TRANSACTIONS
OF THE
NEW ZEALAND INSTITUTE,
1888.

I.—BOTANY.

ART. I.—Further Notes on the Desmideae of New Zealand,
with Descriptions of New Species.

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[Read before the Wellington Philosophical Society, 3rd October, 1888.]

PLATES I. TO VI.

This paper contains descriptions of several plants to be added
to the lists given in my papers of 1880 and 1882, also correc-
tions of some of the identifications in those papers. These
 corrections are due partly to more complete acquaintance
with the writings of foreign authors on the subject, partly
to suggestions from Professor Nordstedt, of Lund, Mr. W. B.
Turner, of Leeds, and others who have kindly assisted me
with advice.

The literature of the Desmideae is becoming every year
more and more voluminous; unhappily, also, it is very scat-
tered. Some works, such as those of Ralls for England,
Wolle for the United States, Delponte for Northern Italy,
may be considered as fairly monographic as regards those
countries, and are procurable in book-form; but the equally
valuable labours of Brébisson, Naegeli, Lundell, Nordstedt,
Bennett, Lagerheim, Wille, and many others are to be found
chiefly in short papers in Transactions of various societies,
and are accessible with great difficulty. Any one who is aware
of the extreme minuteness of Desmids, in which sometimes
the ten-thousandth of an inch is of importance, and of the
delicate variations they exhibit (perhaps an extra crenulation
or two on the edge, an extra granule on the frond), will
recognise the difficulty of a student of the family in a country
like this. Whoever will undertake the preparation of a mono-
graph of the Desmideae will earn the gratitude of all who care
to examine these beautiful little plants.
Transactions.—Botany.

The following list of the works on the Desmidieae which are now (1888) available to me here is given as a guide to anybody desiring to further investigate the family in New Zealand. They do not form more than a small portion of the whole bibliography of the subject, but are sufficiently comprehensive for most purposes. However, every year is adding to the number of works on Desmids.

De Bary, A. Untersuchungen über die Familie der Conjugaten. 1858.

Bennett, Dr. Fresh-water Algae of the English Lake District (in "Journ. of Roy. Micros. Soc."). 1886.


Delporte, J. B. Specimen Desmidiacearum subalpinarum. 1873.

Ehrenberg, C. G. Die Infusionsthierehen. 1888.


Lagerheim, G. Contributions Algologiques à la Flore de la Suède 1886.

— Bidrag till Amerikas Desmidié-Flora. 1885.

— Ueber einige Algen aus Cuba, Jamaica, und Puerto-Rico. 1887.

— Ueber Desmidiaceen aus Bengalen. 1887.

— Sopra Alcune Alge d'acqua dolce. 1888.

Lundell, P. M. De Desmideaeis quae in Suecia invente sunt. 1871.


Nordstedt, O. Symboles ad Floram Brasiliae centralis cognoscendum—Desmideae. 1869.

— Desmideae ex insulis Spetsbergensis et Beeren Eiland. 1872.

— Bidrag till Kännedomen om sydligare Norges Desmideer. 1873.

— Desmideae arctae. 1875.

— Desmideae et Eddogonia in Italia et Tyrolia collectae. 1876.

— Nonnullas Alge aque dulcis Brasilenses. 1877.

— De Algis aque dulcis ex insulis Sandavicensibus. 1878.

— De Algis nonnullis, præcipue Desmideis, inter Utricularias Musei Lugduno-Batavi. 1880.


— Fresh-water Algae collected by Dr. S. Berggren in New Zealand and Australia. 1887.


Ravenhorst, L. Flora Europea Algarum aque dulcis et submarinæ. 1868.

Raffles, J. The British Desmideae. 1848.


Spencer, Dr. Notes on Fresh-water Algae ("Trans. N.Z. Inst."). 1881.

— Continuation of the above. 1882.

Turner, W. B. Notes on Fresh-water Algae (in the "Naturalist"). 1886.


Wallich, Dr. Descriptions of Desmidiaceae from Lower Bengal (in "Annals and Mag. of Nat. History"). 1860.

WOLLE, F. Desmids of the United States. 1884.

Also detached papers on Desmidiae and other Algae by Nordstedt, Witzrool, Marquand, and others.

Professor Nordstedt’s paper on the New Zealand Algae, included in the above list, is specially valuable. It contains descriptions, with seven plates, of about one hundred and fifty species and varieties of Desmidiae.

I have to make the following remarks and corrections regarding some of the plants included in my two former papers. These are rendered necessary by more accurate knowledge acquired since 1882, either by observation, or by more extended access to the literature of the subject, or by suggestions from Professor Nordstedt, Mr. Turner, and others.

Aptogonum undulatum ("Trans. N.Z. Inst.", vol. xiii.). The genus Aptogonum is now by most writers considered as properly only equivalent to Desmidium, Agardh; and Professor Nordstedt attaches my plant as a variety to D. baileyi, de Bary. In his description and figures ("Alg. of N.Z.", p. 27, and pl. ii., 8) he does not, I think, express altogether the convex curve of the upper portion of each cell as seen in front-view (or, as I called it in 1880, the "side-view," meaning as in filament). His specimens appear to be more angular than any I have seen, and I have re-examined for comparison a number of preserved specimens and a few fresh ones. Also, he states that in all cases the end-view is "regularly triangular, with rounded angles and almost straight sides." I find that this is so as a rule; but several specimens exhibit an end-view similar to that given in my paper of 1880 (vol. xiii., pl. xi.), except that the printers then added a sort of loop or curved open ring, which was not in my original drawing, and instead of which there should have been only the three small processes near the angles.

Micrasterias rotata (vols. xiii. and xv.). This, which I reported with very great doubt in 1880 and 1882, turns out to be M. schwefenfurthii, Cohn, a Central African plant. My fig. 16b (vol. xv.) is a form of M. angulosa, Hantzsch.

Euastrium binale, forma (vol. xiii.). The fig. 26 in pl. xii. is the variety denticulatum, Kirchner. See the present paper, with more accurate figure. (Pl. II., fig. 12.)

Holocystis incisa (vol. xiii.). This is Micrasterias decemdentata, Naegeli, var. upsaliensis, Cleve.

Cosmarium ralfsii (vol. xiii.). This is very near to C. pseudopachydermum, Nordstedt ("N.Z. Alg.", p. 53), and is not
the species to which I first referred it. Nordstedt’s specimens, most of which seem to have come from the Canterbury District, as mine did, had not the deep incassation at the ends shown in my pl. xii., fig. 30 (1880). I have re-examined my specimens, and find the incassation very distinct in most of them, though some are without it.

*Cosmarium crenatum* (vol. xiii.). This is *C. naegelianum*, Brébisson, var. *latum* of my present paper.

*C. undulatum* (vol. xiii.) is *C. speciosum*, Lundell. *Vide post.*

*C. undulatum*, var. *β* (vol. xv.), appears to me now to be somewhat near *C. impressulum*, Elfwing, as figured by Roy and Bisset (“Japan Desm.”); but I have not specimens at hand for comparison.

*C. margaritiferum* (vol. xiii.). The three forms figured by me in 1880 appear to belong to different species. Fig. 27 is probably *C. sublatum*, Nordst.; fig. 28, *C. quaternionum*, Nordst.; and fig. 29, *C. reniforme*, Archer, which is at least very closely allied to *C. margaritiferum*.

*C. broomeii* (vol. xiii.). This is *C. sublatum*, Nordst.; but I am not able to see the difference between this new species and Lundell’s *C. latum*.

*C. thyoides* (?) (vol. xv.) is *Penium cucurbitinum*, var. *subpolymorphum*, Nordst.

*C. gemmiferum* (vol. xv.) is *C. magnificum*, sp. nov., Nordst.

*C. speciosum*, var. *inflatum* (vol. xv.). Professor Nordstedt makes this *C. subspeciosum*, var. *validus*, var. nov. In accepting the correction, I cannot help remarking that the differences between *C. speciosum* and *C. subspeciosum* do not appear to be very important.

*C. cyclicum*, var. *ampliatum* (vol. xv.). In accordance with a suggestion from Professor Nordstedt, I describe and figure this in the present paper as *C. subcyclicicum*, sp. nov.

*C. tetraophthalum* *β* minus (vol. xv.) is *C. subpunctulatum*, Nordst.

