz.) Ralfs. W., R., B.

Class MULTINUCLEATÆ.

Order SIPHONÆ.

Genus *Vaucheria* D. C.

V. sessilis (Vauch.) D. C. Bn.

Class CÆNOBIEÆ.

Order VOLVOCINÆ.

Genus *Eudorina* Ehrnb.

E. elegans Ehrnb. Bn., L.

Order PANDORINÆ.

Genus *Pandorina* (Bory) Prings.

P. morum Müll. H., Bn., R., Crummock Water.

Genus *Gonium* (Müll.) Ehrnb.

G. pectorale Müll. B.

Genus *Chlamydococcus* A. Br.

C. pluvialis A. Br. Deepdale.

Order PEDIASTREÆ.

Genus *Pediastrum* Meyen.

P. angulosum (Ehrnb.) Menegh. R., Bn., Crummock Water.

P. Boryanum (Turp.) Menegh. Frequent.

var. *granulatum* (Kütz.) A. Br. W., Bn., R., near
Cockermouth.

P. duplex Meyen (*P. pertusum* Kütz.) B., Bn.

P. Tetras (Ehrnb.) Ralfs. Bn.

**P. tricornutum* Borge (Chloroph. från Norska Finmarken,
p. 4, f. 3). W.

P. integrum Näg. Bn., L.

Order SORASTREÆ.

Genus *Selenastrum* Reinsch.

**S. acuminatum* Lagerh. in Wittr. et Nordst., Alg. exsic., fasc. 9,
No. 441; Bidrag till känn. om Stockholms Pediastr., Protococc., och
Palmell., p. 71, t. iii. f. 27-30. Bn.

S. OBESUM sp. n. Figs. 50-52.

*S. cellulis obesis arcuatissimis, apicibus obtusis subacu-
tisve; familiis e cellulis 4-8 constitutis, facile dissociatis;
apicibus cellularum adularum 1.5-2 μ inter se distantibus;
contentum cellularum læte viride, granulatum.*

Crass. cell. 3-4.2 μ ; diam. max. 6-9 μ . Bn.

The form of the cells of this species at once distinguishes it from
any other, the cells being bent until their apices almost meet. This
sometimes occurred in masses containing from 4 to 24 groups, each
consisting of 4-8 cells.

Genus *Sorastrum* Kütz.

S. spinulosum (Kütz.) Näg. Bn., Crummock Water.

Genus *Staurogenia* Kütz.

S. rectangularis (Näg.) A. Br. Kirk Fell, Brandreth.

Genus *Cœlastrum* Näg.

C. sphaericum Näg. Fig. 64. Bn., B., Hk., L.

C. cambricum Arch. Bn., C.

C. cubicum Näg. Bn.

C. microporum Näg. R.

PROTOPHYTA.

Group SCHIZOPHYCEÆ.

Class PROTOCOCCOIDEÆ.

Order EREMOTRICHÆ.

Genus *Hormospora* Bréb.

**H. plena* Bréb. (Rabh. Fl. Eur. Alg., p. 48). Bn.

Genus *Cylindrocapsa* Reinsch.

C. CONFERTA sp. n. Figs. 40-42.

C. cellulis indivisis quadrato-ellipsoidicis, fere latius quam longius, confertis, cum tegumentis hyalinis circiter binis circumvelatis.

Lat. cell. 21-26 μ ; long. cell. 12-20 μ ; diam. tubul. 24-30 μ . Bn.

The cells had very firm walls and were filled with intensely green granulose contents. The crowded subangular cells seem to distinguish this from any other species hitherto described.

Genus *Sciadium* A. Br.

S. arbuscula A. Br. Bn., Crummock Water.

Genus *Ophiocytium* Näg.

O. cochleare (Eich.) A. Br. B., Bn., R., Hk., Crummock Water.

**O. majus* Näg. Bn.

Genus *Dictyosphærium* Näg.

D. Ehrenbergianum Näg. Bn., Angle Tarn, Crummock Water.

D. reniforme Buln. Bn.

Genus *Dimorphococcus* A. Br.

D. lunatus A. Br. Long. cell. 12-17.5 μ ; crass. cell. 6.5-7.5 μ . Fig. 39. Bn. *Scenedesmus radiatus* Reinsch (Algenfl. des Mitt. von Frank., p. 81, t. vi. f. vi.) is probably a smaller form of this species, with more rounded apices.

