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ON SOME FOSSIL MARINE DIATOMS FOUND IN THE MORAVIAN
"TEGEL," FROM AUGARTEN, NEAR BRÜNN.

By PROF. P. T. CLEVE, Hon. F.R.M.S.

(Read June 26th, 1885.)

PLATES XII AND XIII.

In the marine deposits of Moravia, known as Tegel (marl or clay), belonging to the miocene and pliocene divisions of the tertiary formation, fossil diatoms have been recently found by Herr E. Thum, of Leipzig, who has kindly sent to me a collection of mounted specimens for description. He informs me that they were detected in the "Tegel," from Augarten, near Brünn. Whether it belongs to the miocene or pliocene formation I am unable to determine.

The following is a list of the species sent by Herr Thum :—

COCONEIDÆ.

Cocconeis pellucida, Hantzsch in Rab. Beiträge, p. 21, Pl. 6, Fig. 11 (1863). Grunow, Novara Algæ, p. 12. (Not *C. pellucida* of Verh., 1863.) I have seen three upper valves. Length, ·084-·143 mm.; breadth, ·063-·084; striæ, 12 in the ·01 mm. This species is found in the warmer seas, as the Mediterranean, Red Sea, Indian Ocean, &c., and also in the Nankoori deposit.

MASTOGLOIACÆ.

Orhoneis splendida (Greg.), Grun. *Cocconeis splendida*, Greg. D. of Cl., p. 21, Pl. 1, f. 29 (1857). *C. punctatissima*, Grev. Mic. Journ., v., p. 8, Pl. iii, f. 1 (1857). *Mastogloia cribrosa*, Grun. Verh., p. 577 (1860). *Orhoneis splendida*, Grun. Novara Algæ, p. 15 (1867). Van Heurck Syn., Pl. 28, f. 1-2 (1880). I have seen four examples from this deposit. Length, ·088-·168 mm.; breadth, ·07-·13; puncta, 5 in ·01 mm. Living specimens are smaller, and measure in length ·05 to ·11 mm., breadth ·03-·09 mm. Striae in living specimens vary from 5½ (Greg.) to 8 (Grev.) in ·01 mm.

NAVICULACEÆ.

Navicula aspera, var. *intermedia*, Grun. in A. Schm. Atl., Pl. 48, f. 14, 15 (1876). Franz. Josef's Land Diatomeen, p. 56, Pl. A., f. 20 (1884). One of the Tegel specimens measures $\cdot 2$ mm. in length and $\cdot 034$ mm. in breadth, and has 7 striæ in $\cdot 01$ mm.; the striæ are nearer to the median line on one side than the other. This form is found living in the Arctic seas.

N. nitescens (Greg.), Diat. of Cl., pp. 15 and 69, Pl. 1, f. 16 (1857). A. Schm. Atl., Pl. 7, f. 38 (1875). (*N. Smithii* var.) One specimen, closely agreeing with the figure in the Atlas, measures $\cdot 12$ mm. in length, and $\cdot 002$ mm. in breadth, and has 6 striæ in $\cdot 01$ mm. This species is also found recent in most seas.

N. prætexta, Ehr. *Pinnularia prætexta*, Ehr. Mb. 1840. Several specimens, all agreeing very closely with the figures in A. Schm. Atl., Pl. 3, f. 31-33. Length, $\cdot 1$ - $\cdot 24$ mm.; breadth, $\cdot 06$ - $\cdot 12$ mm.; striæ, 7-7 $\cdot 5$ in $\cdot 01$ mm.

Found recent in most marine gatherings.

N. Lyra, var. *elliptica*. A. Schm. Atl., Pl. 2, f. 29, and Pl. 3, f. 11 (1875). Van Heurck. Syn., Pl. 10, f. 2. One specimen (len. $\cdot 115$, br. $\cdot 075$ mm.; striæ, 6 in $\cdot 01$ mm.) closely resembles the figure in the latter work. Common in recent marine gatherings.

N. inhalata: A. Schm. Atl., Pl. 2, f. 30 (1875). One specimen (length $\cdot 14$, breadth $\cdot 08$ mm.) has 9 striæ in $\cdot 01$ mm. The specimen from Samoa, as figured in the Atlas, has 13 striæ in $\cdot 01$ mm.; in other respects the Tegel specimen agrees well with it.

