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I.—*New Diatoms from Honduras.* Described by Herr
A. GRUNOW. With Notes by F. KITTON, Hon. F.R.M.S.

(Taken as read before the ROYAL MICROSCOPICAL SOCIETY, 1877.)

PLATES CXCIII., CXCIV., CXCV., AND CXCVI.

IN the year 1867, a paper entitled "Diatomeen auf Sargassum von Honduras gesammelt von L. Lindig, untersucht von A. Grunow," appeared in Hedwigia. Herr Grunow has very kindly sent me for publication in this Journal, extracts and supplement (translated into English), with the request that I would see it through the press, and also correct any errors in the translation (from which by the way it is singularly free); he has also added some valuable remarks on allied species and genera. The figures are from his own drawings and have not been previously published.

(The species which are now described for the first time are marked "n. sp.")

Licmophora.

L. Remulus Grun. L. a latere primario anguste cuneate, valvarum parte inferiore plus minus elongata, anguste lineari stipitiforini, subito in laminam oblongam, vel lineari oblongam, apice rotundatum dilatata, linea media in parte superiore conspicua, striis transversis tenuissimis 33-34 in $\cdot 01$ mm.* Longit. $\cdot 05$ - $\cdot 24$ mm., latit. valvæ partis superioris $\cdot 01$ - $\cdot 013$ mm., latit. stipitis $\cdot 0015$ - $\cdot 002$ mm. Tab. CXCIII., Fig. 1, a, b.

I have a similar *Licmophora* from the Samoa Islands, in which the inferior part of the valve does not widen so abruptly into the upper portion; the striæ are also coarser (27 in $\cdot 01$ mm.). I have named it *L. Remus*, but I am doubtful if it be sufficiently distinct from *L. Remulus*. Both species have short gelatinous stipes, and would therefore belong to the genus *Podosphenia* or *Rhipidophora*, Kütz., but as the length of the gelatinous stipes is of no generic value, these genera must be united to *Licmophora*. (See Hedwigia, l. c.)

* About 84 in $\cdot 001$ of an inch. Two and a half times the number of striæ in $\cdot 01$ of a mm. very nearly agrees with the number in $\cdot 001$ of an English inch.—F. K.

Asterionella.

Asterionella Bleakeleyi Wm. Sm. *var. notata* Grun. Valvarum parte inferiore inflata, costa transversa arcuata notata. Striæ transversæ tenerrimæ 36-38 in $\cdot 01$ mm. Tab. CXCI., Fig. 2.

I am doubtful whether this form should be referred to *A. Bleakeleyi*, as I can find no trace of the very conspicuous transverse costa in the various delineations of this diatom ('Q. M. J.,' vol. viii. pl. 7, fig. 10. Lewis' Diatoms of the United States Seaboard, pl. 2, fig. 9).

SYNEDRA.

Synedra lævigata (Grun.) n. sp. (*S. gracilis* var. ? tenuissime striata, Grun. in Hedwigia, s.p.). S. major a latere primario linearis, ad polos paululum attenuata, valvis anguste lineari lanceolatis acutiusculis, striis transversis tenuissimis (plus quam 38 in $\cdot 01$ mm.). Longit. $\cdot 08$ - $\cdot 24$ mm. Tab. CXCI., Fig. 3.

I have seen this diatom from various localities (Honduras, Mauritius, Samoa Islands,) but I have never been able to detect more than traces of a striation even by monochromatic illumination.

Allied to this species is another, and often accompanying it, but which differs in the valves being more linear and the apices more obtuse; the striation is also coarser, and exactly resembles that of *Amphipleura pellucida*. I have named it *S. lævigata* var. ? *obtusiuscula*. Length $\cdot 08$ - $\cdot 30$ mm. Striæ 38 in $\cdot 01$ mm. Pl. CXCI., Fig. 4.

Mauritius (by Ida Pfeiffer), Samoa Islands (Dr. Graeffe). A third species or variety nearly allied is

Synedra lævigata var. ? *hyalina*, which I found on *Haloplegma Preissii*, from South Australia. It is much smaller, with lanceolate valves and slightly produced obtuse apices. Length $\cdot 04$ - $\cdot 052$ mm. Striæ about 38 in $\cdot 01$. Pl. CXCI., Fig. 5, *a, b*.

The median line of all these Synedrae is narrow. A fourth allied Synedra with coarser striation is

Synedra provincialis (Grun.) n. sp. S. minor a latere primario sublinearis, valvis lineari lanceolatis, polis paululum tumidulis, subtruncatis, linea media angusta, striis transversis tenuibus 30 in $\cdot 01$ mm., nodulis terminalibus conspicuis. Longit. $\cdot 065$ - $\cdot 11$ mm. Tab. CXCI., Fig. 6.

Habitat in mari Mediterraneo ad oras Galliae prope Cete (leg. L. Lindig).

S. provincialis var. *tortuosa*. Valvis plus minus undulato tortuosis. Tab. CXCI., Fig. 7. Upolu, Samoa Islands, leg. Dr. Graeffe. The peculiar undulations of this variety occur also in other species of Synedra (*S. ulna*, *S. oxyrhynchus*, &c.).

Synedra undosa Grun. *S. longissima*, linearis, in media parte tumidula, tumore lanceolato oblongo, cornibus longissimis, linearibus, eximie undulatis, ad apicem subclavatis, striis transversis 19 in $\cdot 01$ mm. Longit. variabilis, ad $\cdot 85$ mm. Tab. CXCI., Fig. 8, *a, b, c.*

Common in the Honduras gathering; Gollmer found it at Caraccas, and Hauck in the Adriatic Sea near the isle of Cherso.

It is a very distinct species, resembling *S. undulata* (*S. longissima* Lobarreuski) in outline only, but differs completely by its sharp and fine transverse striæ. The valves of the latter species are irregularly and coarsely punctate, the puncta forming short striæ near the margin only. *S. undosa* seems to be related to a *Synedra*, found by Mr. Hauck near the island of Cherso, which has straight horns, and is perhaps an extreme variety of *S. fulgens*, to which I have given the name of *S. cornigera*; it attains a length of $\cdot 4$ mm., the valve is lanceolate ($\cdot 005$ – $\cdot 02$ mm. in breadth), with longer or shorter horns ($\cdot 006$ – $\cdot 008$ mm. broad), which become wider towards the apices. The striæ (14 in $\cdot 01$ mm.) are interrupted by a very narrow median line, and two longitudinal furrows near the margins, which are more or less conspicuous, Pl. CXCI., Fig. 9. To *S. undulata*, *S. Hennedyana*, and *S. rostrata* is allied my *S. Frauenfeldii*, and which is somewhat inefficiently represented in 'Verh. Wien zool. bot. Gesellsch.,' 1862, tab. vii., fig. 26. The striæ of this species consist of two or three coarse dots which become more scattered near the centre and apices of the valve. It is distinguished from *S. Hennedyana* by its much shorter and less pronounced horns. Pl. CXCI., Fig. 10, *a, b, c.*

[In a gathering from the West Indies I found several short filaments of ten or twelve frustules, the side views of which were exactly like *S. Hennedyana*.—F. K.]

Synedra crystallina Kg, var. *insignis* Grun. (n. sp.?). *S. major* vel maxima, valvis elongatis lineari-lanceolatis, polis paullum incrassatis truncatis, linea media distincta, sulcis longitudinalibus marginalibus obsolete, striis subtiliter punctatis, validis (10–11 in $\cdot 01$ mm.) in media parte sæpe irregularibus, ante apices radiantibus. Longit. ad $\cdot 8$ mm., latit. valvæ $\cdot 013$ – $\cdot 019$ mm. Tab. CXCI., Fig. 11.

Rare in the Honduras gathering.

S. crystallina var. *bacillaris* Grun. *S. major*, valvis linearibus, polis rotundato obtusis, linea media distincta, sulcis longitudinalibus marginalibus obsolete, striis subtiliter punctatis, validis ($8\frac{1}{2}$ –9 in $\cdot 001$ mm.) in media parte sæpe irregularibus, ante apices radiantibus. Longit. $\cdot 32$ – $\cdot 36$ mm., latit. valvæ $\cdot 016$ – $\cdot 017$ mm. Tab. CXCI., Fig. 12, *a, b, c.*

Honduras, Adriatic Sea, near Lesma.

These Synedreæ differ from *S. crystallina* by the very obscure longitudinal furrows near the margin of the valve, which are almost invisible. But as these furrows are very variable in some species, I dare not separate these forms into distinct species.

Another variety of *S. crystallina* is perhaps

S. (crystallina var.) decipiens (Cleve and Grunow) from Cap. de la Néve. The valves of this form are only $\cdot 2$ – $\cdot 21$ mm. long, and $\cdot 009$ mm. broad, narrow, lanceolate, with rounded apices, very conspicuous median line and longitudinal furrows. Striæ $11\frac{1}{4}$ in $\cdot 01$ mm.

Synedra Baculus Greg. var. *minor* Grun. *S. valvis sublinearibus*, in media parte et ad polos vix incrassatis, linea media fere nulla, strii subtilissime punctatis, validis (11–12 in $\cdot 01$ mm.) ante apices radiantibus. Sulcæ longitudinales marginales inconspicuæ. Longit. $\cdot 22$ mm., latit. valvæ $\cdot 0055$ – $\cdot 007$ mm. Tab. CXCIV., Fig. 1.