Genus TETRACOCCLUS gen. n.

Cellulæ parvæ, globosæ vel subglobosæ (nonnumquam subangulares), virides, regulariter quaternæ et propinquæ, familias parvas irregulares, libere natantes, formantes, cellularum 20-80; subfamilia singula quaterna filis delicatis hyalinis subcurvatis sublaxe conjuncta, non-radiatim (forsan reliquæ membranarum cellularum seniorum); contentum chlorophyllosum cellularum cum granulis magnis paucis; propagatio cellularum divisione planitie in duas directiones alternans, et atque fit cellulis filialibus quattuor in cellula matricali ortis.

T. BOTRYOIDES sp. n. Figs. 43-48.

Character idem ac generis.

Diam. cell. 3.8-5.7 μ ; diam. famil. 30-57 μ . Bn., not unfrequent.

The nearest genus to this is *Dimorphococcus* A. Br., but this genus has its quaternate cells of two forms, which character gives rise to the generic name, and the four cells composing these dimorphic groups are somewhat irregularly joined together by short, broad, hyaline processes; these characters do not apply to *Tetracoccus*.

It is also sufficiently distinct from the genera *Dictyosphaerium* Näg., *Dictyocystis* Lagerh., and *Botryococcus* Kütz.

Genus *Apiocystis* Näg.

A. Brauniana Näg. B., Bn.

Genus *Hydrianum* Reinsch.

H. heteromorphum Reinsch. W. Sk., Angle Tarn.

Genus *Characium* A. Br.

C. Sieboldii A. Br. Near Cockermouth.

C. ornithocephalum A. Br. Bn.

Genus *Dactylococcus* Näg.

**D. infusionum* Näg. Gatt. ein. Alg., p. 85, t. iii. Bn.

D. De Baryanus Reinsch. Attached to *Cyclops*, Bowness.

Genus *Nephrocytium* Näg.

N. Nägelii Grun. R.

N. LUNATUM sp. n. Fig. 49.

N. cellulis lunatis et attenuatis, apicibus subobtusis, diametro $3-4\frac{1}{2}$ -plo longioribus, dorso valde convexo, ventre leviter concavo; familiis e cellulis 4 vel 8 formatis, subspiraliter ordinatis; tegumento hyalino, diametro duplo longioribus; contentum cellularum pallidum viride, granulatum.

Long. cell. $14-18\ \mu$; lat. cell. $4-6\ \mu$; long. tegument. $36-60\ \mu$; lat. teg. $20-32\ \mu$. Bn., R.

This is a very characteristic species, being abundantly distinct from the other species.

Genus *Oocystis* Näg.

O. Nägelii A. Br. H., near Windermere.

O. solitaria Wittr. Hp., Sk., Hk., L.

**O. crassa* Wittr.

Long. cell. $14\cdot5-15\cdot5\ \mu$; lat. $10-10\cdot5\ \mu$. B.

**O. Novæ Semliæ* Wille.

forma *major* Wille. Bo.

O. ELLIPTICA sp. n. Fig. 56.

O. cellulis in familias e 4-8 cellulis formantes consociatis, cellulis oblongo-ellipticis, $2\frac{1}{4}$ -plo longius quam latius, apicibus rotundatis et non-incrassatis.

Long. cell. $24-25\ \mu$; lat. cell. $11-11\cdot5\ \mu$. Bt.

forma *minor*.

Long. cell. $15-17\ \mu$; lat. $7\cdot5-8\ \mu$. Buttermere.

This seems distinct from *O. Novæ Semliæ* Wille, *O. solitaria* Wittr., &c.

Order PROTOCOCCACEÆ (includ. PALMELLACEÆ).

Genus *Pleurococcus* Menegh.

P. angulosus Menegh. S.

Genus *Trochiscia* Kütz.

T. aciculifera (Lagerh.) Hansg.

Diam. s. spin. 20 μ , c. spin. 28 μ . Bn.

T. UNCINATA sp. n. Fig. 54.

T. cellulis parvis globosis, solitariis vel in familiis parvis aggregatis; membrana cellularum tenui, spinis longis curvatis validissimis ornata; contentum chlorophyllosum granulosum cellularum læte viride.

Diam. cell. s. spin. 12·5–13·5 μ ; c. spin. 21–23 μ . Bn.

Genus *Palmella* (Lyngb.) Näg.