*Staurastrum avicula* (vol. xiii.) is *S. subdentataclatatum*, Nordst.

*Staur.* (*Didymocladon*) *stella* (volvs. xiii. and xv.) are forms of *S. sexangulare*, Bulnheim.

*Staur. aculeatum* (vol. xv.) is *S. splendidum* of the present paper.

*Staur. clepsydra* (vol. xv.). This name having been previously taken, Professor Nordstedt, at my suggestion, altered it to *S. spencerianum*. He considers the plant a variety of *S.*
connatum, Lundell. Nordstedt observes that the spines in his specimens do not diverge as much as shown in my figures. I have since re-examined my specimens, and find that in the majority the spines, if produced inwards, would meet exactly at the middle of the isthmus, as in my pl. xxiv., fig. 12a: a few of them are less divergent, as in my fig. 12b.

_Docidium dilatatum_ (vol. xiii.) is _D. ovatum_, Nordst. ("Desm. Brasil.") now attached to the sub-genus _Pleurotoanum_. The measurement given in my paper of 1880, "length, \(\frac{3}{4}\) in.," is a clerical error; it should have been "\(\frac{3}{4}\) in."

_Triploceras tridentatum_ (vol. xiii.); the same, var. _cylindricum_ (vol. xv.); the same, var. _superbum_ (vol. xviii.). The distinctions upon which I based this new species and its variations, as separating it from _T. verticillatum_ and _T. gracile_, Bailey, from _T. pristida_, Hobson, and _T. gracile_, Archer, were the presence of three denticulations on the terminal processes and two tricuspidate projections just below them. Professor Nordstedt considers the last as accidental. On re-examining my specimens of var. _cylindricum_ I find that some have the projections, others have not; consequently these cannot be used as sufficient distinction. Nordstedt attaches my var. _superbum_ to _T. verticillatum_, and my var. _cylindricum_ to _T. gracile_, Bailey; but he says that in neither has he been able to see the terminal processes _tridentate_. In all of the eighteen specimens I have preserved of both, the three teeth are very distinct and clear, although in some which are slightly turned towards the eye the third tooth is seen only foreshortened. There is indeed a marked difference between these two plants and _T. aculeatum_ or _T. bidentatum_, Nordst. ("N. Z. Alg.," p. 64), of which I have also specimens. In these last the terminal teeth are never, as far as I have seen, more than two, and sometimes only one is visible. Of the original _T. tridentatum_ I have unfortunately no specimens now, and the locality where it was gathered is no longer available. It will be worth while for some one to make a thorough examination of the plants of this genus in New Zealand, for they are very beautiful and worthy of full investigation. On the whole, I venture to maintain my original diagnosis; and, if _T. verticillatum_ and _T. gracile_ never have three terminal denticulations, I think my plants are rightly separated from both.

The localities in New Zealand where Dr. Berggren collected _Algae_ appear to have been very numerous, ranging from the Bluff to the Bay of Islands. I do not see, however, in the list given in Professor Nordstedt's paper any places in Hawke's Bay or on the south-western coast of the North Island. Most of the new species and varieties mentioned in this present paper and former papers of mine have been collected in these
two regions, either near Napier on the east coast or Otaki on the west. In addition, I have from these places a number of the Desmids described by Nordstedt. The following plants should therefore have habitats attached to them as follows:

_Hawke's Bay._—_Sphaerococcus excavatum_, _Cosmarium minutum_, _Cosm. sexangulare_, _Cosm. arctoun_, _Cosm. blyttii_, _Cosm. repandum_, _Cosm. pseudopyramidatum_, _Xanthidium fasciculatum_ β perornatum, _Staurastrum sub-denticulatum_, _Staur. sebaldi_, _Staur. sagittarium_, _Staur. renardi_, _Penium polymorphum_, _Closterium bréissonii_.


My thanks are due to Professor Nordstedt; to Mr. W. Barwell Turner, of Leeds; to Herr G. Lagerheim, of Stockholm; and others, who have kindly assisted me with advice, figures, and specimens; and also to Mr. C. W. Lee, of Otaki, who has been assiduous in forwarding to me gatherings from that place in which occur many of the plants mentioned in these pages.
ADDITIONS TO CATALOGUE OF NEW ZEALAND DESMIDIOŒ.

[Note.—Plants marked with an asterisk (*) have been reported by Professor O. Nordstedt, in his account of fresh-water Algae collected in New Zealand by Dr. S. Berggren.]

Genus Sphærozosma, Corda.

Sphærozosma compressum, sp. nov. Plate I., fig. 1.

Plant filamentous; joints very minute, elongated, the ends orbicular, the middle cylindrical and compressed, each joint having the appearance of a dumb-bell. Filament twisted, the joints in side-view less compressed in the middle. Section elliptical. Endochrome chiefly visible in the cylindrical portion of each joint. Zygospore smooth, orbicular, a good deal wider than the joints. There are no processes between the joints, of which there are sometimes at least thirty in a filament.

Long. cell., 10·7 μ; lat. term., 5·8 μ; lat. med., 3·5 μ; diam. zyg., 8·6 μ.

Rutherford’s Swamp, Otaki.

This plant is allied to S. excavatum, Ralfs, but differs in the cylindrical middle, orbicular ends, generally longer and rounder joints, and absence of connecting processes. It seems to be rare.

*Sphærozosma pulchellum, Archer. Plate I., fig. 2.

Approximating to S. bambusinoide, Wittrock, which Wolle considers as a variety of S. pulchellum.

Sphærozosma formosum, sp. nov. Plate I., fig. 3.

Cells almost twice as long as broad; filament not twisted; constriction rather deep, linear within and wide at the mouth; semi-cells roundly inflated at the base, thence sub-cylindrical to the rounded angles of the ends, which are not at all dilated; ends straight or slightly convex; cells joined to each other without any glands or processes. Cytioderm smooth. End-view elliptical or sub-circular.

Long. cell., 22·5 μ; lat., 13·4 μ; crass., 10·5–12 μ.

Hawke’s Bay.

Like most species of this genus the filaments are very fragile. I have seen a few with as many as twenty or more joints; but it is rare to find more than three or four cells together, and in most cases the joints are single. When single these cells may easily be taken for Euastrum subiobatum, which is nearly of the same size; but in that plant the terminal angles are slightly dilated, the ends are concave, and the end-view is different. Sphærozosma formosum is so much larger than S. pulchellum, and its cells are so much less inflated (proportionately), that it must for the present be con-
sidered as a separate species. Hereafter it may be perhaps taken only as a large form of *S. pulchellum*.

Genus *Onychonema*, Wallich.

*Onychonema filiforme*, Ehrenb.

I reported this plant in 1880 under the genus *Spharozosma*. Messrs. Roy and Bisset ("Japan Desm.," p. 242) draw attention to the fact that the double processes overlay the semicells, and that the plant must therefore be placed under *Onychonema*.

Hawke's Bay; Christchurch; Otaki.

Genus *Euastrum*, Ehrenberg.

*Euastrum mammatum*, sp. nov.

A. *Forma major*, var. *sub-cuneatum*. Plate I., fig. 4.

Frond rather large; constriction deep, somewhat widened internally; segments in front-view cuneate, margins nearly straight, but with a low inflation or mamma about half-way to the end; ends slightly protruding, and at each side of the notch emarginate; the notch is shallow, but seems as if continued in a shallow groove for nearly a quarter of the distance to the isthmus. On the surface of the frond several (seven or eight) very inconspicuous inflations in two transverse series, two of which correspond to the lateral mammae; at the ends an inflation at each side of the notch. Cytiocyst punctate. In side-view, segments tapering from a shallow constriction to narrow rounded ends; median mammae and inflations visible.

Long., 70–77 μ; lat., 35–42 μ; crass., 18–24 μ; lat. isthmi, 11 μ.

Hawke's Bay.

B. *Forma minor*, var. *ellipticum*. Plate I., fig. 4a.

Frond smaller and somewhat less angular than the last; the sides slightly convex, the ends much more protuberant than in *sub-cuneatum*. Lateral mammae, inflations, and groove as in the larger form. The puncta are less distinct. Ends in side-view very slightly dilated.

Long., 60–67 μ; lat., 31–36 μ; crass., 20–22 μ; lat. isthmi, 12 μ.

Rutherford's Swamp, Otaki.