N. gemmata, Grev., Edin. N. Phil. Jour., x., p. 30, Pl. 4, f. 7 (1859). *N. spectabilis*, Grun., Verh., p. 533, Pl. 3, f. 11 (1860). *N. Grunowii*, Rab. Flor. Eur. Alg., p. 203 (1864). *N. gemmata*, var. *biseriata*, Grun., Novara Algæ, p. 100, Pl. 1 A., f. 16 (1867). *N. gemmata*, var. *spectabilis*, A. Schm. Atl., Pl. 8, f. 38 (1875). *N. grunowii*, A. Schm. Atl., Pl. 70, f. 73 (1881). Three specimens $\cdot 14$ - $\cdot 20$ in length and $\cdot 05$ - $\cdot 052$ mm. in breadth; striæ 3 in $\cdot 01$ mm. One of the specimens is slightly constricted in the middle, and very much resembles *N. pristiophora*, Janisch in A. Schm. Atl., Pl. 70, F. 72. *N. gemmata* is found living in warm seas, as the Mediterranean, Red Sea, the West Indies, California, &c., and in a fossil state in Californian guano and the Nankoori deposit.

N. bomboides, A. Schm. Atl. See Diat. Pl. 1, f. 2 (1874). A.

Schm. Atl., Pl. 13, f. 36-38 (1875). I have seen only one specimen; it is .13 mm. in length and .42 in breadth. It has only a slight central constriction, as in figure 38 of the Atlas. The striæ are 4.5 in .01 mm.

N. gemmatula, Grun. A. Schm. Atl., Pl. 13, f. 20-21 (1875). A somewhat corroded valve (Pl. 12, f. 1); measures .18 mm. in length and .048 in breadth, and has 4.5 striæ in .01 mm. It resembles the last-named form, but is larger. It also resembles *N. mæsta*, A. Schm. Atl., Pl. 69, f. 18-19, which, however, has closer striæ (7 in .01 mm.). Nearly related to our specimen is *N. Lesinensis*, Grun., m.s., measuring .144 mm. in length and .05 in breadth, with 5 striæ in .01 mm., but the depressions parallel to the median line are narrower.

N. Beyrichiana. A. Schm. Atl., Pl. 69, f. 16-17 (1881). One specimen, which measures .18 mm. in length and .05 in breadth, and has 3.3 rows of distant puncta in .01 mm. This species has been found in Ægina (? fossil).

N. Crabo (Ehr.), Kütz. *Diploneis Crabo*, Ehr. Mb. (1844). *N. Crabo*, Kütz., Sp. Al., p. 83 (1849). *N. Pandura*, Bréb. Diat. Cherb., Pl. 18, f. 4 (1854). I have seen four valves from the "Tegel," all of which have lost their finely-sculptured layer. All of them agree very well with Figures 4 and 8 (pl. 69) in the Atlas; Figure 8 seems to be more nearly related to *N. multicostata*, if this is really distinct from *N. Crabo*.

SURIRELLÆ.

Surirella opulenta. Grun. Verh., p. 461, Pl. 11, f. 10 (1862).

S. fastuosa, var. *opulenta*. A. Schm. Atl., Pl. 20, f. 1. One large specimen.

S. Baldjiki. Norman, T.M.S., ix., p. 6, Pl. 2, f. 2. A. Schm. Atl., Pl. 20, f. 7. One specimen. This species is still living in the Mediterranean and Black Seas.

Campylodiscus hibernicus, Ehr. A. Schm. Atl., Pl. 55, F. 10-11. I have seen one perfect specimen from the "Tegel." Mr. Thum informs me that this well-known freshwater species really occurs in this deposit. This seems highly improbable, as all the other species found in it are purely marine.

C. Clypeus, Ehr. Ehr. Mb., p. 205 (1840). *Cocconeis Clypeus*, Ehr. (1838). I have seen one small specimen closely agreeing with figure 3, Pl. 55, in Schm., Atl.