P. mucosa Kütz. H.

P. hyalina Bréb. R.

Genus *Botrydina* Bréb.

B. vulgaris Bréb. S.

Genus *Palmodictyon* Kütz.

P. viride Kütz. Crummock Water.

Genus *Tetraspora* Link.

T. bullosa (Roth) Ag. Lake Side.

Genus *Chlorococceum* Fries.

C. gigas (Kütz.) Grun. Bn., B., R., Hp.

C. REGULARE sp. n. Fig. 55.

C. cellulis subrotundatis, singulis, geminatis (rarius ternis), quaternis, vel octonis consociatis; membrana cellularum subcrassa; dispositione chromatophorarum parietali cum puncto rubro unaquaque cellula; tegumento hyalino pellucidissimo et non-lamelloso.

Diam. cell. s. teg. 12–15·5 μ , c. teg. 36–48 μ .

Hab. amongst *Sphagnum* and *Utricularia*, frequent. Harrop Tarn and Bowness. Also seen from East Cornwall, Devonshire, North and West Ireland.

It differs from *C. gigas* (Kütz.) Grun. in its very hyaline tegument not being lamellose, in its thicker cell-walls and in the cells being arranged usually in a binate or quaternate manner.

Genus *Glæocystis* Näg.

G. ampla (Kütz.) Rabh. H., R., Bn.

G. vesiculosa Näg. Frequent.

Genus *Schizochlamys* A. Br.*S. gelatinosa* A. Br.Diam. cell. 10–12 μ . S., Sk., L.*S. DELICATULA* sp. n. Fig. 57.

S. cellulis parvis, globosis subglobosisve, vel singulis vel geminis in familias consociatis; familiæ 10–50 in matricem hyalinam achroam aggregatæ; membrana tenuis dissociata in unam portionem; divisio cellularum in unam directionem fit.

Diam. cell. 5·8–6·7 μ . Bo., Bn., Esthwaite Water.

This is a much smaller and more delicate plant than *S. gelatinosa* A. Br., the much thinner membrane separating in one piece, the new cell escaping by a lateral slit, and the division of the cells is only in one direction.

Genus *Eremosphæra* De Bary.

E. viridis De Bary. Frequent. Occurs up to 2400 ft. on Helvellyn.

Genus *Botryococcus* Kütz.*B. Braunii* Kütz. B., Bn., Black Sail Pass, near Cockermouth.*B. calcareus* West. Bn.Genus *Urococcus* Hass.*U. insignis* (Hass.) Kütz. Very frequent.Genus *Rhaphidium* Kütz.

R. polymorphum Fres. var. *falcatum* (Corda) Rabh. Very frequent.

var. *aciculare* (A. Br.) Rabh. Bn.**R. convolutum* (Corda) Rabh. Bo.*R. biplea* Reinsch. Bn.Genus *Scenedesmus* Meyen.

S. bijugatus (Turp.) Kütz. Near Cockermouth, Bassenthwaite Water.

S. alternans Reinsch. Bo., Bn.*S. denticulatus* Lagerh.var. *linearis* Hansg. (var. *lineatus* West). Bn., Hk.*S. quadricauda* (Turp.) Bréb. Frequent.*S. antennatus* Bréb. Bn., Rydal Water.*S. acutus* Meyen. Frequent.var. *obliquus* (Turp.) Rabh. Bn., near Cockermouth.var. *dimorphus* (Kütz.) Rabh. Bn.Genus *Tetraëdron* Kütz.*T. minimum* (A. Br.) Hansg.Lat. cell. 10 μ ; crass. 6 μ . Angle Tarn.**T. trigonum* (Näg.) Hansg. Bn.

- T. regulare* Kütz. (*Polyedrium tetraëdricum* Næg.). Bn.
 forma PACHYDERMA.
 Forma membrana crassissima.
 Lat. 31–35 μ ; crass. membr. 2–2·5 μ . Bn.
T. gigas (Wittr.) Hansg.
 forma OBTUSA.
 Forma angulis abrupte obtusis.
 Lat. 27–42 μ . Kirk Fell.
 var. MAMILLATA var. n. Fig. 53.
 Var. major, angulis mamillatis.
 Lat. max. 92 μ . Bn.
T. enorme (Ralfs.) Hansg. R., Bn.

Class PHYCOCHROMACEÆ.

Sub-class *Nostochinæ*.

Order NOSTOCACEÆ.

Genus *Nostoc* Vauch.