Both forms of this plant approach *E. cuneatum*, Jenner (which also occurs in New Zealand); but they are much smaller, and the inflations, the grooves at the notch, and the protuberant ends distinguish them.

*Euastrum sinusum*, Lenormant.

I have two forms which I refer to this species, as follow:—

A. *Forma major*, var. *gemmulosum*, var. nov. Plate I., fig. 5.
Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

NEW ZEALAND DESMIDIEAE.
Frond rather large; constriction deep, linear; segments in
front-view obscurely three-lobed, the basal lobes widely
emarginate with very shallow depressions; end-lobe com-
pressed, ends slightly dilated, round, a little protuberant, with
a deep narrow notch. At the base of each segment five
granuliferous inflations (three on the face and one at each
side); above these four others; at the ends an inflation on
each side of the notch; altogether eleven inflations on each
segment. The granules are conspicuous, and the cyti-
derm is punctate. Segments in side-view thick, sub-cylindrical,
slightly narrowed near the ends, the inflations giving irregular
outlines. In end-view the sub-elliptical grooved ends appear
conspicuously on the rounded and inflated basal lobes, the
granules being conspicuous.

Long., 75–80 μ; lat., 40–44 μ; crass., 26 μ; lat. isthmi,
11·8 μ.

Hawke’s Bay; Otaki.
B. Forma minor, var. simplex, var. nov. Plate I.,
fig. 6.

Frond much smaller than the last; otherwise similar in
outline. Inflations not constant in number: some plants
exhibit eleven on each segment, others only seven, the lowest
row having only three, the middle only two; inflations
granuliferous, the granules distinct. Cytioderm smooth, or,
at least, the puncta are extremely obscure. Zygospor
globose, with subulate spines which have very broad bases and
rather long points.

Long., 53 μ; lat., 26 μ; diam. zyg. ex spin., 27 μ; long.
spin., 11 μ.

Rutherford’s Swamp, Otaki.

E. sinuosum was attached by Ralfs ("Brit. Desm.," p. 85)
to E. circulare, Hassell, but has since been considered as
separate. The two forms here given do not, as it seems
(unless the hitherto undescribed zygospor of the European
plant be found to differ), require to be considered as anything
but varieties of the type. Nordstedt reports ("N.Z. Alg.,"
p. 33) E. sinuosum from New Zealand without remark. The
measurements which he there gives (long., 87 μ; lat., 50 μ) are
a good deal larger than those of Ralfs. My var. gemmulosum
exactly corresponds with Ralfs’s dimensions; the var. simplex
is a good deal smaller. The measurements I give are constant
in a number of specimens observed. I think that the con-
spicuous granules in the inflations of both, the divided sub-
elliptical end conspicuous in end-view, and the shallowness of
the depressions in the edges, may be taken as sufficiently dis-
tinctive characters: the variable number of inflations is not
important. Wolle ("Desm. of U.S.," pl. xxvii.) figures
E. circulare with much-compressed end-lobe, and with a
circular end in end-view. He gives its length as only 36 μ, and does not mention E. sinuosum.

* Euastrum longicolle, Nordstedt. Plate I., fig. 7.
There is in this plant, near the middle of each segment in front-view, a small circular orifice with a spot in the centre, as if there were there a ring-like opening of the frond. Professor Nordstedt ("N.Z. Alg.," p. 33) casually mentions this feature without further remark. The only other species of this genus, as far as I am aware, exhibiting "scrobiculi" are E. crassum, var. scrobiculatum, Lundell, and E. rostratum, Ralfs, var. praeornatum, Nordstedt, the former a Swedish, the latter a New Zealand form.
Rutherford's Swamp, Otaki.

Euastrum rotundum, sp. nov. Plate I., fig. 8.
Frond moderate; constriction deep, linear; segments in front-view obscurely three-lobed, the basal lobes smoothly and widely rounded, not emarginate; on each segment three basal granuliferous inflations, and two others at the ends; a few granules on the edges. Segments in side-view sub-cylindrical at the base, slightly emarginate on account of the median inflation, then tapering rapidly towards the ends, which are very slightly dilated. End-view elliptical with median inflation.
Long., 44·6 μ; lat., 26 μ; crass., 17 μ.
Rutherford's Swamp, Otaki.
Allied apparently to E. pingue, Elling; but it is more slender and less clearly three-lobed. It is much smaller and more evenly rounded than E. ansatum, Ralfs. E. obesum, Joshua ("Burm. Desm.," p. 638, and pl. xxiii., 19), is like it in outline, but is larger as a rule, and has apparently no granuliferous inflations.

* Euastrum sublobatum, Brébisson. Plate I., fig. 9.
Some authors place this plant under Cosmarium, others under Euastrum. The end-view seems to me to determine its place in the latter genus, and so I leave it.
Hawke's Bay.

Euastrum expansum, sp. nov. Plate I., fig. 10.
Frond very minute, not quite as long as broad; constriction deep, linear, rather wide externally; segments in front-view three-lobed, basal lobes somewhat protruded and a little turned upwards, end-lobe with concave end but without a terminal notch. Frond in side-view narrow, constriction shallow and wide, segments elliptical towards the base and tapering towards the rounded ends. End-view elliptical at the base, with the tip of the end-lobe appearing as if sub-rect-
angular. Inflations doubtful, no specimen having been seen without endochrome.

Long., 11.4 μ; lat., 13.2 μ; crass., 3.2 μ.

Christchurch.

If it were not for the concave ends and for the appearance in end-view, this plant would belong more properly to the genus Cosmarium. It is exceedingly minute, and not common.

* Euastrum denticulatum, Kirchner. Plate II., fig. 11.

This appears to be one of the innumerable varieties of E. binale, Ralfs. It is the plant of which a rough representation was given by me in 1880 ("Trans.," vol. xiii., pl. xii., 26); the present figure is more accurate. Nordstedt ("Alg. of N.Z.," pl. iii., fig. 11) represents this plant as "sp. ad E. denticulatum accedens," and in his fig. 9 he shows Kirchner's original type as a good deal smaller. The two sizes occur here together. I can detect only one median inflation on each segment in front-view. The side-view which I give is less "ornate" than that of Nordstedt (iii., 11c): it is taken from two specimens observed.

Hawke's Bay; Christchurch.

Euastrum binale, Ralfs, forma. Plate II., fig. 12.

This seems to be nearer than the last to the original type, although it does not seem to fit it exactly.

Christchurch.

The variations of E. binale would appear to be endless. Ralfs, Lundell, Delponte, Wolle, all give figures which differ a good deal from each other. Especially Wolle describes and figures E. binale as distinguished by the "pouting" of the ends at each side of the terminal notch, this very character being a distinctive one of E. elegans. In fact, there is so much difference in these figures that one wonders why some of the plants have not been transferred to other species. My figure 12, which I take to be E. binale because its ends do not exhibit any "pouting," is very similar to one of Wolle's ("Desm. of U.S.," pl. xxvii., 25) which he names E. elegans.

Euastrum undulosum, sp. nov. Plate II., fig. 13.

Frond moderate; constriction deep, linear; segments in front-view trapezoidal, tapering directly from the base to the rather wide ends; sides crenate, each with four equal crenations; ends wide, angles divergent, with minute terminal spines, slightly protuberant towards the middle and emarginate; notch conspicuous; at the base of each segment is a single median conspicuous inflation, and on the face of the frond a number of concentric verrucose undulations. In side-view the constriction is shallow and wide, the inflation visible;
the segments taper with sinuous edges to the rounded ends. End-view sub-elliptical with median inflation. Cytioderm very obscurely punctate, if not free from puncta.
Long., 38.6 μ; lat., 22.7 μ; crass., 13.5 μ.
Hawke’s Bay.

_E. incrassatum_, Nordst., is more elliptical, and has not dilated ends; also its crenations are not equal. _E. crenatum_, Kützing, seems near it; but Dr. Bennett ("Journ. Roy. Micros. Soc.," 1886, p. 9) describes that plant as having quite straight ends and scarcely any notch; also a very shallow constriction. It differs from _E. denticulatum_ in the absence of the rather deep notch which in that species separates the terminal from the lateral lobes. In _E. undulatum_ the edge is evenly crenulate from the constriction to the terminal angles.

_Equisetum irregularare_, sp. nov. Plate II., fig. 14.