Rare in the Honduras gathering.

S. Baculus Greg. and *S. superba* Kg. have no true median line, but only a slight central depression running from one end of the valve to the other. *S. superba* has more or less conspicuous longitudinal furrows near the margin, and distinctly granulated striæ ($10\frac{1}{2}$ in $\cdot 61$ mm.). The valves are $\cdot 02$ – $\cdot 024$ mm. broad, but I have seen a small variety from Finmark with valves not more than $\cdot 015$ mm. in breadth.

S. capillaris Grun. (n. sp.). *S. angustissima valvis linearibus*, in media parte vix incrassatis, linea media angusta distincta. Striis transversis subtilibus (19 in $\cdot 01$ mm.). Longit. $\cdot 225$ mm., latit. valvæ $\cdot 0015$ – $\cdot 002$ mm. Pl. CXCIV., Fig. 2.

Rare in the Honduras gathering.

It is probable that many of the marine forms hitherto classed with the Synedreæ should be placed in the genus *Toxarium* of Bailey. I have not seen living specimens of *T. undulatum*, and am therefore unable to say whether the cell-contents are arranged in longitudinal plates or divided into numerous globules like those of *S. fulgens* and its allies. Pfitzer has seen the cell-contents of several marine Synedreæ divided into numerous small portions, but he thinks they are not identical with the endochrome globules of his great family of *Cocchochromaticæ*.

The valves of a Synedra like *S. splendens* are very different in many respects from those of *S. fulgens*, *S. superba*, &c., and it is possible that the cell-contents also differ in a manner which make a division of the genus necessary, like that of *Staurosira* Ehr. and *Fragilaria*. *Staurosira* (*Dimeregramma* Ralfs ex parte *Odontidium* ex parte *Fragilaria* species plurime) is a genus nearly allied to the Synedreæ of the type of *S. splendens*. *Fragilaria virescens* and its few allies are coccochromatic diatoms, as Pfitzer has stated, and

nearly related to *Diatoma*, *Odontidium*, &c. I had employed the name of *Staurosira* as a sub-genus of *Fragilaria*, but both genera must be separated and even placed in different families. To *Staurosira* belongs the greater part of *Fragilaria*, and it would perhaps be better to retain the name of *Fragilaria* for it, but then a new name would be necessary for *Fragilaria virescens*, a thing to be avoided if possible.

Sceptroneis.

Sceptroneis cuneata Grun. (*Synedra cuneata* Grun. in Hedwigia, l. c.). *S. valvis elongatis clavatis in apice cuneatis, obtusis, linea media nulla (vel indistincta), sulcis duabus longitudinalibus margin approximatis aut distinctissimus aut obsoletis, interdum vix conspicuis, striis transversis (12-13 in .01 mm.) subtiliter punctatis (punctis lineas longitudinales densas efficientibus). Longit. .21-.32 mm., latit. valvæ .018-.024 mm. Tab. CXCIV., Fig. 3, a, b, c, d.*

Common in the Honduras gathering.

S. cuneata is nearly related to *Synedra clavata* Greville [‘Trans. Mic. Soc.’, vol. xiii. p. 25, Greville notices the resemblance of his form to *S. robusta*, Ralfs, and I have seen the latter species as distinctly cuneate as *S. clavata*.—F. K.], and *S. Gomphonema* Janisch et Rabenhorst, but differs from both of them by the absence of a distinct median line. *S. clavata* has much coarser striæ (6 in .01 mm.) and a greater breadth (.038 mm.). [In a paper by Otto Witt, in the Journal of the Godeffroy Museum, Part I., a form resembling *S. cuneata* is described and figured under the name of *Synedra clava*, O. W. I have a similar species from Colon.—F. K.]

Synedra Gomphonema is known to me only by the delineation, which shows a broad median line. The striæ are described as fine, which cannot be said of *Sceptroneis cuneata*. I have seen another form (but only once) in the Honduras gathering. This is

S. dubia, Grun. *S. valvis clavatis, basi rotundatis, apice paullum producto, obtusiusculo, linea media distincta, sulcis marginalibus nullis, striis subtiliter punctatis (10½-11½ in .01 mm.) in basi radiantibus, in apice subradiantibus. Longit. .116 mm., latit. valvæ .015 mm. Tab. CXCIV., Fig. 4, a, b.*

Very rare in the Honduras gathering.

Is this an abnormal form of *Synedra crystallina*? I am not inclined to think so, the striation on the ends of the valve being so very different.

In a slide of diatoms found in stomachs of *Holothuriæ* from Java, communicated by Herr Weissflog, I have seen a variety of *S. cuneata* with a more slender outline and coarser striæ (8 in .01 mm.) and no submarginal furrows; this form I have named *S. cuneata var. Javanica*. Length .4 mm., breadth below

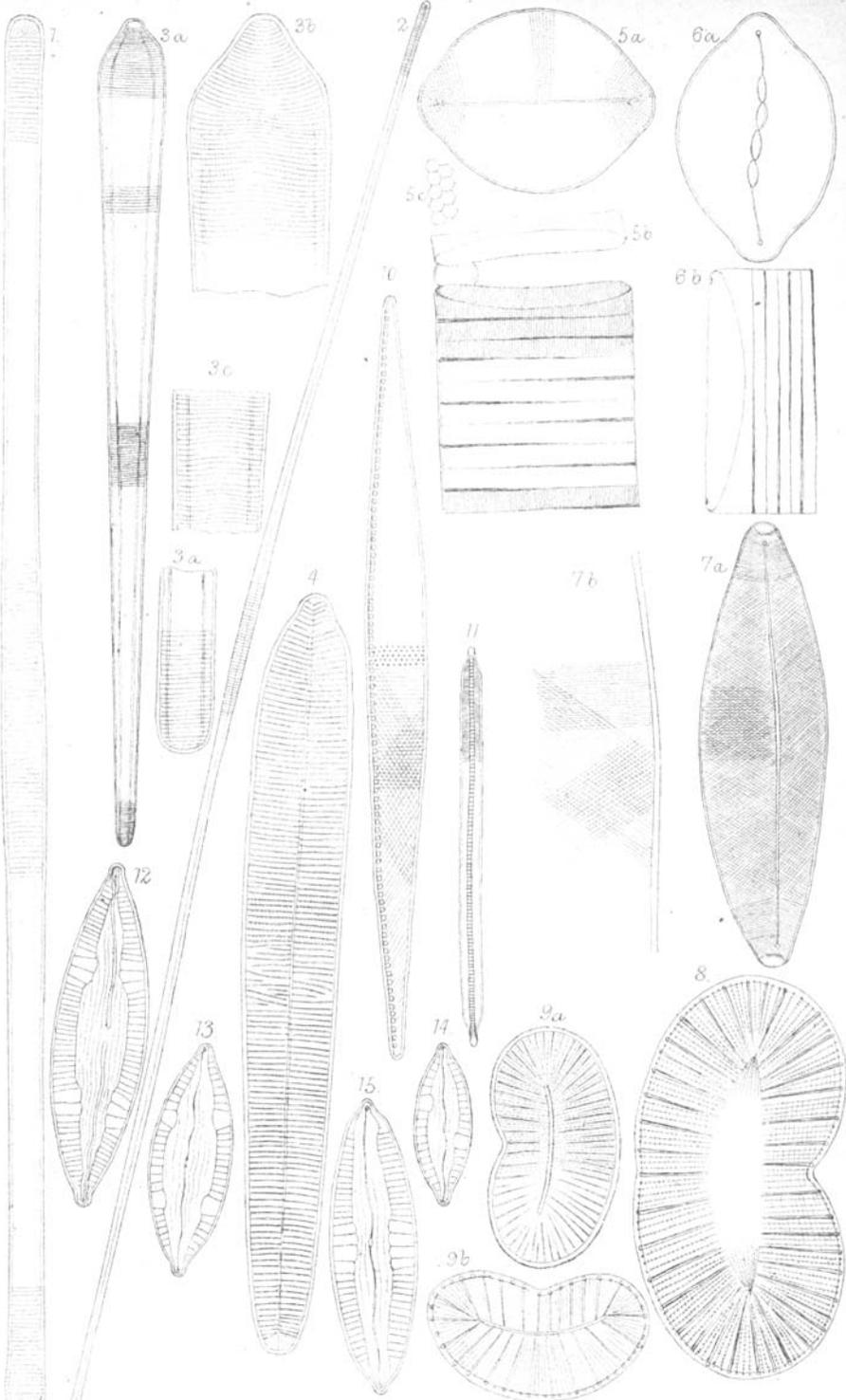
·008 mm., above ·019 mm., summit more rounded than in *S. cuneata*.