- **N. paludosum* Kütz. Bn.
N. muscorum Ag. Amongst mosses, Scandale.
N. humifusum Carm. R.
N. microscopicum Carm. [*N. rupestre* Kütz. *N. hyalinum* Benn.
 (*N. opalinum* Benn.)]. Bn., R., H., Bt., Deepdale.

Genus *Anabæna* Bory.

- A. sp.* Crass. cell. 7·5–8 μ ; crass. heterocyst. 8·5–9 μ . Bn.

Order RIVULARIACEÆ.

Genus *Dichothrix* Zanardini.

- D. Orsiniana* (Kütz.) Bornet et Flah. (Revis. des Nostocac.
 Hétérocyst., p. 376). Langdale.

Genus *Glæotrichia* J. Ag.

- G. Pisum* (Ag.) Thuret. Pike of Bliscoe.

Order SCYTONEMACEÆ.

Genus *Microchæte* Thur.

- **M. diplosiphon* Gomont var. CUMBRICA var. n.
 Var. cum articulis prope basem 7·5–8 μ crassis, apicem
 versus 3 μ crassis; vagina exteriore 23–30 μ crassa; hetero-
 cystis intercalaribus diametro 4-plo longioribus.
 Crass. vag. inter. 6·5–9 μ ; long. heterocyst. intercal.
 22–24 μ , lat. 5·5 μ . C.

No freshwater species of this genus has hitherto been recorded for Britain. The form seen had the trichomes occasionally interrupted.

Genus *Scytonema* Ag.*S. COOKEI* sp. n.[*S. natans* Cooke (Brit. Freshw. Alg., p. 265, pl. 105, fig. 2) non Bréb.].Crass. fil. 18–24 μ ; crass. trich. 6–7 μ . Langdale.

This species belongs to the section *Euscytonema* Bornet et Flah. (Revis. des Nostocac. Hétérocyst., p. 86); it has the sheath composed of parallel strata and has distinct dissepiments. *S. natans* Bréb. does not belong to this genus, it is the same as *Plectonema mirabile* Thur. (vide Bornet et Flah., l.c. p. 113). As Cooke's description of the species which he places under *S. natans* Bréb. agrees with the Langdale plant, I propose to call it *S. Cookei*.

S. figuratum Ag. H., C., Pike of Bliscoe.*S. crustaceum* Ag. [*Petronema fruticulosum* Thwaites.] Bo.Genus *Tolypothrix* Kütz.

T. tenuis Kütz. [*T. pygmaea* Kütz.; *T. flaccida* De Bary.] Bn., H., Hk., Crummock Water.

Genus *Desmonema* Berk. et Thwaites.*D. Wrangelii* (Ag.) Bornet et Flah. (Revis. des Nostocac. Hétérocyst., p. 127).[*Calothrix Dillwynii* Kütz.; *Desmonema Dillwynii* Berk. et Thw.]

var. MINOR var. n.

Var. trichomatibus angustioribus. Lat. trich. 5–6 μ . Langdale.

Exactly similar to the typical form but smaller.

Order SIROSIPHONIACEÆ.

Genus *Stigonema* Ag.*S. ocellatum* (Dillw.) Thur. R.*S. panniforme* (Ag.) Bornet et Flah. Pike of Bliscoe.*S. minutum* (Ag.) Hass. Bo.*S. turfaceum* (Eng. Bot.) Cooke. Bt., Langdale.*S. mamillosum* (Lyngb.) Ag. Langdale.

Order OSCILLARIACEÆ.

Genus *Oscillaria* Bosc.*O. tenerrima* Kütz. Near Keswick, near Cockermouth.*O. leptotricha* Kütz. Bassenthwaite Water, near Cockermouth.*O. subfusca* Vauch. Bn.*O. tenuis* Ag. H., Bn., Sk., C.*O. limosa* (Roth) Ag. Bo., Vale of Newlands.*O. nigra* Vauch. H., Bn.*O. Frolichii* Kütz. Bn.*O. princeps* Vauch. Bn., C., Hk.

Genus *Lyngbya* Ag.

L. SUBTILE sp. n. Fig. 58.

L. solitaria et sparsa, trichomatibus subflexuosis, libere natantibus, distincte articulatis; vaginis arctis, achrois; articulis diametro duplo; cytoplasmate pallide ærugineo et homogæneo.

Lat. fil. $1.5-1.8 \mu$. Bo., H., Bn., Scarf Gap Pass.