Froンド small; constriction deep, linear; segments in front-view sub-trapezoidal, the sides tapering from the base to the rather wide ends; ends emarginate, with conspicuous notch, the lips of which do not protrude; at the angles fine spines; sides irregularly emarginate, incised with small but distinct depressions, but the division between the terminal and lateral lobes is not clearly marked. Inflations on each segment in front-view seven—three at the base, two at the end, and two near the sides. In side-view the segments are sub-rectangular, slightly inflated towards the base, the ends very slightly dilated, with rounded angles. End-view sub-fusiform, with sinuous edges.
Long., 22.3 μ; lat., 18 μ; crass., 8.9 μ.
Kaitoke; Otaki; Masterton.

In outline this plant is similar to some varieties of _E. binale_, except that the edges are much more irregularly incised; the number and arrangement of the inflations also differentiate it.

Genus _Cosmarium_, Corda.

_Cosmarium variabile_, sp. nov. Plate II., fig. 15.

Froند moderate, elongated; constriction shallow, rather open; segments tapering from rounded basal angles to rather wide truncate ends; sides sometimes convex, sometimes straight, sometimes concave; ends very slightly rounded or almost straight, never concave, but with often the inner cell-wall distinctly thickened. The cytioderm is not punctate. In side-view segments elliptical, ends more or less acute, sides smooth. The end-view is elliptical.
Long., 42 μ; lat., 21 μ; crass., 15 μ.
Hawke’s Bay; Otaki.
The form with concave sides approaches to \textit{C. anceps}, Lundell, but it is larger, and the ends are not emarginate. I observe that Wolle's figure of \textit{C. anceps} ("Desm. of U.S.," pl. xviii., fig. 11) differs considerably from Lundell's. The convex form resembles \textit{C. parvulum}, Brébisson, but is also much larger. The three outlines which I give were taken from a gathering in which the plant occurred rather plentifully. Mr. W. B. Turner informs me that he has seen from India a plant something like mine, and thought of giving it the name of \textit{C. varians}. Herr G. Lagerheim tells me that he has had my plant growing in a greenhouse at Berlin for two years: he does not mention the locality whence he procured it, but this could hardly have been New Zealand.

\textit{Cosmarium curtum, var. attenuatum}, Brébisson. Plate II., fig. 16.

Sufficiently near to the European species, I believe, to permit identification. It will be noticed that this New Zealand form has a slightly elliptical end-view, being narrowed as seen from the side. It is just possible that this may be sufficient to distinguish it from Brébisson's plant, or, at least, to suggest that it should be named "\textit{forma compressa}." But for the present I prefer leaving it as it is, subject to future revision. In dimensions it is rather smaller than the type.

Long., 35 \( \mu \); lat., 15 \( \mu \); crass., 10 \( \mu \).

Otaki.

\textit{Cosmarium retusum}, Perty; var. \textit{laeve}, Roy and Bisset. Plate II., fig. 17.

This plant differs from Perty's type in the total absence of granules. Lundell ("Desm. Suec.," p. 36) remarks that the granules of \textit{C. retusum} are not easily observed; but they are undoubtedly absent in the New Zealand as in the Japanese form.

Long., 17.8 \( \mu \); lat., 13.5 \( \mu \); crass., 7 \( \mu \).

Hawke's Bay; Otaki.

The dimensions given are rather smaller than those of Roy and Bisset ("Japan Desm.," p. 195), but the plant seems to be otherwise identical.

\textit{Cosmarium pachydermum}, Lundell, \textit{forma intermedia}. Plate II., fig. 18.

Long., 81 \( \mu \); lat., 55 \( \mu \); crass., 19 \( \mu \).

Christchurch; Hawke's Bay; Kaitoke; Otaki.

This plant seems to be intermediate in size between Lundell's original type and Nordstedt's "\textit{var. minus}" ("Norges Desm.," p. 18). The segments are quite round, as in the type; but in side-view they are rather narrower and more attenuated.
The plant which I reported as "Cos. ralftii, var. β" ("Trans." 1882, vol. xv., p. 239), may perhaps have been a still smaller form of the same plant; but I have not now any specimens to which to refer.

* Cosmarium trilobulatum, Reinsch, var. basicondrum, Nordstedt. Plate II., fig. 19.
  Long., 18 μ; lat., 12 μ.
  Otaki.
  My measurements are a little less than those given by Professor Nordstedt ("Alg. of N.Z.," p. 57).

Cosmarium cordatum, Brébisson, forma minor. Plate II., fig. 20.
  Long., 30 μ; lat., 15 μ; crass., 12 μ.
  Rutherford's Swamp, Otaki.
  I have never seen the original figures of this plant, and have judged from those given of it by Wolle ("Fresh. Alg. of U.S.," pl. lx.) and by Turner ("Journ. Roy. Micr. Soc.," Dec., 1885). With these it agrees nearly in all but size, and perhaps a little more angular form in side-view.

* Cosmarium repondum, Nordstedt. Plate II., fig. 21.
  I think my specimens have rather more sinuous sides than the type.

Cosmarium speciosum, Lundell, forma genuina. Plate II., fig. 22.
  Long., 50 μ; lat., 26-8 μ; crass., 17 μ.
  Hawke's Bay.
  The dimensions of this plant seem to vary. Wolle says that the American forms are much larger than the Swedish.

Cosmarium speciosum, Lundell, var. simplex, Nordstedt. Plate II., fig. 23.
  Long., 40-45 μ; lat., 28-32 μ; crass., 15-17 μ.
  Hawke's Bay.
  This plant is less angular than the type; but I scarcely like to consider it at present as a new variety. Hereafter it may be separated on account of its rounder form.*

* Cosmarium sub-speciosum, var. validius, Nordstedt. Plate II., fig. 24.
  This plant, in vol. xv. of our "Transactions," I reported as C. speciosum, var. inflatum. Professor Nordstedt has placed it more correctly as above.

* Since completing this paper I have received from Dr. Nordstedt a tracing of C. speciosum, forma intermedia, Wille ("Dezm. of Nov. Zemliya"), which appears to be perhaps nearer our plant than the var. simplex.
Cosmarium regnesi, Reinsch, var. ornatum, var. nov.
Plate II., fig. 25.
Frond very minute; constriction shallow, wide, and curvilinear; segments in front-view irregular, sides very short, cut into three minute lobules with concave edges; angles between the lobules sharp; ends concave. Cytioderm bearing at each side of each segment three granules arranged triangularly. Segments in side-view sub-fusiform, tapering gradually to rounded ends; two minute granules visible on the face and two others on each edge: of the last, one pair are near the base, the other near the end. End-view angular-elliptical, a minute granule marking each quasi-angle.
Long., 9 μ; lat., 9 μ; crass., 2.5 μ.
Christchurch.
If I may judge by a tracing sent to me by Mr. W. B. Turner of Reinsch's original figure of this plant, and by a figure of Mr. Turner's in the "Naturalist," February, 1886, the plant herein described is more ornate than the original. Some specimens, however, in slides sent me from England a few years ago by Mr. Joshua, are nearer to this New Zealand form, though not exactly similar. Reinsch's figure is, as I understand, by no means a good one. The plant is exceedingly minute, and is scarcely to be made out with a less power than 1,000 diameters. It appears to have sometimes a pink tinge.
Cosmarium holmiense, Lundell, forma minor. Plate III., fig. 26.
Long., 54 μ; lat., 35 μ; crass., 23.7 μ.
Hawke's Bay.
Shorter, and not quite as wide as the original type. The American form (Wolle, "Desm..of U.S.,” p. 68) is even narrower. The dimensions here given are constant in many specimens.
Cosmarium naegelianum, Brébisson, var. latum, var. nov.
Plate III., fig. 27.
Frond small; constriction deep, linear, narrowed at the mouth; segments in front-view nearly twice as wide as long, with slightly convergent sides; edges crenulate, with five cre- nations at each side; ends wide, plane, or very obscurely crenulated. In side-view, segments sub-rectangular, angles rounded; in end-view elliptical, with a very slight median inflation and an obscurely crenulate edge. Cytioderm minutely punctate, the puncta obscurely arranged in transverse rows when in side-view. Zygosporo globose, spinous with short sharp subulate spines.
Long., 25 μ; lat., 23.8 μ; crass., 11 μ; diam. zygosp. incl. spin., 32.7 μ; long. spin., 3 μ.
Christchurch; Hawke's Bay; Otaki.