The genus *Sceptroneis* Ehr. is only distinguished from *Synedra* by its cuneiform valves. It contains the following species: *Sceptroneis caduceus* Ehr., *S. clavata* Greville, *S. Gomphonema* Jan. et Rab., *S. cuneata* Grun. et var. *Javanica*, *S. dubia* Grun., and perhaps *S. marina* Greg. = *Meridion marinum* Greg. *Campylostylus striatus* Shadbolt (*Synedra Normaniana* Greville) occurs now and then in the Honduras gathering, but I am uncertain whether this species should be placed in the genus *Synedra* or with *Ceratoneis arcus*. The latter is distinguished from *Synedra* by its curved valves and very distinct pseudo-nodules. [I am not prepared to admit that the forms now described are rightly placed in the genus *Sceptroneis*; if striation has any distinctive value, they certainly are not. Herr Grunow's figures show that the transverse lines are composed of short lines like those on *Synedra robusta*; those on *Sceptroneis caduceus* are composed of large distinct moniliform granules like those on *Doryphora amplioceros*. Professor H. L. Smith unites *Sceptroneis* with *Synedra*.—F. K.]

I have removed from *Ceratoneis* all the other species that I had united with it several years ago, and consider *C. arcus* the only representation of the genus. *Eunotia* (*Synedra*) *lunaris* and its varieties, as well as *E. flexuosa*, *E. biceps*, Bréb., &c., are true *Eunotia*, having the terminal nodules and the longitudinal line situated near the lower (central) margin of the valve, and no trace of a (central) pseudo-nodule like *Ceratoneis arcus*, and many species of *Synedra*. In *Ceratoneis* and *Synedra* the median line and terminal nodules are central. Schumann has delineated something like a central median line in some of the species I had erroneously placed in *Ceratoneis* and Kützing in *Synedra*, but I have never seen it, and am of opinion that these details are about as correct as several other things delineated by Schumann, who seems to have been sometimes deceived by an excess of sunlight or other causes in the interpretation of minute structures.

A remarkable example is the duplication of the striæ of many diatoms, but which can only be seen in entire frustules when the focus of the microscope is situated exactly between the two valves (this fact was communicated to me by Professor Pfitzer, who had also observed it). Every line is then divided by diffraction into two, and every dot into : : . The latter phenomenon is very interesting, and may be easily seen in some of the larger species of *Cocconema* (*Cocconema mexicanum*, &c.), with coarse granulations.

I cannot avoid noticing here the exceedingly fine striation which Schumann has delineated on the smooth parts of some of



the Pinnularia, but which I have been unable to see even with a power capable of resolving the striation of *Amphipleura pellucida* into rows of dots, and as far as I know no one else has been more successful. It is true that the coarse striation of Pinnularia often reaches as far as the median line, but these prolongations of the costæ are very shallow and in most cases quite invisible. In corroded valves they are more distinct as well as the granulations of the costæ which are now and then very evident; but as I previously remarked, I have never been able to detect the fine striation as represented by Schumann. In oblique sunlight various short irregular and fine striæ appear, but they are produced by diffraction, and which may have induced him to presume a fine striation over the whole of the valve, and really exists in many diatoms. Further examination with the best objectives would be very useful.

Striatella.

Striatella Lindigiana Grun. S. articulis subcylindraceis, isthmis crassis gelatinosis, dissepimentis alternatim a summo ad imum incrassatis, membrana connectiva longitudinaliter et transverse subtiliter striato punctata, valvis late ovatis vel suborbicularibus, linea media ante polos extincta vel obsolete bifida, striis punctatis subradiantibus 15-17 in $\cdot 01$ mm., ad polos tenuioribus 22-23 in $\cdot 01$ mm., radiantibus. Longit. valvæ $\cdot 07$ - $\cdot 087$ mm., latit. valvæ $\cdot 05$ - $\cdot 065$ mm. Tab. CXIV., Fig. 5, a, b, c.

Not rare in the Honduras gathering, but never seen by me from any other locality; the dots composing the striæ are hexagonal when seen with a higher power.

S. intermedia Grun. S. Lindigianæ affinis, dissepimentis magis confertis, valvis ovatis vel oblongis, apice vix producto, obtuso, linea media interdum undulata, nodulis, terminalibus conspicuis, striis punctatis subradiantibus 24-27 in $\cdot 01$ mm., striis longitudinalibus 28-30 in $\cdot 01$ mm. Longit. valvæ $\cdot 69$ - $\cdot 126$ mm., latit. valvæ $\cdot 042$ - $\cdot 062$ mm. Tab. CXIV., Fig. 6, a, b, c.

Not rare in the Honduras gathering.

The median line is sometimes divided into two branches, which by reuniting and dividing form 2-4 little oval spaces.

The structure of *S. unipunctata* resembles an obliquely striated Pleurosigma. Oblique striæ 18-20 in $\cdot 01$ mm., transverse striæ 30 in $\cdot 01$ mm. Not being aware of the existence of any exact delineation, I have represented the valve of this species in Pl. CXIV., Fig. 7, a, b.

Climaconeis.

Climaconeis Lorenziana Grun., 'Verh. Wien zool. bot. Gesellsch.,' 1862, tab. v., fig. 7. *C. Frauenfeldii* Grun., 'Verh. Wien zool. bot. Gesellsch.,' 1862, tab. vii., fig. 2. *Climacosphenia*

linearis, Janisch et Rabenhorst in Rabenh. 'Beitr.' I., tab. ii., fig. 2 (1863). *Stictodesmis australis* Greville in 'Edinburgh New Phil. Journ.' vol. xviii., No. 5, pl. i., figs. 1-4 (1863). Rare in the Honduras gathering, Adriatic and Red Sea, New Caledonia, &c. *Climaconeis* seems to be rather an abnormal or craticular state of *Navicula scopulorum* Bréb. (*Pinnularia Johnsonii* Wm. Sm.) than a distinct genus. The valves of both of them are characterized by their very small oblong central nodules, and the striæ radiating round the terminal nodules, which are somewhat removed from the apices. The striæ are distinctly moniliform and more or less parallel until they approach the central nodule, when they become radiant (18-20 in .01 mm.). This craticular state of *N. scopulorum* seems to occur only in the warmer seas. I have not yet seen it from the northern seas, and rarely from the Adriatic, where it is mixed now and then with unaltered *N. scopulorum*. I may here mention *Surirella craticula* Ehr., to which I had previously given the name of *Craticula Ehrenbergii*, but which is only an abnormal state of *Navicula cuspidata* [G. Norman, of Hull, also considered it to be a state of *N. cuspidata*, but it seems to me to more nearly resemble *N. ambigua*.—F. K.]. *C. Perrotettii* Grun. must be named *Navicula Perrotettii*, a species found not only in the Senegal river but also in Bengal and Italy.

[Professor H. L. Smith, 'Lens,' vol. i. p. 77, retains the genus *Stictodesmis* to which he relegates *Surirella craticula*. If either of the two genera is to be retained it must be *Climaconeis*, as Grunow's genus has the priority of publication.—F. K.]

Grammatophora.

Grammatophora anguina Kütz. var. *delicatula* Grun., minor et angustior, striis 17-18 in .01 mm. Common in the Honduras gathering.

G. oceanica Ehr. var. *intermedia* Grun. Striis 21-22 in .01 mm. Common. Between *G. marina* and *G. subtilissima* there seems to be an uninterrupted series of forms, the striation of which becomes gradually finer.

Plagiodiscus, Grunow et Eulenstein.

Genus novum, *Surirellis* affine, *frustrulis cuneatis valvis reniformibus, costis radiantibus*.

P. Martensianus Grun. et Eulenstein. Area media lævi lineari oblonga, leviter curvata. Tab. CXCIV., Fig. 8.

Rare, Mauritius, Amboyna, Viti Islands, Seychelles.

P. nervatus Grun. Linea media angusta, curvata, area lævi nulla. Tab. CXCIV., Fig. 9, a, b.

More common. To the above localities may be added Honduras, Caraccas, Samoa, Constantinople.

I am not sure whether the two species are distinct; in case they should prove not to be so, I wish to retain the name of *P. Martensianus* for both forms. The structure of the valves resembles that of *Surirella gemma*. In the middle of the concave margin a small dot like a terminal nodule may be perceived.

[This form has been long known to diatomists by the MS. name of *Surirella reniformis*. I should be inclined to consider it a distorted form of *Surirella*. *S. gemma* sometimes occur with a deep indentation in one of the margins.—F. K.]

Nitzschia.

N. Kolaizeckii Grun. *N. valvis lanceolatis, ad utrumque finem versus leviter attenuatus acutiusculis, carina marginali, punctis carinalibus 8-9 in .01 mm. valvis striato punctatis, granulis ita dispositis ut striarum directiones in angulo acuto sese serantes tres efficient, striis transversis 17-18 in .01 mm. obliquis 13-16 in .01 mm. Longit. .067-.12 mm., latit. valvæ .0075-.01 mm. Tab. CXCIV., Fig. 10.*

Very rare in the Honduras gathering, more plentiful in the stomach contents of *Salpa spinosa* from the Southern ocean, kindly communicated by Herr Weissflog. This species is nearly related to *N. lanceolata*, but differs widely in its markings, which resemble those on *Pleurosigma angulatum*.

Bacillaria.

B. paradoxa var. *tropica* Grun. *Valvis linearibus (hinc inde lateraliter monstrosa inflatus) apicibus paullum attenuatis, obtusis, punctis carinalibus 6-7 in .01 mm. striis transversis 24-25 in .01 mm. Longit. .10-.16 mm., latit. valvæ .0065 mm. Tab. CXCIV., Fig. 11. Common in the Honduras gatherings, Bengal, Polynesian Islands.*

Distinguished from *B. paradoxa* by its finer striæ, the striæ of which are 20-21 in .01 mm., and the valves linear with obtuse apices or linear lanceolate.