This is one of the smallest species of the genus yet observed. The filaments are frequently interrupted in the sheath and single joints occasionally become separate, as well as parts of the filament. It is sufficiently distinct from *L. hyalina* Borzì (Nuova Notarisia, Apr. 1892, p. 40) which occurs in an olive-green stratum and has tortuose and intricate filaments, and its cells longer than broad.

L. vulgaris (Kütz.) Kirch. H. (at 2400 ft.).

Genus *Inactis* Kütz.

I. tinctoria (A. Br.) Thur. On *Myriophyllum* in Crummock Water.

Genus *Spirulina* Link.

S. oscillarioides Turp. B., Bn.

var. *minutissima* (Hass.) Rabh. Forma anfractibus laxissimis, 1 in 38μ . Crass. trich. 2μ . Bn.

Sub-class *Chroococcaceæ*.

Order CHROOCOCCACEÆ.

Genus *Chroococcus* Näg.

**C. minor* (Kütz.) Näg. (Gatt. einz. Alg., p. 47, t. i. A, f. 4). H., Bt., S., L., Ennerdale, near Bow Fell.

**C. pallidus* Näg. (l.c. p. 46, t. 1 A, f. 2). Sk., C.

C. cohærens (Bréb.) Näg. L., Sk., Bn.

C. turgidus (Kütz.) Näg. Frequent.

var. *VIOLACEUS* var. n.

Var. cytoplasmate constanter violaceo.

Diam. cell. s. teg. $14-18 \mu$; c. teg. $18-22 \mu$.

Foot of Bow Fell, near Angle Tarn, along with *Aphanothece saxicola* Näg. and *Glæocapsa quaternata* (Bréb.) Kütz.

C. GIGANTEUS sp. n. Figs. 59 and 60.

C. cellulis magnis subsemicircularibus, plerumque binis (rarius quaternis) in familias consociatis; familiis solitariis; tegumento hyalino, leve lamelloso (lamellis 2-3); cytodermate tenui; cytoplasmate densissime ærugineo et granulato.

Diam. cell. s. teg. $54-58 \mu$; c. teg. $67-70 \mu$; crass. teg. $5.4-6 \mu$. Bn., not uncommon.

This differs from *C. turgidus* (Kütz.) Näg. in its very much larger cells with relatively much thinner tegument.

C. SCHIZODERMATICUS sp. n. Figs. 61-63.

C. cellulis subglobosis vel subtrigonis, nonnunquam subreniformibus, binis vel ternis, quaternis in familiis consociatis; familiis solitariis vel 2-4 aggregatis; tegumento crassissimo, stramineo vel fuscescente, valde lamelloso (lamellis 5-10), demum irregulariter discedente; cytodermate subcrasso; cytoplasmate æruginoso et granulato.

Diam. transv. cell. s. teg. 5·8-11 μ , c. teg. 21-38 μ ; diam. long. cell. s. teg. 5-7·6 μ , c. teg. 27-42 μ . Near Windermere.

This is at once distinguished from all other species by the peculiar thick, splitting tegument similar to that of *Urococcus insignis* (Hass.) Kütz. (*Chroococcus macrococcus* Rabh. et var. *aureus* Rabh.).

Genus *Glæocapsa* Näg.

G. atrata Kütz. Langdale.

G. caldariorum Rabh. H.

G. polydermatica Kütz. Sk., near Windermere.

G. quaternata (Bréb.) Kütz. Bow Fell, near Angle Tarn.

G. æruginosa (Carm.) Kütz. Langdale.

**G. punctata* Näg. (Gatt. einz. Alg., t. i. F, f. 6).

Diam. cell. s. teg. 0·8-1 μ . Langdale.

Genus *Aphanocapsa* Näg.

**A. pulchra* (Kütz.) Rabh. (Fl. Eur. Alg., ii. p. 49).

Diam. cell. 2·5-3 μ . Bn.

A. Grevillei (Berk.) Rabh. R., Bn., S.

Genus *Microcystis* Kütz.

M. protogenita (Bias.) Rabh. Bn., near Cockermouth, Esthwaite Water.

M. marginata (Menegh.) Kirchn. Bn.

Genus *Clathrocystis* Henfrey.

C. æruginosa (Kütz.) Henfrey. Bn.

Genus *Cælosphærium* Näg.

C. Kützingianum Näg. Bn.

Genus *Merismopedia* Meyen.