A plant of the series of C. crenatum, Ralfs; but proportionately shorter and broader, and the crenulations of the ends in front-view are so obscure that the end often appears nearly straight. C. naegelianum, as figured by Wolle ("Desm. of U.S."), is narrower than this New Zealand form, but his description otherwise corresponds. This plant differs from C. sub-punctulatum, Nordstedt ("Alg. of N.Z.," p. 47), in the absence of the granules which are conspicuous in that form. The zygospore is new.

Cosmarium turnerianum, sp. nov. Plate III., fig. 28.

Frond moderate; segments in front-view twice as broad as long, or more; constriction deep, linear, and somewhat wide, so that the segments do not closely approximate; segments sometimes circular, sometimes trapezoidal, the edges deeply sinuous with ten wide crenulations; cytioderm marked by a number of granular inflations corresponding to the crenulations of the edge, giving an appearance to the frond of grooves radiating from the centre; in the median space a series of seven smaller inflations in a row on the base of each segment. A frond with circular segments is almost regularly elliptical, the ends at the constriction somewhat sharp. In side-view, segments sub-elliptical, narrow, ends rounded, edges very obscurely crenulated towards the ends, and with a slight inflation towards the base marked with minute inflations. In end-view, frond sub-elliptical with sharp ends, the thickness variable; a slight median inflation visible, and the granules arranged in transverse series.

Long., 36-40 µ; lat., 40 µ; crass., 14-20 µ.

Hawke's Bay.

This plant approaches C. cyclicum, Lundell, especially when elliptical with rounded segments, but it is smaller, has a wider sinus at the constriction, with more conspicuous "grooves" on the frond, and the row of granules at the base of each segment, producing the inflation in side-view, is quite distinctive. Lundell gives two variant figures of C. cyclicum, neither of which has trapezoidal segments. C. cyclicum, var. arcticum, Nordstedt, is more angular than Lundell's type, but its edges are irregularly incised, and it has not the rows of granules which produce the inflations of our species.

I have ventured to attach to this plant the name of Mr. W. B. Turner, who has been kind enough to give me much help.

Cosmarium sub-cyclicum, sp. nov. Plate III., fig. 29.

In 1882 ("Trans." vol. xv., p. 241) I reported this plant under the name C. cyclicum var. ampliatum. Professor Nordstedt suggests to me that it should rather be a new species,
and certainly the number of small crenulations on the margin is about double that of Lundell’s plant, which has only twelve. The rather widely-gaping constriction (from which I took my former name) seems to separate it from any species hitherto described.

Long., 51 µ; lat., 46–49 µ; crass., 16 µ.
Sumner Road, Lyttelton.

Cosmarium heliosporum, sp. nov. Plate III., fig. 30.
Frond small; segments in front-view sub-quadrate, crenate, with from ten to twelve conspicuous crenations; angles rounded; cytioderm marked with large granular inflations corresponding to the crenations and radiating from the median space, giving the frond a deeply-grooved appearance; in the median space, at the base of each segment, a row of small, apparently vertical inflations, usually five in each row. In side-view, segments sub-quadrate, slightly tapering to the wide ends, which are a little convex; edges smooth at the base of the segments, and minutely crenulate at the ends. End-view elliptical, with transverse rows of granules; viewed from the base of a segment the granules form a circle round the isthmus. Zygosporangium globose, with numerous spines; the spines subulate, on broad bases, and minutely divided at the apex.

Long., 28.3 µ; lat., 23 µ; crass., 15.6 µ; diam. zygosp. exclus. spin., 33 µ; long. spin., 3.5 µ.

Hawke’s Bay.

A species belonging to the series of C. crenatum, but distinct by its sub-quadrate segments, which are conspicuously crenate at the ends, and by the form and size of the spines on the zygospore. From these spines Mr. Turner suggested to me the specific name which I have herein adopted.

Cosmarium amplum, Nordstedt. Plate III., fig. 31.

I give a figure of this plant, partly because of its peculiar end-view in some cases (roundly triangular); partly because the granules seem to me often to be arranged in concentric curves, and not always in quincunx, as Professor Nordstedt reports; and partly on account of a conspicuous inflation observed in some specimens when viewed neither in front nor directly from the end. The plant is a fine one. Perhaps two-thirds of the specimens observed by me from Otaki have a triangular end-view; all those from Hawke’s Bay have elliptical ends.

Hawke’s Bay; Otaki.

Cosmarium quadrifarium, Lundell, var. gemm ulatum, var. nov. Plate III., fig. 32.

Frond moderate; constriction deep, linear; segments in
front-view sub-semicolon, basal angles slightly rounded; edges incised with numerous (eighteen to twenty on each) crenulations, of which the little elevations are truncate; cytiocolumn apparently slightly grooved just within the edge; in the centre of each segment a circular granuliferous inflation, the granules arranged more or less concentrically, and connected by a network of fine rays; between the inflation and the edge are three concentric rows of granules. End-view elliptical, the edges crenulate, the median inflation conspicuous, sub-orbicular; on the surface are six rows of granules, arranged longitudinally.

Long., 50 μ; lat., 33–36 μ; crass., 18 μ ex. inflat.
Rutherford's Swamp, Otaki.

This handsome plant is apparently an intermediate form between the original _C. quadrifarium_ and its varieties _hexastichum_, Lundell, and _octastichum_, Nordstedt. From the former it differs in having six rows of granules in end-view instead of four, and from the two latter in having the granules on the median inflation arranged more or less concentrically instead of in direct rows. The network of rays connecting these granules appears to be a character visible in the var. _octastichum_. The edges in end-view in my specimens do not exhibit such conspicuous "papillae" as those figured by Lundell and Wolle, but have obscure crenulations. I have not seen the zygospore, which in _C. quadrifarium_ is quadrate, a rather unusual form amongst _Cosmariaria_.

Genus _Xanthidium_, Ehrenberg.

_Xanthidium intermedium_, sp. nov. Plate IV., fig. 33.

Fond large; constriction deep, linear; segments in front-view sub-trapezoidal, widely and roundly inflated at the base, then tapering and slightly concave towards the ends, which are wide and straight, the angles very slightly dilated. Cytioderm punctate. On each segment are a number of strong simple spines, neither dilated nor forked: most of these are disposed in groups on the edges of the basal inflations in front-view, others in pairs or in threes on the ends and at the terminal angles, a few are scattered or in short rows on the surface. Median inflation not to be made out in front-view; granules none. End-view elliptical, with a very slight median inflation; the spines arranged in a longitudinal band, most numerous towards the two ends, and with a parallel row of only a few spines at each side of the band.

Long., 89 μ; lat., 71.5 μ; crass., 35.5 μ; long. spin., 4.5 μ.
Rutherford's Swamp, Otaki.

The main distinction, it would seem, between the genera _Cosmariaria_ and _Xanthidium_ lies in the usually truncate and granular projection which, in addition to the spines, occupies
the centre of each segment. In the present plant this projection is so slight, so round, and so free from granules that the generic position of the plant is not easily fixed. In a general way it belongs probably to the series of *X. aculeatum*, Ehrenberg, but it is not that species. It is smaller than *X. octonarium*, Nordstedt (also a New Zealand plant), and has many more spines. Hereafter it may be found necessary to relegate it to the genus *Cosmarium*, but even then it will have to occupy a rather doubtful position, something like Mohammed’s coffin.

**Genus Arthrodesmus**, Ehrenberg.

*Arthrodesmus convergens*, Ehrenb., var. *divaricatus*, var. nov. Plate IV., fig. 34.

Frond resembling generally the original type, with the segments in front-view elliptical, though the edges are usually very slightly angular (so slightly as not to form a distinctive character). The spines converge at first and then diverge in a regular curve, and they are blunt, if not even a little dilated, at the tip. In end-view the spines are straight.

Long., 36 μ; lat., 33-5 μ; crass., 13 μ; long. spin., 8 μ.

Hawke’s Bay; Otaki.

I mentioned this plant in my paper of 1882 ("Trans.," vol. xv., p. 243), but, as I had at that time only seen one specimen, did not think it desirable to found a variety on it. Since then, however, I have obtained a number of specimens, all agreeing in the above characters, and venture therefore to consider them as not exactly conforming to the type. I have seen two or three specimens of larger size, reaching long. 56 μ, lat. 45 μ.

*Arthrodesmus incus*, Brébisson.