C. obsoletus, Cl., n.sp. Valve orbicular or oval, diameter .17 mm., central area large, surrounded by a circle of short puncta. Limbus, with a few irregular and obliterated canaliculi. Margin with short cellules. Of all the described forms of Campylodisci with which I am acquainted, this shows the nearest affinity to *C. tabulatus*, A. Schm. Atl., Pl. 52, f. 4, but the canaliculi in that species extend from the margin to the circle of puncta surrounding the central margin. Pl. 12, f. 2, $\frac{280}{1}$, *b. c.*, margin in different foci $\frac{1000}{1}$.

SYNEDREÆ.

Synedra fulgens (Kütz). W. Sm. *Gomphenema*, Kütz (1833). *S. fulgens*, W. Sm., 1853. Van. Heurck Syn., Pl. 43, f. 1-4. I have only seen a fragment of a valve .02 mm. broad, with unusually coarse striæ, 6 in .01 mm.

ENTOPYLEÆ.

Gephyrea media, Arnott, M.J.S. viii., p. 20 (1860). *Achnanthes angustata*, Johnst. (nec. Grev.), M.J.S. viii., p. 14, Pl. 1, f. 13 (1860.) Costæ 6.5 in .01 mm. The species found in the "Tegel" are identical with those from the Moron deposit. It occurs living in California, Japan, &c.

STRIATELLÆ.

Rhabdonema adriaticum, Kütz. One specimen.

Grammatophora maxima, Grun. Verh., p. 416, Pl. 5, f. 5 (1862). A large and robust form, .18-.3 mm. in length and .018 in breadth. No striation could be detected.

ISTHMIÆ.

Isthmia nervosa, Kütz. No difference between this specimen and the recent form could be detected.

BIDDULPHIÆ.

Biddulphia pulchella, Gray. (1821). The Tegel specimens are identical with the recent forms.

B. Tuomeyi (Bail.), Roper. *Zygoceros Tuomeyi*, Bailey (1843).

B. Tuomeyi, Roper (1859). Van Heurck Syn., Pl. 98, f. 2-3. This is a very variable species; some specimens so nearly resemble *B. elegantula*, Grev., T.M.S. xiii., Pl. 6, f. 13, that they might be taken for that species, whilst others can scarcely be distinguished from *B. regina*, W. Sm. Syn., Vol. ii., p. 50, Pl. 76, f. 323. Van Heurck Syn., Pl. 98 f. 1.

Syringidium, sp. I have seen one imperfectly developed frustule which seems to belong to *S. Americanum*, Bail. (Van Heurck Syn., Pl. 106, f. 2.) Pl. 12, f. 3, $\frac{480}{1}$.

Triceratium Favus, Ehr. Type form.

T. Favus, var. *maxima*, Grun. Van Heurck Syn., Pl. 107, f. 5. Distance between the angles $\cdot 15$ - $\cdot 25$ mm. Cellules (1 - $1\cdot 4$ in $\cdot 01$ mm.) very regularly arranged in lines parallel with the margins; surface of valve covered with coarse granules (10 in $\cdot 10$ mm.), radiating from the centre to the margins. Although the form of the valve and the arrangement of the cellules are the same as in the typical *T. Favus*, the presence of the radiating granules seems to be sufficient to constitute it a distinct species.

T. arcticum, Brightwell, 1853. A. Schm. Atl. Pl. 79, f. 12-13. Large triangular ($\cdot 15$ mm. between the angles) cellules in lines radiating from the centre angles; obtuse, with rows of smaller cellules, 8 in $\cdot 01$ mm. In addition to the coarser cellulation the surface is covered with very small cellules, as shown in figures 5, 6, 7, Pl. 79, of the Atlas.

T. Moronense, Grev. (T.M.S. xiii., p. 9, Pl. 4, f. 18, 1865). Of this species I have seen two specimens. Distance between the angles $\cdot 08$ - $\cdot 15$ mm. So far as I know this species has only been found in the fossil deposits of Moron and Nankoori.

T. latum, Grev. (T.M.S., xiii, p. 103, Pl. 9, f. 20, 1865). A. Schm. Atl., Pl. 77, f. 38-39. One specimen. Distance between the angles $\cdot 075$ mm. In all respects identical with A. Schmidt's figures; this species has been found living at Singapore and Celebes.