M. glauca (Ehrnb.) Näg. Very frequent.

M. æruginea Bréb. Bn.

M. irregulare Lagerh. Hp.

Genus *Synechococcus* Näg.

S. æruginosus Näg. H., Langdale.

S. crassus Arch. Bn., Kirk Fell.

Genus *Glæothece* Näg.

**G. linearis* Näg. (Gatt. eing. Alg., p. 58, t. i. G, f. 2). Hk, L.

**G. violacea* Rabh. (Fl. Eur. Alg., ii. p. 61).

Diam. cell. s. teg. 0·6–0·9 μ , c. teg. 6–9 μ . Sk.

The teguments were highly refractive.

G. cystifera (Hass.) Rabh. var. *MAXIMA* var. n.

Cellula latitudine $1\frac{1}{2}$ -plo longior, duplo major quam in forma typica, cytioplasmate granuloso.

Long. cell. s. teg. 14–16 μ , c. teg. 18–30 μ ; lat. cell. s. teg. 9–10 μ , c. teg. 13–20 μ . Bn.

Genus *Aphanothece* Näg.

A. microscopica Näg. Bn., R., Scarf Gap Pass.

A. saxicola Näg. Bn., Bt., Esthwaite Water, foot of Bow Fell, near Angle Tarn.

Genus *Glaucocystis* Itz.

G. Nostochinearum Itz. Bo.

Genus *Tetrapedia* Reinsch.

T. Reinschiana Arch. Bn., Esthwaite Water.

Class DIATOMACEÆ.

Genus *Cyclotella* Kütz.

C. operculata (Ag.) Kütz. B.

C. Kützingiana Thw. B., H. (at 2400 ft.).

Genus *Melosira* Ag.

M. varians Ag. Bo., Bn., Vale of Newlands, Crummock Water.

M. nivalis Sm. Bo., near Windermere.

Genus *Surirella* Turpin.

S. linearis Sm. Common. Occurs up to 2400 ft. on Helvellyn.

var. *constricta* (Grun.) Rabh. Hp., Bn., C., Kirk Fell.

S. biseriata (Ehrnb.) Bréb. Frequent. Occurs up to 2400 ft. on Helvellyn.

S. angusta Kütz. Bn.

S. splendida (Ehrnb.) Kütz. Bn.

S. nobilis Sm. H. (at 2400 ft.).

S. ovalis Bréb. Deepdale.

S. ovata Kütz. Near Cockermouth.

S. minuta Bréb. Bo., near Cockermouth.

S. pinnata Sm. Bn., Threlkeld, Blea Tarn in Borrowdale.

Genus *Cymatopleura* Sm.

C. Solea (Bréb.) Sm. Bo., Bn., Deepdale, Dubb's Moss.

Genus *Epithemia* Bréb.

- E. turgida* (Ehrnb.) Kütz. H., Bn., Crummock Water.
E. Westermanni (Ehrnb.) Kütz. H., C., Pike of Bliscoe.
E. Hyndmanii Sm. Bn.
E. Sorex Kütz. Bn., B.
E. gibba (Ehrnb.) Kütz. Bn., B., L., Bt., Hk.
E. ventricosa Kütz. Bt., C.
E. Zebra (Ehrnb.) Kütz. Bn., B.
E. gibberula (Ehrnb.) Kütz. var. *rupestris* (Sm.) Rabh.
(*E. rupestris* Sm.). H., C.
E. Argus (Ehrnb.) Kütz. Bn., L., Hk.
E. alpestris Sm. Bn.

Genus *Eunotia* Ehrnb.

- E. incisa* Greg. Bn., Kirk Fell, Scawfell.
E. diodon Ehrnb. H., Bn., Scawfell.
E. triodon Ehrnb. H., Deepdale.
E. tetraodon Ehrnb. H., Bn., C., Brandreth.
E. Arcus Ehrnb. Bt., Hp., B., Kirk Fell, Easedale.
E. majus Sm. H., Black Sail Pass.
E. bidens Greg. B., C., Hk.
E. gracilis Ehrnb. Very frequent. Occurs up to 2400 ft. on Helvellyn.
E. pectinalis Dillw. W., H., B., Bn., C., Wythburn, Crummock Water.
 var. *undulatum* Ralfs. C., Pike of Bliscoe.

Genus *Ceratoneis* Ehrnb.