Besides the forms *a*, *c*, *d* of Ralfs ("Brit. Desm.," pl. xx.), reported by Professor Nordstedt ("N.Z. Alg.," p. 45), I have specimens of the form *b* from Otaki. The plant is very variable in shape, and seemingly also in size.

**Genus Staurastrum**, Meyen.

*Staurastrum dilatatum*, Ehrenberg, forma. Plate IV., fig. 35.

Frond small; constriction deep and wide; segments in front-view elliptical, in end-view triangular, with slightly concave sides and widely-rounded angles; cytiomere punctate.

Long., 30-35 μ; lat., 34-41 μ.

Christchurch; Hawke’s Bay; Otaki; Wellington.

Professor Nordstedt reports a form, *S. dilatatum*, var. *obtusilobum*, De Notaris, from New Zealand, but with four-angled end-view. All the specimens I have observed have but three angles.
Stauastrum bieneanum, Rabenhorst, forma minor. Plate IV., fig. 36.

Frond small; segments in front-view fusiform, with very wide constriction; in end-view triangular, with deeply concave sides, and rounded, rather tapering, angles; cytioiderm punctate, the puncta in transverse lines; edges apparently not perfectly smooth.

Long., 20–25 μ; lat., 15–22 μ.
Hawke’s Bay; Wellington; Otaki.

I prefer attaching this plant to Rabenhorst’s species (which, indeed, he considered rather a variety of S. orbiculare, but which later authors have considered distinct), instead of erecting it into a separate species on the minute variations which it presents.

Stauastrum sub-amœnum, sp. nov. Plate IV., fig. 37.

Frond small, slightly variable in size; constriction only a minute notch. Segments in front-view unequally pentagonal, the sides obscurely sinuous and widening from the base to the sub-acute lateral angles, thence tapering rapidly to the terminal angles; ends straight. The edges all round are obscurely irregular. Within the border the edges of the side-view can be seen. Cytioderm punctate; puncta in concentric curves. In side-view the segments are lozenge-shaped, the angles slightly truncate; edge irregular; puncta in longitudinal series, and the edge of the front-view is visible. In end-view the frond is four-sided, the angles slightly truncate, sides slightly concave, puncta transverse.

Long., 35–39 μ; lat., 28–33 μ.
Hawke’s Bay.

This plant belongs to the series of S. capitulum, Brébisson, and S. amœnum, Hülse, of which Professor Nordstedt reports a variety, “*tumidiusculum,*” from New Zealand. It is, however, less ornate than any of these, and also smaller. S. merianii, Reinsch (as figured by Wolle, “Desm. of U.S.”) also approaches it.

Stauastrum alternans, Brébisson, var. *sub-alternans*, var. nov. Plate IV., fig. 38.

Frond small; segments in front-view sub-elliptical; when viewed slightly tilted (as in the figure) the third angles of the two segments are not exactly opposite. In end-view, segments triangular, sides concave, angles rounded; the frond being only slightly twisted, the angles of each segment are neither quite in correspondence nor quite alternate. Cytioderm punctate, the puncta transverse.

Long., 25 μ; lat., 26.7 μ.
Christchurch; Hawke’s Bay.
I have proposed this as a true "variety" of the original form, as in all the specimens seen since 1879 (perhaps more than a hundred) the twisting of the frond, although distinct, is never sufficient to bring the angles in end-view regularly alternate as in the European and American types.

_Staurostrum striolatum_, Naegeli, var. _acutius_, var. nov. Plate IV., fig. 39.

Angles, both in front- and end-views, a good deal sharper than in the type.

Long., 21 μ.; lat., 23 μ.

Hawke's Bay.

_Staurostrum ventricosum_, sp. nov. Plate IV., fig. 40.

Frond moderate; constriction deep and wide; segments in front view elliptico-fusiform, with convex ends, and prolonged into short processes each tipped with three minute spines; cytioderm rough with conspicuous granules; on the outer edges several spines, small, simple, neither dilated nor forked. End-view triangular; processes short; edges obscurely irregular; sides slightly concave; granules in transverse series.

Long., 39 μ.; lat., 40 μ.

Christchurch; Wellington; Kaitoke; Hawke's Bay.

A plant which I had at first considered as a variety of _S. proboscideum_, Brébisson; but it is separated from that species by the absence of forked or dilated spines, and by the transverse arrangement of the granules in end-view. It is much smaller than the next species, and has not concave or depressed ends with widely divergent spines in front-view.

_Staurostrum splendidum_, sp. nov. Plate IV., fig. 41.

Frond rather large; constriction wide. Segments in front-view sub-orbicular, the ends depressed or sometimes slightly concave, sides produced into moderately long processes, each bearing three conspicuous spines. Cytioderm rough with large conspicuous granules. Edge smooth, or obscurely irregular for a little way from the isthmus, thence conspicuously crenulated to the commencement of the depressed ends; between the crenulations conspicuous simple spines inclined outwards. End-view triangular; cytioderm rough with granules arranged transversely; sides slightly concave; edges crenulate, with simple spines; angles truncate, tricuspid; viewed from the isthmus the orbicular form of the segment is conspicuous.

Long., 67 μ.; lat., 52 μ.

Christchurch; Hawke's Bay.

This is the plant which in my paper of 1882 I wrongly considered as a form of _S. aculeatum_, Ehr. Mr. W. B. Turner tells me that he thinks it is intermediate between the smaller
forms of *S. sebaldi*, Reinsch, and *S. proboscideum*, Brébisson. The large, simple spines, and the straight or concave ends, seem to separate it from either; and the spines are not sufficiently long nor the segments slender enough for *S. aculeatum*. The two forms reported from New Zealand by Professor Nordstedt—*S. sebaldi*, β *ornatum*, var. *novizelandica*; and *S. pseudosebaldi*, var. *tonsum*—differ from it in several particulars, both being much more slender, and the last not having a triangular end-view. The large size, the depressed ends, and the conspicuous spines on the edge in end-view distinguish it from the last species.

*Staurastrum piletum*, Delponte, var. *inflatum*, var. nov. Plate IV., fig. 42.

Frons moderate; constriction shallow and wide. Segments in front-view sub-trapezoidal, widest outwardly; sides and ends slightly convex; outer angles terminated by two rather thick spines; cytioderm smooth or very obscurely punctate in the middle, and bearing five or six transverse rows of granules towards the angles; edges obscurely irregular. End-view triangular; sides very slightly concave, angles slightly inflated and terminating in spines; granules in transverse rows near the angles only; edges smooth except by the rows of granules.

Long., 45 μ; lat., 60 μ.
Otaki.

This plant appears to differ from Delponte’s species (‘‘Desm. Subalpin.,’’ p. 167) in the more convex form both in front- and side-views.

*Staurastrum pseudoligacanthum*, sp. nov. Plate V., fig. 43.

Frons moderate; constriction deep, linear; segments in front-view sub-quadrate, but produced at the sides to sub-acute angles so as to have an irregularly pentagonal form; sides sinuous, ends straight; cytioderm smooth in the median space, and bearing towards the angles a few transverse rows of minute puncta; edges obscurely irregular or crenulate, and bearing between the lateral angles and the straight ends four or five spines, of which two at each side are conspicuous; the spines of the third angle are visible on the face of the frond. End-view triangular; sides straight, edges obscurely irregular; on each side are two spines dividing it in three equal divisions; cytioderm bearing transverse rows of puncta towards the angles, and three pairs of granules corresponding to the six marginal spines.

Long., 35.9 μ; lat., 37.9 μ.
Otaki.

The figure of *S. oligacanthum*, Bréb., given by Nordstedt (‘‘Desm. Arctœ,,” pl. vi.), differs from the above in a few
particulars, mainly in the arrangement of the spines. The triangular end-view of our species is scarcely a distinctive character, as so many of the *Staurastrum* seem to have indifferently three or four sides.

*Staurastrum spinuliferum*, sp. nov. Plate V., fig. 44.

Frond moderate; constriction shallow, wide; segments in end-view inflato-fusiform, widening rapidly from the isthmus to the angles; ends convex; angles acute; cytioderm bearing minute puncta arranged in transverse rows, and towards the angles very minute spines; many very minute spines along the edges all round, and at each angle three spines rather larger. End-view triangular; sides straight or slightly concave; cytioderm punctate; spines as in front-view.