The genus *Bacillaria* is only distinguished from *Nitzschia* by the union of the frustules into longer or shorter filaments [? and also by the remarkable movement of the frustules.—F. K.], a difference which becomes extremely dubious as several species of *Nitzschia* sometimes occur in filaments. A similar difficulty exists in distinguishing the exact separation of other genera allied to *Nitzschia*, all marks of distinction between them being inconstant.

There are a few species of *Nitzschia* allied to *N. (Eunotia)*

amphioxys which must be separated not only from the genus *Nitzschia*, but probably from the family of *Nitzschieæ*. I long ago proposed (in letters to various friends) a new genus (*Hantzschia*, in honour of Mr. Hantzsch and his valuable researches on *Nitzschia*) for their reception.

The carinæ of the valves of *Hantzschia* are not opposed diagonally, but are situated at the same side of the frustule which bears a great resemblance to those of *Epithemia* and *Eunotia*. The following are the species belonging to the genus *Hantzschia* :

<i>H. amphioxys</i>	=	<i>Eunotia</i> and <i>Nitzschia</i> .
<i>H. vivax</i>	=	<i>Nitzschia vivax</i> .
<i>H. elongata</i>	=	„ <i>elongata</i> .
<i>H. virgata</i>	=	„ <i>virgata</i> .
<i>H. murina</i>	=	<i>Epithemia murina</i> .

and a few other which are more or less dubious.

Mastogloia.

M. erythræa Grun., 'Verh. Wien zool. bot. Gesellsch.,' 1860, tab. vii., fig. 4 (mala). Common in the Honduras gathering, Red and Adriatic seas. My former delineation of this diatom, was not very correct, having been made from a small and badly cleaned specimen. I therefore give better in Pl. CXCIV., Figs. 12, 13, 14. The loculi are very narrow (12 in $\cdot 10$ mm.), and interrupted at two places by one, two, or three loculi of somewhat larger dimensions. The slightly radiating transverse lines are very fine, the longitudinal are coarser (12-14 in $\cdot 01$ mm.) and undulating like the median line.

M. erythræa var. *biocellata* Grun. n. var. ? loculis mediis ceteris majoribus, striis distantioribus (24 in $\cdot 01$ mm.). Tab. CXCIV., Fig. 15.

Very rare in the Honduras gathering.

The enlargement of some of the loculi seems to be of little specific value; I have seen a var. of *M. quinquecostata* where the large loculi are arranged in the same manner as in *M. erythræa*. In some other species (*M. apiculata* and *M. Braunii*) only two or three loculi in the centre of the valve are occasionally enlarged.

Mastogloia Jelineckii Grun. (Grun. in 'Verh. Wien zool. bot. Gesellsch.,' 1863, tab. v., fig. 12). Honduras, Brazil, Campeachy Bay, Virgin Island, West Indies, &c. This is a species of *Mastogloia* with very small loculi resembling those of some varieties of *M. quinquecostata*. Pl. CXCIV., Fig. 1.

M. rostellata Grun. (*M. Jelineckii* var. ? *rostellata* Grun. in Hedwigia). *M. valvis oblongis medio minime constrictis, polis cuneato*

productis acutiusculis, fascia marginali loculorum oblongorum angusta, loculis terminalibus ceteris paulum majoribus, striis punctatis subradiantibus, 14 in 01 mm. granulis oblongis (illis *Stauroneis asperæ* similibus). Longit. $\cdot 042$ - $\cdot 058$, latit. valvæ $\cdot 02$ mm. Tab. CXC.V., Fig. 2. Rare in the Honduras gathering, Campeachy Bay. This is not a variety of *M. Jelineckii*, as I at first thought. The valves of that species have six very shallow depressions, three on each side of the median line, but which I cannot detect on *M. rostellata*. The dots composing the striæ are shorter in *M. Jelineckii* and form irregular longitudinal lines, those on *M. rostellata* are arranged in an irregular quincunx like the dots on most of the varieties of *Stauroneis aspera*.

M. angulata Lewis, var. *pusilla*. *M.* minor valvis ovato lanceolatus polis paululum productis, obtusiusculis, loculis 4-5 in $\cdot 01$ mm., striis obliquis decussatis: 14-86 in $\cdot 01$ mm., transversis tenuioribus. Longit. $\cdot 026$ mm., latit. valvæ $\cdot 014$ mm. Tab. CXC.V., Fig. 3. Rare in the Honduras gathering.

M. ? reticulata Grun. (*Navicula reticulata* Grun. in Hedwigia, l. c.). *M.* valvis bilobatis, lobis ovatis obtusis, isthmo profundo, margine cellulis majoribus (loculis?) cincto, structura duplex e cellulis irregulariter hexagonis, reticulatis in area oblonga vel suborbiculari nodulum centralem ambiente deficientibus, et striis transversis subtilibus punctatis totam valvam obtegentibus (21-22 in $\cdot 01$ mm.) composita. Longit. $\cdot 1$ - $\cdot 13$ mm., latit. lobum $\cdot 034$ - $\cdot 37$ mm., latit. isthme $\cdot 014$ mm. Color valvæ exsiccata fuscescens. Tab. CXC.V., Fig. 4. Rare in the Honduras gathering.

M. ? reticulata is allied to a series of diatoms considered till now to be species of the genus *Navicula*, but differing from all other *Naviculæ* by a row of larger cells bordering the margin, and which seem to be analogous to the loculi of the *Mastogloia*.

The following species I refer to this genus: *Navicula marginata* Lewis, *N. strangulata* Grev., *N. spectatissima* Grev., and perhaps *N. Jamaicensis* Grev.; to these I can add four or five more. It would perhaps be better to found a new genus for these species, but before doing so a more critical examination into the nature of the marginal cells which seem to belong to the valve, and not to a second plate inserted between the valve and connecting membrane, as in *Mastogloia*, is requisite. The central constriction is of no generic value. I have seen forms with a very slight constriction, and others with a lanceolate outline, and no constriction, without being able to separate them into distinct species, outline as well as granulation being exceedingly variable in this group of diatoms. I intend to describe a larger number of these forms in a future paper on *Mastogloia*.

M. marginulata Grun. *Novara Exp. tab. 1, fig. 12* (a trans-

lation of the new forms described in this paper, with copies of the figures, will be found in 'Grevillea,' vol. i. p. 41, pl. ii., fig. 12 *a, b*). Valves lanceolate with obtuse apices: the marginal border of loculi (12-14 in .01 mm.) more or less narrow, striæ punctate very fine. Length .025-.08 mm., breadth .0057-.11 mm. Rare in the Honduras gathering, Valparaiso, Tahiti, New Zealand, Polynesian Islands, Australia, Adriatic Sea, &c.

M. undulata Grun., 'Verh. Wien zool. bot. Gesellsch.,' 1860, tab. vii., fig. 5. Honduras, Adriatic, Mediterranean and Red seas, Polynesian Islands, Australian seas, Seychelles, &c. This form cannot be *Ceratoneis meleagris*, as I at one time thought. The dots composing the striæ (16-18 in .01 mm.) are oblong, and form coarse, irregularly undulating lines. *M. erythræa* has much finer striæ and more crowded loculi, which are interrupted at two places by several loculi of larger size.

Navicula Meleagris Kütz. is perhaps identical with my *Mastogloia Braunii*, a form by no means rare in the Baltic, but I am unable to say for a certainty to what species of *Mastogloia*, *N. Meleagris* of Kützing from the eastern shore of the island of Jütland belongs. *M. Braunii* is well characterized by the longitudinal furrows near the median line, which resemble those of *Navicula Lyra*. W. Smith has confounded this form with *M. lanceolata* Thwaites, a form I could not find in a slide (from Lancing, in Surrey) determined by Smith himself. It contains a small variety of *M. Braunii*, with loculi sometimes enlarged, but no *M. lanceolata*.

The latter form corresponding with Smith's figure is by no means common. The striæ on this species are not radiant near the apices, but slightly convergent towards the margins of the valve, and show no traces of longitudinal furrows near the median line.

M. bisulcata Grun. n. sp. *M. minuta*, valvis late ovato lanceolatis, polis parum productis obtusis, loculis latiusculis æqualibus 5-6 in .01 mm. Striis subradiantibus, subtiliter punctatis 10½ in .01 mm. utrinque area lævi lineari lanceolata subarcuata interruptis linea media undulata, nodulo centrali parvo oblongo. Longit. .017-.03 mm., latit. valvæ .009-.011. Tab. CXCv., Fig. 6.

Not rare in the Honduras gathering. This species is very like *M. minuta* Grev. in outline, but differs widely by its much coarser striæ and the two smooth furrows on each side of the valve. In the Honduras gathering occurs another *Mastogloia*, which I consider is the true *M. minuta* of Greville; it is very like the preceding, but has a nearly straight median line, very fine subradiant transverse striæ (25 in .01 mm.), still finer longitudinal striæ, and no smooth furrows. Pl. CXCv., Fig. 7.

Orthoneis.