T. turgidum, Ch. n.sp. Valve in s.v. triangular, with very broad angles; outline orbicular, very convex; centre with scattered puncta, which become closer as they approach the margin. In s.v. the centre is very turgid, and the angles produced. Distance between the angles $\cdot 07$ mm. Pl. 12, f. 4, *a b*, $\frac{280}{1}$.

T. Stokesianum, Grev. (T.M.S., xiv., p. 8, Pl. 2, f. 23, 1866). The form found in the Tegel, and which I refer to the above named species, differs from Greville's figure, the veins not forming transverse bars; they are also shorter and more irregular. In a small specimen they are very short, but I do not think these differences are of any specific value. I have examined four specimens. Distance between the angles $\cdot 1$ - $\cdot 16$. The centre of the valve has a few puncta (?) differing from the ordinary cellulation;

they are probably short spines or apiculi. A small specimen shows considerable affinity to *T. Jensenianum* Grun. (A. Schm. Atl., Pl. 77, f. 15-16), but differs from that form by the short veins being more numerous. Pl. 12, f. 5, $a b, \frac{280}{1}$

T. parallelum, Ehr, Grev. Triangular form=*T. obtusum*, Ehr.? Cleve, West Ind. Diat., p. 16 (1878). *T. parallelum* var. *trigone*, A. Schm., Pl. 76, f. 14-17, (1882). Quadrangular form=*Amphitetras parallela*, Ehr., Mb. (1840). *Triceratium parallelum*, Grev. T.M.S., xiii., p. 104, Pl. 9, f. 22 (1865). Hexagonal form, Grev. l.c., f. 23. Both the triangular and quadrangular forms occur in the "Tegel." The species is found living in the warmer seas, as the Mediterranean, Red Sea, West Indies, Gallopagos Islands, and as fossil in Ægina Moron and San Jeremie, F.K).

T. tessellatum, Grev. (T.M.S. ix, p. 71, Pl. 8, f. 14). This species belongs to a group of Triceratia; extremely difficult to exactly determine, so many slightly differing forms having been described as distinct species and also imperfectly figured. As my determination may not be perfectly correct, I give a figure of the only specimen I have seen from the Tegel deposit. Distance between the angles, .08 mm. Pl. 12, f. 7.

T. irregulare var. *hebetata*, Grun. Van Heurck Syn., Pl. 111, f. 10. One specimen closely agreeing with the above figure. The angles and margin show a structural difference when the focus of the objective is altered. This is probably caused by the existence of two differently sculptured layers. In one focus the angles have large cellules, in the other very small ones. I have some doubts as to this form being the true *T. irregulare*.

T. trisulcum, Bail. (in Pritch. Inf., p. 854, Pl. 8, f. 24, 1861). A. Schm. Atl., Pl. 78, f. 5-8. Of this form I have seen several specimens. Distance between the angles .10-.18 mm:

Var. *minor*, Cleve. Small. Distance between the angles, .1 mm. The apices of the angles are more acute than in the larger form. Pl. 12, f. 6, $\frac{480}{1}$

T. nobile (Grev.), Cl. *Amphitetras nobilis*, Grev. T.M.S. xiii, p. 105, Pl. 9, f. 27 (1865). One large specimen. Distance between the angles .115 mm., rows of cellules, 4 in .01 mm. A small quadrangular specimen agrees well with *Amphitetras producta*, Grev., T.M.S. ii., p. 94, Pl. 9, f. 11 (1862); not *T. productum*, Grev. (1861), nor *T. balearicum*, Cl. Grun. and green Sv. Vet. Ak. Handl., T. xviii, p. 25, Pl. 6, f. 73.

T. antediluvianum (Ehr.), Van Heurck. *Amphitetras antediluviana*, Ehr. (1839). I have seen only one specimen from the Tegel deposit, and this is not the type form; the lobes are less obtuse. It more nearly resembles the last described form, from which it differs principally by its coarser cellulation (3 cellules in the .01 mm.) and less produced lobes. Distance between the angles .07 mm.