Long., 34 μ; lat., 26·9 μ.

Hawke's Bay.

Probably of the series of which *S. hirsutum*, Ehr., is the type; but it differs in its acutely-angled front-view from all, and the spines are also much smaller than in any species described. Indeed, only careful examination will detect them. I have stated above that in front-view these spines are noticeable on the surface towards the angles, the median space being simply punctate: it may be that the spines cover the whole frond, but they are too minute to be made out. Mr. Turner suggests that the plant may be a form of *S. kjellmanni*, Wille, which has minute conical granules on the edge; but in our species they are certainly fine spines.

*Staurastrum pseudassurgens*, sp. nov. Plate V., fig. 45.

Segments in front view widely dilated from a rather narrow isthmus, with gaping constriction; lower edges very slightly crenulate, outer edge crenulate, convex, with a series of minute granular verrucae just within the edge; segments produced at each side into sub-cylindrical processes, each of which curves gradually but conspicuously upwards, and ends in two rather large teeth, widely diverging, one tooth turned well upwards, the other usually horizontal or nearly so. End-view fusiform, slender, the median portion slightly dilated, the rows of verrucae visible; two terminal teeth usually visible, but often only one. Zygosporae sub-globose with concave edges, bearing a number of long rays which are forked and recurved at the apex.

Long., 29-32 μ; lat., 46-50 μ; diam. zyg. ex rad., 27 μ; long. rad., 12 μ.

Rutherford's Swamp, Otaki.

I at first considered this plant as *S. assurgens*, Nordstedt, having then only a sketch of the latter. I find, however, that it differs, first in size, secondly in less slender shape, thirdly in never exhibiting more than two teeth on each process. In
general appearance it approaches S. bicone, Hauptfleisch (apud Lagerheimi in lit. cum uone); but that plant has deep quadrangular crenulations on the edge in front-view, which are absent from our species. The zygospore resembles somewhat that of S. sagittarium, Nordst. ("Alg. of N.Z.", p. 37), but is much smaller and less angular.

_Stauastrum inconspicuum_, Nordstedt, _forma gracilius_. Plate V., fig. 46.

Frond very minute; in front-view sub-rectangular, the constriction represented by concave sides, and the angles produced into short sub-cylindrical processes slightly bent in the middle and obscurely forked at the tip; two of these processes can be seen in focus at once at each end, and a third is seen either in front or behind, between each pair. End-view convex-triangular, the angles produced in processes alternating with the three processes of the other end, which may be seen between them. Length of the frond in front-view more than twice the diameter at the isthmus.

Long. ex rad., 11·7 μ; lat., 9 μ; lat. isthmi, 4·3 μ; long. rad., 4 μ.

Otaki.

This form is more slender than Nordstedt's original plant, and rather smaller; and the specimens which I have observed are triangular in end-view, the American and European forms being quadrangular. Probably forms may exist here with either three or four sides.

_Stauastrum furcatum_, Ehrenberg, _forma?_ Plate V., fig. 47.

I have only one specimen of this plant, and have not seen it in end-view: it is referred therefore here only provisionally to Ehrenberg's species. It is the one which in my paper of 1882 I considered as probably _S. spinosum_ of Ralfs, which several authors (e.g., Rabenhorst and Wolle) refer to _S. furcatum_. The species appears to be very variable: my figure approaches that of Wolle ("Desm. of U.S.", pl. xlviii.), especially in the occurrence of a process or processes on the frond near the isthmus.

Long. ex rad., 26·7 μ; lat., 16·4 μ; long. rad. circ., 5·5 μ.

Hawke's Bay.

_Stauastrum brachiatum_, Ralfs, var. _gracilius_, var. nov. Plate V., fig. 48.

Frond extremely minute; constriction only a small notch; segments in front-view sub-quadrate, produced at the outer angles into long, sub-cylindrical, smooth, very transparent processes, which are deeply cut into two or three (mostly three) points; endochrome extending only to the quadrate
portion of the segment; a third process is visible either in front or behind at each end. In end-view triangular, the sides slightly convex, angles produced into long processes, and the three processes of the other end are visible alternating with these. The plant has a distinct mucous envelope.

Long. ex rad., 7-5 μ; lat., 5 μ; long. rad., 6 μ, ex spin.
Rutherford’s Swamp, Otaki.

The great transparency of the rays and the minuteness of this plant render it difficult to examine it properly. I am not quite sure that the rays may not perhaps be very slightly rough-edged. I have attached it to S. brachiatum, although it is scarcely a third of the size of that plant, and its rays are more slender and rather more sharply pointed. It has also a resemblance to S. levispinum, Bisset (“Desm. Winderm.”), but that also is much larger, and its rays do not appear to be forked. The distinct mucous envelope of our plant is not, I suppose, a specific character.

* Stauastrum spencerianum.

This plant, reported by me in 1882 under the name S. clepsydra, is considered by Nordstedt as a sub-species of S. conнатum, Lundell. The name has to be changed, as that of “clepsydra” had been previously taken.

Genus **Tetmemorus**, Ralts.

*Tetmemorus granulatus*, Brébisson, *forma minor*. Plate V., fig. 49.

I attach this plant to this species, instead of to *T. levis* (also occurring in New Zealand), as its form is the same on all sides and it has the lip-like process of the type.

Long., 130–150 μ; lat., 30–35 μ.
Otaki.

* *Tetmemorus brébissonii*, Ralts.

Specimens of this plant from Otaki, where it is fairly plentiful, in company with the last species, do not show the tapering of the ends from which Professor Nordstedt has established his New Zealand variety, *attenuatus*.

Genus **Penium**, Brébisson.

* Penium curviblinum*, Bisset, var. *sub-polymorphum*, Nordstedt. Plate V., fig. 50.

Long., 75 μ; lat., 37 μ.
Christchurch; Hawke’s Bay; Otaki.

Professor Nordstedt establishes his variety only on account of the fact that the zygospore of the European plant has not been yet discovered. He figures the zygospore of our New Zealand form as quadrate: I have not seen it.
Penium polymorphum, Perty, forma. Plate V., fig. 51.

The semi-cells are more cylindrical than in the type, as figured by Lundell ("Desm. Suec.," pl. v., 10), and the ends less attenuated. The strie are so faint that it is very difficult to make them out. The cytiderm is pale pink or straw-coloured.

Long., 43 μ; lat., 20 μ.

Christchurch; Hawke's Bay; Otaki.

My measurements, which are much smaller than those of Professor Nordstedt, agree exactly with those of Lundell.

Penium navicula, Brébisson. Plate V., fig. 51a.

Long., 55-60 μ; lat., 12-15 μ; diam. zyg., 20-25 μ; diam. zyg. diagonal, 45 μ.

Rutherford's Swamp, Otaki.

This plant ought perhaps to be considered as a small form of P. closterioides, Ralfs, but Wolle and others separate it. I cannot detect any "dancing" granules at the ends, as the characteristic ones of P. closterioides. I give a figure of the zygospore (of which I have observed two specimens), which Wolle ("Desm. of U.S.," p. 36) describes without figuring. A figure of it is given in Lundell ("Desm. Suec.," pl. v., 8), and the dimensions of that are not far removed from ours; but the angles appear to be somewhat sharper, and the empty conjugating cells proportionately smaller than those of the specimens which I have seen.

Penium incrassatum, sp. nov.(?). Plate V., fig. 52.

Frond sub-elliptical, somewhat dilated at the middle, the ends broadly rounded; there is no constriction, but the cell-wall appears slightly thickened outwardly at the centre, so that in some specimens there is the appearance of a thin ring round the plant. Cytioderm very obscurely punctate.

There are two sizes—Forma major, long. 60 μ, lat. 38 μ; Forma minor, long. 40 μ, lat. 25 μ.

Hawke's Bay.

On account of the thickening of the cell-wall in this plant I hesitate as to its position. It seems to be properly attached to the genus Penium by the arrangement of the endochrome in fillets, and if there were any sign of a median constriction I should look upon it as perhaps allied to P. lagenaroide, Bisset ("Desm. Winderm."). The name given above is applied to it here provisionally.

Genus Docidium, Brébisson.

* Docidium nodosum, Bailey. Plate V., fig. 53.

Long., 250 μ; lat. max. nod., 41.5 μ.

Rutherford's Swamp, Otaki.
*Docidium ovatum*, Nordstedt.