O. Crucicula Grun. n. sp. *O. minuta*, valvis ovatis obtusis, loculis utrinque quinque, mediis angustioribus reliquis semicircularibus, nodulo centrali transversim dilatato cruciformi, striis subtiliter punctatis subradiantibus tenuibus (20 in .01 mm.) linea media recta. Longit. .014-.017 mm., latit. valvæ .008-.01 mm.

Not rare in the Honduras gathering.

This is a small but very characteristic species, distinguished by the singular shape of its loculi. *O. fimbriata* (Brightwell) Grun. Novara Exped.

Cocconeis fimbriata Brightwell, in 'Q. Mic. Jour.,' vol. vii. fol. 1, fig. 3. *Mastogloia cribrosa* Grun., in 'Verh. Wien zool. bot. Gesellsch.,' 1860, ex parte tab. vii., fig. 10 d. Common.

O. binotata Grun., l. c. page 15. *Cocconeis binotata* Grun., in 'Verh. Wien zool. bot. Gesellsch.,' 1863, tab. iv., fig. 13. *C. scutellum*, var. γ Roper, in 'Q. Mic. Jour.,' vol. vi., pl. iii., fig. 9. Common.

There can be no doubt that these species do not belong to the genus *Cocconeis*, both the valves being alike, and the frustules are not concave. It is very doubtful whether these forms are distinct from *Mastogloia*; the marginal loculi of this genus are represented here by small semicircular plates; these, as well as the loculi in *Mastogloia*, are probably intended for the secretion of the gelatinous membrane investing the frustule. This becomes most evident in *O. binotata*, where two long horns (in the living frustule) project from it at the places where the two semicircular plates are situated. A large number of horns are developed from the frustules of *O. fimbriata* (and *O. splendida*?). I have not seen these horns on any species of *Mastogloia* or any other species that I have formerly attached to *Orthoneis*. These species must be placed in *Mastogloia*, and are only distinguished by their ovate valves, a difference of little specific value, and of no value as a generic distinction. The species are *Mastogloia cribrosa* (= *Cocconeis coronata* Brightwell?), *M. cocconeiformis*, *M. ovata*, *M. Harvathiana*, and several others. [Not having specially studied the genus *Mastogloia*, the following remarks must only be taken for what they are worth. This genus was constituted by Thwaites for certain naviculoid forms with secondary plates, upon one of which are the loculi. The presence or absence of a mucous cushion, frond, or stipes, although formerly considered by William Smith and others as generic distinctions, are now generally admitted to be of no value, even in the determination of species. I have seen *N. serians* and *Himantidium Soleirolii* embedded in mucous like *Mastogloia*, *Cocconema cymbiforme* without stipes flourishing

vigorously, and *Campylodiscus clypeus* with a mucous fringe apparently protruded from the caniculi; this fringe, like the horns of *Orthoncis*, is analogous to the stipes and fronds of *Cocconeia*, *Schizonema*, &c. It seems to me to be better to restrict the genus *Mastogloia* to those forms where the loculi are distinct, and constitute a new genus for those species with ovate or naviculoid valves, and of which the loculi form an integral part, or include them all in *Orthoncis*.—F. K.]

Amphora.

A. decussata Grun. *A.* (complexa²) valvis semilunaribus, acutis, ventre plano vel sub concavo et subbiundulata, dorso convexo, linea longitudinali margini inferiori valvæ valde approximata subrocta vel subarcuata, nodulo centrali transversim dilatato, valvæ parte ventrali angustissima transverse striata, parte dorsali oblique striata, striis obliquis (16–18 in $\cdot 01$ mm.) e cellulis elongatis concatenatis compositis, valvæ margine dorsali punctorum serie unica ornata. Longit. $\cdot 07$ – $\cdot 17$ mm., latit. valvæ $\cdot 018$ – $\cdot 031$ mm. Tab. CXCv., Fig. 9. Honduras, Adriatic Sea.

Allied to *A. ostrearia*, but well distinguished by the very oblique striæ composed of elongated puncta.

A. hyalina Kg. var. (= *A. hemisphærica* Grun., Hedwigia, *l. c.*), and *A. cymbelloides* Grun., are already delineated in Schmidt's Atlas (tab. xxvi., figs. 52 and 53, and tab. xxvi., fig. 10).

Navicula.

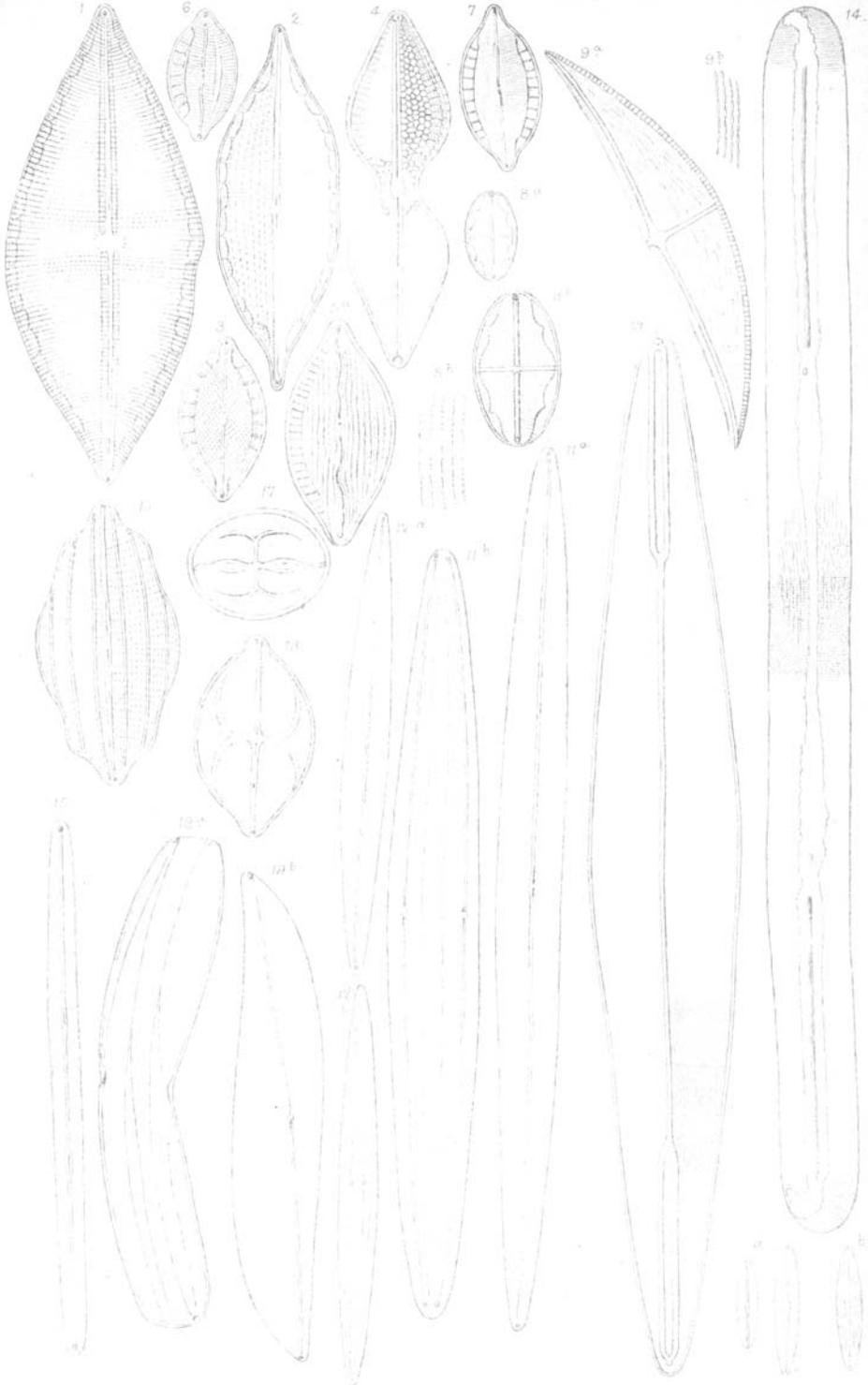
N. triundulata Grun. *N.* valvis latiusculis trigibbis tumore medio ceteris majore et crassiore, apicibus productis obtusis, striis punctatis subradiantibus (10 in $\cdot 01$ mm.), utrinque sulcis tribus longitudinalibus interruptis. Longit. $\cdot 044$ – $\cdot 05$ mm., latit. valvæ $\cdot 023$ mm. Tab. CXCv., Fig. 10.

Very rare, Honduras, Campeachy Bay.

This form is perhaps the same as *N. sulcata* Grev. in 'Trans. Bot. Soc. Lond.,' vol. viii. pt. 3, fig. 10, but not having seen an authentic specimen I am unable to decide.

N. fusiformis Grun. (*Berkeleya fusidium* Grun. in Hedwigia, *l. c.*). *N.* fusiformis valvis lanceolatis acutiusculis, nodulis terminalibus minutissimis, nodulo centrali minuto plerumque ægre conspicuo, striis transversis tenuissimis: 33 in $\cdot 01$, longitudinalibus 36 in $\cdot 01$. Longit. $\cdot 115$ – $\cdot 15$ mm., latit. valvæ $\cdot 010$ mm. Tab. CXCv., Figs. 11, *a*, 11, *b*. Honduras.