- C. Arcus* (Ehrnb.) Kütz. Crummock Water.
C. Amphioxys Rabh. W., Sk., R., Derwent Water, Bassenthwaite Water.

Genus *Cymbella* Ag.

- C. Ehrenbergii* Kütz. Bn., Hk., Bassenthwaite Water.
C. cuspidata Kütz. Bt., C., Hk., Buttermere, Threlkeld, Dubb's Moss.
C. turgida Greg. W., B., Bn., H. (at 2400 ft.).
C. gastroides Kütz. B.
C. Smithii Rabh. (*C. helvetica* Sm.). B.
C. maculata Kütz. B., Bn., near Cockermouth.
C. ventricosa Ag. B.

Genus *Cocconema* Ehrnb.

- C. lanceolatum* Ehrnb. Frequent.
C. cymbiforme (Kütz.) Ehrnb. H., B., Bn., Derwent Water.
C. Cistula Hempr. Very frequent. Occurs up to 2400 ft. on Helvellyn.
C. parvum Sm. H., B., Threlkeld, Ennerdale, Scawfell, Sty Head Tarn.

Genus *Encyonema* Kütz.

E. cæspitosum Kütz. B.

E. gracile Rabh. W.

Genus *Amphora* Ehrnb.

A. ovalis Kütz. Bn., W., H., B., H. (at 2400 ft.), Deepdale, Crummock Water.

Genus *Cocconeis* Ehrnb.

C. Placentula Ehrnb. H., Bn., Derwent Water, near Cocker-mouth.

C. Thwaitesii Sm. B.

Genus *Achnanthidium* Kütz.

A. microcephalum Kütz. Scawfell, Sty Head Tarn.

A. lanceolatum Bréb. B., Threlkeld, Derwent Water, near Cocker-mouth.

Genus *Achnanthes* Bory.

A. exilis Kütz. Very common.

Genus *Denticula* Kütz.

D. tenuis Kütz. B.

D. obtusa Sm. B.

D. sinuata Sm. L.

Genus *Odontidium* Kütz.

O. hiemale (Lyngb.) Kütz. B., H. (at 2400 ft.), Derwent Water, Crummock Water, Ennerdale, Kirk Fell.

O. mesodon Kütz. Common. Occurs up to 2400 ft on Helvellyn.

O. mutabile Sm. Frequent.

O. Harrisonii Sm. Bn.

Genus *Fragilaria* (Lyngb.) Ag.

F. capucina Desmaz. Bo., H., Threlkeld, Grisedale Tarn, Derwent Water, Vale of Newlands.

F. virescens Ralfs. B., Deepdale, Crummock Water.

Genus *Diatoma* D. C.

D. vulgare Bory. B.

D. elongatum Ag. B., Grisedale Tarn.

Genus *Synedra* Ehrnb.

S. lunaris Ehrnb. Common.

S. sp. B.

This was near to *S. longissima* Sm., but was straighter and narrower.

1892.

- S. biceps* Kütz. Frequent.
S. pulchella Kütz. B., H., Kirk Fell, near Cockermouth, Derwent Water.
S. Ulna Ehrnb. H., Bn., Ambleside, Deepdale, Dubb's Moss, Bassenthwaite Water.
S. splendens Kütz. Common.
S. Acus Kütz. B., L., Threlkeld, Esthwaite Water, Sty Head Tarn.
S. delicatissima Sm. B.

Genus *Asterionella* Hass.

- A. formosa* Hass. Bo., L., H. (at 2400 ft.), Deepdale, Bassenthwaite Water.

Genus *Amphipleura* Kütz.

- A. pellucida* Kütz. Bn.

Genus *Nitzschia* Hass.

- N. Amphioxys* (Ehrnb.) Sm. H., Cockermouth.
N. constricta (Kütz.) Pritch. (*N. dubia* Sm.). Bn.
N. parvula Sm. Bn., Scawfell.
N. sigmoidea (Nitzsch.) Sm. Bn., Derwent Water.
N. curvula (Ehrnb.) Sm. Very frequent.
N. linearis (Ag.) Sm. H., Bn., B., W., Deepdale, near Cockermouth.
N. tenuis Sm. B., Bn., Crummock Water, near Cockermouth.

Genus *Nitzschiella* Rabh.

- N. acicularis* (Kütz.) Rabh. Bn.

Genus *Navicula* Bory.