In my paper of 1880 I reported this species under the name of *D. dilatatum*. I had not then seen Professor Nordstedt's Brazilian plant, identical with it. But a clerical error crept into my description of it, as the length was given as \( \frac{1}{13} \) in.; this should have been \( \frac{1}{16} \) in. The dimensions are, in point of fact, somewhat variable. Long., 340–380 \( \mu \); lat., 85–96 \( \mu \).

Mr. Turner thinks that our New Zealand plant differs a little from the Brazilian, and in several specimens I can observe differences in the granules at the ends; but probably these distinctions are not important.

*Docidium ovatum*, Nordstedt, var. *tumidum*, var. nov. Plate VI., fig. 54.

Frond large, stout, tumid-cylindrical; constriction rather wide and deep; segments regularly ovate, with smooth edges, and tapering without dilatation to the somewhat wide ends, which bear conspicuous small tubercles, the tubercles not set close together. Cytiioderm punctate.

Long., 250 \( \mu \); lat. max., 112 \( \mu \); lat. constrict., 58 \( \mu \); lat. term., 27 \( \mu \).

Rutherford's Swamp, Otaki.

A form clearly distinguishable from the last, being much shorter and proportionately broader; and the tubercles at the ends are more conspicuous and wider apart.

Genus *Closterium*, Nitzsch.

*Closterium diana*, Ehrenberg, var. *arcuatum*, Bréb. Plate VI., fig. 55.

The dimensions of this plant vary considerably. The largest specimens I have seen reach as much as 530 \( \mu \) (chord of arc); the smallest are no more than 175 \( \mu \). In the largest the ends are slightly emarginate, as shown in fig. 55b, and faint transverse striæ can be made out in the middle (fig. 55c). I think the more semicircular, or genuine, form of *C. diana* does not occur here.

* C. *venus*, Kützing. Plate VI., fig. 56.

This is also variable in size, ranging from 114 \( \mu \) in length down to 67 \( \mu \) (chord of arc). I should take this to be only a small form of *C. diana*, but there may be something in the distinction made by Delponte ("Desm. Subalp.", pls. xvii. and xviii.) that in *C. diana* the ends are emarginate, in *C. venus* simply tapering.

* C. *cynthia*, de Notaris, *forma*. Plate VI., fig. 57.

The striæ are excessively faint, and the ends thicker than in the type. The plant would approach very closely to
C. jenneri, Ralfs, if the frond ever showed any constriction in the middle; but I can detect none.

Long. chord, 78.5 µ; lat., 9 µ.
Christchurch; Otaki; Kaitoke.

Closterium decorum, Brébisson, forma gracilior. Plate VI., fig. 58.

The frond is more slender than the type (as given by Delponte and Wolle), and the outer edge is often slightly depressed towards the middle, giving a wavy appearance to the plant. The dimensions vary a good deal.

Long., 196–230 µ; lat., 13.5–24.5 µ.
Christchurch; Kaitoke; Wellington; Otaki.

* Closterium praelongum, Brébisson. Plate VI., fig. 59.

The ends are slightly recurved in all the specimens which I have seen.

Long., 204 µ; lat., 24 µ.
Kaitoke.

* Closterium lineatum, Ehrenberg, var. sandvicense, Nordstedt. Plate VI., fig. 60.

As the striae are very closely set in this plant, and the inner edge frequently a good deal inflated, I attach it to Professor Nordstedt’s form, which he reports from the Sandwich Islands. It is a little smaller, apparently, than that type.

Long., 460–570 µ; lat., 30–40 µ.
Hawke’s Bay; Otaki.

Closterium (?) or Raphidium (?). Plate VI., fig. 61.

Frond very long, slender, and acicular; the ends tapering to very sharp points. Viewed in one direction it is quite straight; in another the outer edge is slightly convex, the inner almost straight for two-thirds of its length from the middle, then slightly bent. Endochrome extending only to the bend of the inner edge, the rest to the ends translucent; vesicles in a single row; at the middle there is a minute clear space which can be seen to extend across the whole width. Cytioderm not striated. Near the ends are vacuoles with “dancing” granules.

Long., 350–380 µ; lat., 10 µ.
Wellington.

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[Note.—Excepting where otherwise mentioned, all the forms in this list are magnified 700 diameters.]

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Fig. 2. S. pulchelhum, Archer.
Fig. 3. S. formosum, n. sp.
Fig. 54
Fig. 55
Fig. 56
Fig. 57
Fig. 58
Fig. 59
Fig. 60
Fig. 61

W.M.M. delt.  
NEW ZEALAND DESMIDIEÆ.  
C.H.P. lith.
Fig. 4. Euastrum mammatum, var. sub-cuneatum, n. sp. et var.
Fig. 4A. E. mammatum, var. ellipticum, n. sp. et var.
Fig. 5. E. sinuosum, Lenormant, var. gemmulosum, n. var.
Fig. 6. E. sinuosum, Lenormant, var. simplex, n. var.
Fig. 7. E. longicolle, Nordstedt.
Fig. 8. E. rotundum, n. sp.
Fig. 9. E. sublobatum, Brébisson
Fig. 10. E. expansum, n. sp.  ...  ...  ...  ...  × 1,000

PLATE II.

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Fig. 12. E. benale, Ralfs, forma.
Fig. 13. E. undulatum, n. sp.
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Fig. 15. Cosmarium variabile, n. sp.
Fig. 16. C. curvum, var. attenuatum, Brébisson.
Fig. 17. C. retusum, Perty, var. love, Roy and Bisset.
Fig. 18. C. pachydernum, Lundell, forma intermedia.
Fig. 19. C. trilobulatum, Reinsch, var. basichondrum, Nordstedt.
Fig. 20. C. cordatum, Brébisson, forma minor.
Fig. 21. C. repandum, Nordstedt.
Fig. 22. C. speciosum, Lundell, forma genuina.
Fig. 23. C. speciosum, Lundell, var. simplex, Nordstedt.
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PLATE III.

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Fig. 30. C. heliosporum, n. sp.
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PLATE IV.

Fig. 33. Xantlidium intermedium, n. sp.
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Fig. 36. S. beneaenum, Rabenhorst, forma minor.
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Fig. 38. S. alternans, Brébisson, var. sub-alternans, n. var.
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Fig. 40. S. ventricosum, n. sp.
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PLATE V.

Fig. 43. Stauroastrum pseudotrigonum, n. sp.
Fig. 44. S. spinuliferum, n. sp.
Fig. 45. S. pseudosurgentis, n. sp.
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Fig. 47. S. furcatum, Ehrenberg, forma?
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Fig. 49. Tetramorium granulatum, Brébisson, forma minor.
Fig. 50. Penium cucurbitatum, Bisset, var. sub-polymorphum, Nordstedt.
Fig. 51. P. polymorphum, Perty, forma.
ART. II.—On the Botany of Te Moehau Mountain, Cape Colville.

By JAMES ADAMS, B.A.

[Read before the Auckland Institute, 22nd August, 1888.]

CAPE COLVILLE PENINSULA terminates at its northern end in the high range called Te Moehau. This range may be said to commence on the saddle between Cabbage Bay on the west and Matamatahakeke on the east, from whence, rising gradually, it extends to the saddle between Waiaroa Valley and Port Charles. Then it rises with a steep incline into the mountain Te Moehau, which has an altitude of 2,750ft.

All the approaches to this mountain are very steep, but especially at the northern end, where the spurs rise abruptly from the sea. The appearance of this end is the more forbidding from the high and rugged rocks that stand in the sea at a little distance from the shore. There is a weird look about the mountain, from whatever point it is seen, which is greatly owing to two bare peaks that tower up to form the summit. The Maoris, who are rather numerous on the coast at Otago, Waiaro, and Port Charles, have a great dread of the upper parts of the mountain. They say that long ago their numbers were much greater than at present, and that every port from Cabbage Bay on the west to Matamatahakeke on the east was thickly peopled by the powerful and warlike tribe of Ngatirongo. In those good old times the interior was occupied, they say, by Turehu or Patupaiarehe, a race short in stature and of fair skin. The Turehu only ventured to the sea-shore at night, when large parties could be seen busily engaged in fishing. As soon as the Maoris attempted to approach, the Turehu fled to the hills, leaving the refuse of the fish and the scales. These Turehu could often be heard—voices of men, and women, and children were