N. fusiformis var. *ostrearia* (Turpin) minor, striis transversis 36 in $\cdot 01$ mm. Longit. $\cdot 063$ – $\cdot 073$ mm., latit. valvæ $\cdot 006$ – $\cdot 007$ mm. Tab. CXCv., Fig. 12, *a*, 12, *b*.—*Vibrio ostrearius* Gaillon (1820). *Navicula ostrearia* Turpin, in 'Dict. d'hist. natur,' Lévrault II., tab. i., fig. 2 (*nec* Brébisson in Kütz. 'Spec. Alg.').



W. West & Co. lith.

Honduras Diatoms.

W. West & Co. lith.

Marseilles, by Lindig; Trieste, by Hauck; Huitrieres du Croisic, Loire inferieure, by Bornet. M. Bornet informs me that the oysters become greenish by feeding on this diatom, which occurs in great abundance in the oyster-beds at the mouth of the Loire.

This species differs from all other Naviculæ by its fusiform outline and resemblance to *Amphipleura pellucida*. I had formerly placed it in Berkeleya, being deceived by the two small dots on the median line, which occasionally seem to limit a small linear nodule, but more recent investigations with better objectives have convinced me that there is only a very small roundish or oblong central nodule on each valve. It is the same with my *Amphipleura Frauenfeldii*, 'Verh. zool. bot. Gesell.,' *l. c.*, tab. i., fig. 19, a species closely allied to *N. fusiformis*, but differing by a somewhat broader outline, more distinct longitudinal and much coarser transverse striæ (29 in $\cdot 01$ mm.). The central nodule of this species (which must be named *Navicula Frauenfeldii*) is exceedingly small.

Amphipleura.

The genera *Amphipleura* and *Berkeleya* (incl. *Rhaphidogloia* Kg.) are distinguished by the absence of a central nodule, the valve is divided by a narrow longitudinal line, terminating at the end by long fork-like expansions; these are very conspicuous in *Amphipleura*, but less so in *Berkeleya*. The frustules of the former are embedded in gelatinous sheaths or in amorphous jelly.

A. (pellucida var.?) Lindheimeri Grun., 'Verh. Wien zool. bot. Gesell.,' 1862, tab. xiii., fig. 11. Valves lanceolate, $\cdot 15$ - $\cdot 16$ mm. long, $\cdot 024$ mm. broad. Transverse striæ 26 in $\cdot 01$ mm., longitudinal striæ 26 in $\cdot 01$ mm., slightly curved and interrupted. Length of "forks" $\cdot 036$ mm. Terminal nodules short, rounded. Tab. CXCIV., Fig. 13. Texas.

A. (pellucida var.?) intermedia Grun. Valves narrow, lanceolate, $\cdot 19$ - $\cdot 2$ mm. long, $\cdot 013$ - $\cdot 015$ mm. broad. Length of "forks" $\cdot 044$ mm. Striæ somewhat finer than in *A. Lindheimeri*. Terminal nodules short, rounded. Oregon deposit; not very rare.

A. (pellucida var.?) Oregonica Grun. Very large, valves lanceolate, $\cdot 33$ mm. long, $\cdot 027$ mm. broad. Length of "forks" $\cdot 063$ mm. Terminal nodules somewhat elongated, linear. Striation like that of *A. Lindheimeri*. Oregon deposit; not rare.

All these forms are closely allied to *A. pellucida*, and it may perhaps be best to consider them all mere varieties of that species. The numerous forms of *Navicula rhomboides* are allied in a similar manner, although the extreme members of both series differ very widely. I may also add that *N. rhomboides* is very nearly allied to *Amphipleura*, and that the central nodules are occasionally some-

what elongated, thus bearing a strong resemblance to those in *Amphipleura*. The valves of the genuine *A. pellucida* are narrow, lanceolate, $\cdot 09$ – $\cdot 13$ mm. long and $\cdot 007$ – $\cdot 009$ mm. broad. Length of "forks" not exceeding $\cdot 02$ mm. Striæ 37–39 in $\cdot 01$ mm.

Schumann has found in the Baltic two large specimens of *Amphipleura* ('Schrift. d'Königsberg Phys. Ök. Gesell.,' 1867, tab. i., fig. 9), which are $\cdot 18$ – $\cdot 20$ mm. long and $\cdot 14$ mm. broad. The striation is very coarse (16 in $\cdot 01$ mm.). This is also a doubtful variety of *A. pellucida*, and may be called *A. Schumanni*. Schumann delineates the striæ of *A. Schumanni* and *A. pellucida* ('Diat. der Hohen Tatra,' tab. ii., fig. 10) as composed of three large distant dots forming coarse longitudinal striæ on each side of the valve.* But this is an optical delusion, the striæ in *A. pellucida* and all its varieties consist of rows of numerous very minute dots.

A. Weissflogii Janisch differs from *A. pellucida* and *A. Oregonica* by its exactly linear valves and rounded apices. Length $\cdot 19$ – $\cdot 25$ mm., breadth of valve $\cdot 012$ – $\cdot 013$ mm.; length of "forks" $\cdot 06$ – $\cdot 08$ mm. Striæ 25 in $\cdot 01$ mm. Oregon deposit; rare. Pl. CXCv., Fig. 14. This figure represents the authentic specimen of Janisch, and shows a very abnormal condition of the terminal nodules; in normal specimens they are exactly like those of *A. Lindheimeri*.

A. danica, Kg.? This is a true *Amphipleura*, if Schumann's figure (*l. c.*, tab. i., fig. 3) represents the genuine species of Kützing, which, however, seems to me very doubtful. The valve of *A. danica* Schu., is linear, with rounded apices: the frustules of *A. danica* Kg., are lanceolate, and, as it seems, fusiform, like those of my *Navicula fusiformis*, to which it seems to be nearly related.

From *Amphipleura* must be separated *A. inflexa* Bréb., as I suggested long ago in Hedwigia. The late Dr. Eulenstein proposed naming it *Okedenia*, and as I am not aware of any other genus *Okedenia*, I adopt Eulenstein's name.

Berkeleya.

The species belonging to the genus *Berkeleya* are *B. Dillwynii* Grun., including a great many species of *Schizonema* (see Hedwigia and Novara Exp.); *B. micans* (Lyng.), Kg.; *Bangia micans* Lyngbye; *Rhaphidogloia micans* Kg.; *Berkeleya fragilis* Greville (*nec* Smith, 'Brit. Diat.,' pl. liv., fig. 344; his figure resembles *Navicula scopulorum*); *B. Adriatica* Kg. Striæ, 24 in $\cdot 01$ mm. Pl. CXCv., Fig. 15.

B. manipulata (Kg.) = *Rhaphidogloia* Kg.

B. medusina (Kg.) =

" *B. micans* "

Both are very nearly related to *B. micans*.

* A copy of Schumann's figure will be found in the 'M. M. J.' ("On Dr. Schumann's Formulæ for Diatom Lines," by W. J. Hickie), vol. xiv., Pl. CIX., Fig. 1.—F. K.

B. interrupta (Kg.) = *Raphidogloia* Kg. frustules somewhat sigmoid.

B. Harveyana Grun. *Novara Exp.*, Alga quasi maxime paradoxa. Harvey, Friendly Islands, Algæ, No. 99.

B. penicillata (Grun.) (*Homœocladia penicillata* Kg.?).

B. hospitans (Grun. n. sp.). *B. parasitica*, frustulis minutis, valvis lineari oblongis, acutiusculis, nodulo centrali elongato ægre conspicuo leviter arcuato, striis transversis tenuissimus. Longit. $\cdot 12$ – $\cdot 023$ mm., latit. valvæ $\cdot 003$ – $\cdot 004$, habitat. in vaginis *Hydrocolei tingentis*. Tongatabu (legit Dr. Graeffe). Pl. CXCV., Fig. 16.

Schizostauron Grun. *genus novum*.

Frustula naviculacea, valvis lanceolatis vel ovatis, nodulo centrali transversim dilatato, in utroque fine befido.

S. Lindigii Grun. S. valvis late ovalibus, linea media subsigmoidea, utrinque inter polos et nodulum centralem dilatata, nodulo centrali transversim dilatato, lineari in utroque fine bifurcato, ramis elongatis patentibus, recurvis (cum margine fere parallelis (striis transversis tenuissimus (36 in $\cdot 01$ mm.). Longit. $\cdot 029$ mm., latit. valvæ $\cdot 021$ mm. Valva exsiccata hyalina ecolora. Tab. CXCV., Fig. 17. Very rare in the Honduras gathering.

S. Reichardtii Grun. S. valvis ovato lanceolatis polis parum productis, obtusiusculis, linea media recta lineari, fascia transversa utrinque befida, ramis arcuatis divergentibus, striis transversis subtiliter punctatis, subradiantibus 12 in $\cdot 01$ mm. Longit. $\cdot 26$ – $\cdot 036$ mm., latit. valvæ $\cdot 16$ – $\cdot 19$ mm. Tab. CXCV., Fig. 18.

Adriatic Sea near Lussin piccolo (leg. Dr. Reichardt) in *Codium bursa* from Dalmatia (leg. Dr. Bartach). I have seen single specimens of two other species. *Cocconeis Wrightii*, O. Meara, 'Q. M. J.,' vol. vii., n. s., pl. vii., fig. 6, is without doubt another species of that genus.

Rhoicosigma Grunow.