- N. cuspidata* Kütz. B., Ennerdale, Crummock Water, Dubb's Moss.
N. rhomboides Ehrnb. Very frequent.
N. serians (Bréb.) Kütz. L., C., Angle Tarn, Scawfell.
N. elliptica Kütz. (*N. ovalis* Sm.). Bo., Bn., L., B., Hk., Deepdale.
N. pygmaea Kütz. (*N. minutula* Sm.). Bn.
N. limosa (Kütz.) Grun. L.
N. amphixæna Bory. Bo., Bn., C., Bassenthwaite Water.
N. sphærophora Kütz. Near Cockermouth.
N. pusilla Sm. Bo.
N. rhynchocephala Kütz. Bo., Bn., near Cockermouth, Bassenthwaite Water.
N. affinis Ehrnb. B., Bn., H. (at 2400 ft.).
N. firma Kütz. Bn., common. Seen with auxospores.
N. Amphirhynchus Ehrnb. Bn., C., Bassenthwaite Water, Kirk Fell.

- N. producta* Sm. W., Bn., Vale of Newlands.
N. appendiculata Kütz. B.
N. exilis (Kütz.) Grun. Frequent.
N. cryptocephala Kütz. B., H., Ambleside, Bassenthwaite and
 Crummock Water.
N. dicephala Ehrnb. Bn., Derwent Water.

Genus *Pinnularia* Ehrnb.

- P. nobilis* Ehrnb. H. (at 2400 ft.), Deepdale.
P. major (Kütz.) Rabh. Common. Occurs up to 2400 ft. on
 Helvellyn.
P. Rabenhorstii Ralfs. (*P. interrupta* Rabh.). Sk.
P. Tabellaria Ehrnb. Derwent Water.
P. gibba Ehrnb. Very frequent.
P. lata (Bréb.) Rabh. Bn., H., Bt., C., Brandreth.
P. viridis (Ehrnb.) Rabh. Very common. Occurs up to 2400
 ft. on Helvellyn.
P. alpina Sm. C.
P. radiosa (Kütz.) Rabh. Frequent.
 var. *silesiaca* (Bleisch) Rabh. Bn.
P. borealis Ehrnb. B., Threlkeld.
P. acuta Sm. Bn.
P. mesolepta Sm. W., Bn., Bt., L., C.
P. divergens Sm. H., Bn., Deepdale.
P. Brebissonii (Kütz.) Rabh. Very frequent.
 var. *subcapitata* Rabh. Hp., Bt., B., L., Ennerdale.

Genus *Frustulia* Rabh.

- F. saxonica* Rabh. forma *aquatica* Rabh. (*Navicula crassi-*
nervia Bréb.). Common.

Genus *Pleurosigma* Sm.

- P. attenuatum* (Kütz.) Sm. Threlkeld.
P. Spencerii (Quekett) Sm. Bo., near Cockermouth.

Genus *Stauroneis* Ehrnb.

- S. Phœnicenteron* (Nitzsch) Ehrnb. Very frequent.
S. gracilis Ehrnb. Bn.
S. anceps Ehrnb. B., Bn., Bt., C.
S. dilatata Sm. Bn.

Genus *Schizonema* Ag.

- S. neglectum* (Thw.) Rabh. Bassenthwaite Water.

Genus *Gomphonema* Ag.

- G. tenellum* Kütz. Frequent.
G. dichotomum Kütz. W., H., B., Kirk Fell.
G. Vibrio Ehrnb. H., Sty Head Tarn.

- G. capitatum* Ehrnb. Bn., Sk.
G. constrictum Ehrnb. Bn., near Cockermouth, Sty Head
Tarn, Ennerdale.
G. geminatum Ag. H., R., B.
G. acuminatum Ehrnb. B., W., H., Bn., Sty Head Tarn,
Crummock Water.
G. olivaceum (Lyngb.) Kütz. B., Bassenthwaite Water.
G. intricatum Kütz. B., L., C., Sty Head Tarn.

Genus *Meridion* Ag.

- M. circulare* (Grev.) Ag. B., Hp., near Cockermouth.

Genus *Tabellaria* Ehrnb.

- T. flocculosa* (Roth) Kütz. Very common.
var. *ventricosa* (Kütz.) Rabh. Scawfell, Crummock
Water.
T. fenestrata (Lyngb.) Kütz. Common.

Genus *Tetracyclus* Ralfs.

- T. lacustris* Ralfs. B.
-