Frustula plus minus spiraliter torta valvæ illis Pleurosigmati similes.

This genus is perhaps not sufficiently distinct from Pleurosigma, but the species belonging to it are of a very peculiar habit, in front view resembling an *Achnanthes*.

Rhoicosigma Reichardtii Grun. Valvis late lineari lanceolatis obliquis convexis, linea media subrecta, striis transversis tenuibus (20–24 in $\cdot 01$ mm.) longitudinalibus obsoletis. Longit. $\cdot 77$ – $\cdot 18$ mm., latit. valvæ $\cdot 14$ – $\cdot 034$ mm. Tab. CXCV., Fig. 19, *a, b*. Honduras (legit Lindig), Quarnero (legit Dr. Reichardt), Port Jackson (legit Cleve). The Quarnero specimens are larger than those from Honduras.

R. Reichardtii var. ? *constrictum* Grun. differs from the type

form in the valves being more or less constricted in the centre, and the median line is more accurate. Honduras, Quarnero.

R. compactum (= *Pleurosigma compactum* Greville), very variable in outline, differs from *R. Reichardtii* by the very curved median line. Not rare. Honduras, Campeachy Bay, Corsica, Quarnero, Honolulu, Tahiti, Gallopagos, &c.

The other species of *Rhoicosigma* are—

R. arcticum Cleve, 'Bihang. till. Vetensk. Akad. Handl.,' Bd. I., No. 13, tab. iii., fig. 16. Arctic Sea, Finmark.

R. mediterraneum Cleve, MSS. Valve narrow, lanceolate; median line very much curved; striæ transverse; 17 in $\cdot 01$ mm. Balearic Isles.

R. falcatum (Donkin) = *Pleurosigma falcatum* Donkin. 'Q. Mic. Jour.,' vol. i., n. s., pl. i., fig. 1. Cresswell and Boulmar Bay.

Two or three other species have been imperfectly observed. *Ceratoneis spiralis* Kg., 'Bacill.,' II. 31, may possibly be a species of *Rhoicosigma*, but I have never seen anything like Kützing's figure.

Isthmia.

I. Lindigiana, Grunow et Eulenstein. *I. gracilis* ecostata, valvis inequalibus, inferiore longiore, oblique conica obtusa, superiore brevior, oblique subtriangulati, margine superiore convexo, plus minus distincte bigibbo, valvarum margine inferiore serie annulare corpusculorum clavæformium (interdum etiam irregulariter in cetera valvæ parte interna distributorum) ornato, areolis in utriusque valvæ dorso sitis ceteris majoribus, irregularibus, reliquis membranæ connectivæ versus in lineas longitudinales curvatas ordinatis, apicem versus minoribus hexagonis et irregulariter dispositis, membrana connectiva lata, areolis in lineas longitudinales ordinatis ornata, in media parte minoribus, valvas versus elongatis. Longit. frustul. $\cdot 023$ – $\cdot 039$ mm., latit. $\cdot 5$ – $\cdot 10$ mm. Tab. CXCVI., Fig. 1, a, b, c, d.

Common in the Honduras gathering.

This species is well characterized by the small club-shaped corpuscles in the interior of the valves. I have seen nothing analogous to these in any other diatom. The areolæ are covered with minute dots when seen under a higher power.

I. Lindigiana is very nearly related to an *Isthmia* inhabiting the southern seas, and seems there to represent the *I. enervis* of the northern seas. I name it *I. (enervis* var. ?) *capensis*. It is not rare at the Cape of Good Hope, and it also occurs on the coast of Australia and the Polynesian Islands. It is distinguished from *I. Lindigiana* by the absence of the peculiar club-shaped corpuscles, and from *I. enervis* by its narrower and longer valves.

[*I. capensis* is perhaps the *I. minima* of Harvey and Bailey.—
F. K.]

Triceratium.

T. (orbiculatum Shadl. var.) *elongatum* Grun. T. frustulis cylindraceis concatenatis, membrana connectiva elongata lineis transversis (e divisione imperfecta ortes?) plus minus numerosis in utroque dimidio opposite curvatis instructa, valvis exacte orbicularis, vel in tribus locis pluries undulatis, varius late ovalibus, cornibus tribus (rarissime quaternis) conicis obtusis aculeo unico instructes, nodulis suborbicularibus, marginatis ab margine aliquantulum remotes tenuissime punctatis. Areolæ hexagonæ parvæ in valva radiantibus in membrana connectiva lineas longitudinales et obliquas efficientes. Diameter valvæ $\cdot 036$ – $\cdot 102$. Tab. CXCVI., Fig. 2, *a, b, c.*

Common in the Honduras gathering.

This *Triceratium* is distinguished by its orbicular valves and the slight undulation which I have not observed in other specimens of *T. orbiculatum*. It closely resembles the elongated form of *Auliscus pruinosis* as figured by Bailey, and also a peculiar *Cerataulus* which I shall presently describe.

Cerataulus.

I have in my collection a form of *Cerataulus* from China (legit Gaudichaud) which I consider to be a dubious variety of *C. lævis*, and have named it

C. (lævis var. ?) *Chinensis* Grun. It differs from *C. lævis* by its truly circular valves, the greater number of processes, and the arrangement of the minute dots which are irregularly scattered over the whole surface, and only form short striæ (13–14 in $\cdot 01$ mm.) near the margin of the valve when seen from above. The connecting membrane is sometimes elongated (Pl. CXCVI., Fig. 3, *a, b*) like that of *Triceratium orbiculatum* var. *elongatum*, and shows similar divisions separated by curved lines, and which are always constant in the connecting membrane of *Rhizosolenia*.

I am unable to determine whether this elongation of the connecting membrane is connected with some at present unknown method of propagation, or only the result of certain abnormal conditions of life. The frustules of *Orthosira Roeseana* (Rabenhorst) (= *O. spinosa* Greville) often become elongated, and have then a very complicated connecting membrane. These abnormal forms of *O. Roeseana* seem to be produced in places where they are not always covered with water. Ehrenberg found them on the stems of trees, and named them *Liparogyra spiralis* and *L. dentroteres*. I have also found them on the thallus of a *Marchantia* from China, and sometimes in gatherings of *O. Roeseana*, but less developed.

In a preparation of Möller from Porto Rico I observed a still more interesting abnormality, viz. the multiplication of the valves within the frustule. Here the connecting membrane was very short, and the enclosed frustules (numbering 1, 2, 3 or more) became gradually smaller as they approached the centre like a nest of pill-boxes. Pl. CXCVI., Fig. 4, b. W. Smith has delineated a similar growth in *Orthosira Dickiei*, and I have observed a like abnormality in a small variety of *Orthosira distans*. Can this be a craticular state of the Melosireæ, similar to that of *Navicula cuspidata*, *N. Perrotettii*, *Meridion circulare*, and *Odontidium mesodon*, and which Pfitzer, in his beautiful paper on the Bacillaria, compares to the resting spores in other algæ, and the thickening of the membrane for their protection from unfavourable influences? But in what manner do these abnormal frustules multiply and reproduce a new series of normal forms? Certainly not by conjugation or self-division.

The inner frustules of *Cerataulus lævis* are sometimes very small, and it is impossible to comprehend how these small frustules can reproduce by self-division frustules of the average size; the diminution of the frustule is always the result of self-division, and not the contrary. Much still remains to be done towards the interpretation of these and other facts connected with the reproduction of the Diatomaceæ.

I may here add that many genera of Biddulphiæ and Eupodisceæ are very doubtful. It is now generally admitted that Amphitetras and Amphipentas ought not to be separated from Triceratium, and it is even difficult to find a sufficient distinction between the latter genus and Biddulphia.

Triceratium striolatum Ehr. (= *T. membranaceum* Brightwell, *T. Biddulphia* Heiberg) is the triangular form of *B. rhombus*. (See Cleve, 'Bihang. till. k. Svenska Akad. Handling,' Bd. I., tab. xiii., fig. 2.)

T. spinosum is a triangular form of *B. granulata* Roper. [*T. spinosum* is often quadrangular and *B. reticulata* sometimes three-sided.—F. K.]

Hydrosera triquetra Wallich, is also only a triangular variety of *T. compressa* Wallich. And *Cerataulus lævis* sometimes occurs, as we have just seen, with three processes.

[Cleve (*l. c.*, tab. iv., fig. 3, a, b) figures a frustule of *Biddulphia aurita* (which he considers sporangial), resembling our Fig. 4, b, inasmuch that a small frustule has been formed within it,* but in neither case can I imagine the larger frustules to be sporangial.

* In the August part of this Journal, p. 75, I suggested the probability that the endochrome may under certain conditions possess the power of producing (? by means of microspores) perfect frustules without conjugation. This would perhaps explain the abnormal conditions just described.

The peculiar structure of the connecting membrane in *Triceratium orbiculatum* var. *elongatum* and *Cerataulus lævis*, bears, in my opinion, only a superficial resemblance to *Rhizosolenia*. This genus resembles *Rhabdonema* and some allied genera in possessing a series of annuli (generally more or less wedge-shaped), and at a certain period of growth a smooth connecting membrane is formed, and shortly after two beaked ends (valves) are produced; in some splendid specimens of *R. striata* from the Arafura Sea this has occurred three or four times before the frustules separated, thus forming a filament of considerable length.

It seems to me probable that Mr. Thwaites' explanation of the peculiar state in which *Orthosira Dickiei* is sometimes found is correct, and that it is a sporangial condition. In a very good gathering of this form I have seen it in every stage, from its commencement to the reproduction of the normal frustule; the first indication is the formation of two conical valves, resembling two thimbles joined at their bases; within these are formed two fresh valves with the bases slightly broader; this is repeated until a large but normal frustule is formed, and self-division goes on until the

EXPLANATION OF PLATES.

PLATE CXCIH.

- FIG. 1.—*Licmophora Remulus*. *a*, valve; *b*, frustule × 400.
 „ 2.—*Asterionella Bleakleyi* var.? *a*, valve; *b*, frustule × 400.
 „ 3.—*Synedra lavigata* × 900.
 „ 4.— „ „ var. *obtusiuscula* × 900.
 „ 5*a*, *b*.— „ „ „? *hyalina* × 900.
 „ 6.— „ „ *provincialis* × 900.
 „ 7.— „ „ var. *tortuosa* × 900.
 „ 8.—*a*, „ „ *undosa* × 400; *b*, apex; *c*, centre × 900.
 „ 9.—*a*, „ „ *cornigera* × 400; *b*, apex; *c*, centre × 900.
 „ 10.—*a*, „ „ *Frauenfeldii* × 900; *b*, apex; *c*, centre × 1540.
 „ 11.—*a*, „ „ *crystallina* var.? *insignis* × 200; *b*, apex; *c*, centre × 900.
 „ 12.— „ „ „ var. *bacillaris*. *a*, valve × 450; *b*, apex; *c*, centre × 900.

PLATE CXCIV.

- FIG. 1.—*Synedra Baculus* var. *minor* × 900.
 „ 2.— „ „ *capillaris* × 900.
 „ 3.—*Sceptroneis cuneata* × 400; *b*, apex; *c*, centre; *d*, lower apex × 900.
 „ 4.— „ „ *dubia* × 900.
 „ 5.—*Striatella Lindigiana*. *a*, valve; *b*, frustule × 400; *c*, areolation × 1500.
 „ 6.—*Striatella intermedia*. *a*, valve; *b*, frustule × 400.
 „ 7.— „ „ *unipunctata*. *a*, valve × 900; *b*, portion of diito × 1540.
 „ 8.—*Playiodiscus Martensianus* × 900.
 „ 9*a*.— „ „ *nervatus* × 400.
 „ 9*b*.— „ „ „ *forma minor* × 900.
 „ 10.—*Nitzschia Koltzeckii* × 900.
 „ 11.—*Bacillaria paradoxa* var. *tropica* × 400.
 „ 12.—*Mastogloia erythræa* × 900.
 „ 13.— „ „ „ var. × 900.
 „ 14.— „ „ „ „ × 900.
 „ 15.— „ „ „ „ *biocellata* × 900.

[PLATE CXCV.

formation of another sporangial frustule is requisite, either by reason of the power of dividing becoming exhausted or from the diminution of the size of the frustules.

In concluding these remarks, I beg to thank Herr Grunow for his kindness in permitting me to publish his valuable observations in this Journal, thus enabling the English diatomist to obtain a knowledge of what other countries are doing towards elucidating many of the mysteries connected with the life-history of the Diatomaceæ.—F. K.]

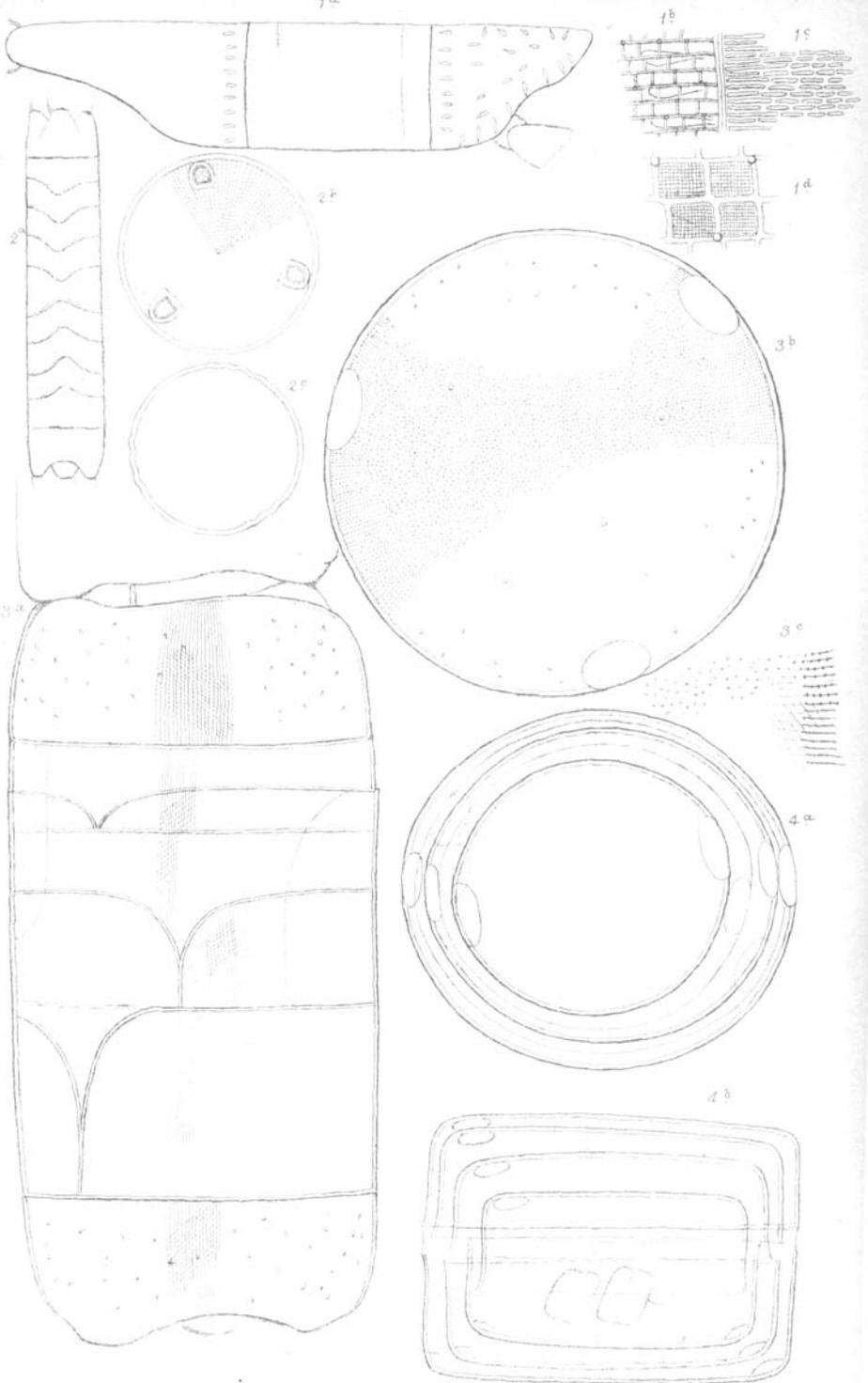
PLATE CXC.V.

- FIG. 1.—*Mastogloia Jelineckii*.
 „ 2.— „ *rostellata*.
 „ 3.— „ *angulata* var. *pusilla*.
 „ 4.— „ ? *reticulata* × 400.
 „ 5.—*a*, „ *undulata*; *b*, part of valve × 1500.
 „ 6.— „ *bisulcata*.
 „ 7.— „ *minuta*.
 „ 8.—*a*, *Orthoncis crucicula*; *b*, forma minor.
 „ 9.—*a*, *Amphora decussata* × 400; *b*, striæ, highly magnified.
 „ 10.—*Navicula triundulata*.
 „ 11.— „ *fusiformis*. *a*, valve; *b*, frustule.
 „ 12.— „ „ var. *ostrearia*. *a*, valve; *b*, frustule.
 „ 13.—*Amphipleura Lindheimeri*.
 „ 14.— „ *Weissflogii*, original specimen with abnormal terminal nodules.
 „ 15.—*Berkeleya micans*.
 „ 16.— „ *hospitans*. *a*, valves; *b*, ditto, with endochrome.
 „ 17.—*Schizostauron Lindigii*.
 „ 18.— „ *Reichardtii*.
 „ 19.—*Rhoicosigma* „ *a*, frustule; *b*, valve.

All magnified 900 diameters, excepting Figs. 4, 5*a*, 5*b*, and 9*a*, *b*.

PLATE CXC.VI.

- FIG. 1.—*Isthmia Lindigiana*. *a*, frustule × 200; *b*, lower portion of valve; *c*, ditto connecting membrane, highly magnified; *d*, arcolæ × 1000.
 „ 2.—*Triceratium orbiculatum* var. *elongatum*. *a*, frustule × 200; *b*, *c*, valves × 400.
 „ 3.—*Ceratulus levis* var. *Chinensis*. *a*, frustule; *b*, valve × 900; *c*, striæ × 1510.
 „ 4.—*Ceratulus levis* var. × 900; *b*, frustules, showing abnormal self-division.
 Within the smallest of the larger frustules are two minute frustules.



A. Gruber del.

Honduras Diatoms.

W. West sculp. lith.