Eupodiscus Argus, Ehr. *Tripodiscus Argus*, Ehb. (1849). *E. Argus*, W. Sm., Syn. vol. I, 1859. Van Heurck Syn., Pl. 117, f. 3-6. Several specimens examined, but no difference could be detected between them and recent forms.

Aulacodiscus Oregonensis, Bail. 1862. *A. Oregonus*, Ralfs. 1861. A. Schm. Atl., Pl. 34, f. 4-5.

A. amoenus, Grev., T.M.S. xii., p. 10, Pl. 1, f. 3 (1864). A. Schm. Atl., Pl. 41, f. 13. One specimen agreeing very well with A. Schmidt's figure.

A. Grunowii, Cl., n.sp. Valve large, .1-.3 mm. in diameter, with distant rows of granules radiating from the centre, where they are scattered. Between these are very small puncta; below the granulated surface is a reticulated layer; number of rays 6-10. Pl. 12, f. 8, $\frac{280}{1}$.

This beautiful species approaches very closely in general appearance to *A. Grevilleanus*, Norman (T.M.S. xii., p. 10, Pl. 1, f. 1, 1864), but the markings on that species show many important differences; nevertheless, our species has a close affinity with it. *A. Grevilleanus* was found in the Moron deposit.

Cerataulus turgidus, Ehr. (1843). Van Heurck Syn., Pl. 104, f. 1-2. Two small specimens, .05-.06 mm. in diameter.

C. Johnsonianus (Grev.), Cl. *Biddulphia Johnsoniana*, Grev. T.M.S. xiv., p. 6, Pl. 2, f. 14-15 (1866). A very robust species, .18 mm. in diameter. The puncta of the valve form irregular wavy lines, about .11 in 0.1 mm. (Moron deposit, Greville.)

Auliscus confluens, Grun. A. Schm., Probetafel, f. 1 (1874). Atlas, Pl. 32, f. 6-8. Several specimens, diameter .1 mm.

A. cælatus, Bail. (1853). The specimens from the Tegel agree with Figure 12, Pl. 32, in A. Schm. Atl. (from Moron).

A. Normanianus, Grev. T.M.S. xii., Pl. 11, f. 11 (1864). A. Schm. Atl., Pl. 32, f. 3, and Pl. 67, f. 5. One valve agreeing in every respect with the Moron specimen.

A. pulvinatus, Cl., n.sp. Valve nearly orbicular; processes

two, large, centre punctate depressed, surrounded by two elevated rings, separated by a furrow. Structure: minute puncta, arranged in irregular radiating lines. Margin with a few short apiculi. Diameter $\cdot 08$ mm. Pl. 13, f. 9, $\frac{48}{1}$

ACTINOPTYCHÆ.

Actinoptychus undulatus, Ehr. Large specimens $\cdot 08$ - $\cdot 18$ mm. in diameter. Between the three marginal nodules and the central area are distinct raphes.

A. splendens (Shadb.), Ralfs. Van Heurck Syn., Pl. 119. Besides the typical form I have observed the following varieties:—

var. *Californica*, Grun. Van Heurck Syn., Pl. 120, f. 1.

var. *Nicobarica*, Grun., l.c., f. 4.

A. glabratus, Grun, l.c., Pl. 120, f. 6.

var. *incisa*, Grun., l.c., f. 8.

A. vulgaris, var. *Virginica*, Grun., l.c., Pl. 121, f. 7. Pl. 13, f. 11. Another variety occurs in the Tegel, having a coarser reticular and more distant rows of puncta. Pl. 13, f. 10.

A. Simbirskianus, A. Sehm. Atl., Pl. 29, f. 11 (1875). One specimen, resembling the figure in the Atlas.

A. Boliviensis, Janisch. A. Sehm., Atl. Pl. 1, f. 23 (1875). One large specimen. I regard as varieties of this species —

A. Gründleri. A. Sehm. Atl., Pl. 1, f. 22 (1875).

A. Pfitzeri, l.c., Pl. 29, f. 1 (1875).

The differences between the three forms consist in the number of the marginal nodules, the form of the blank spaces, and the depression of the surface, but all these characters are variable. In Pl. 13, f. 12, I give a figure of *A. Pfitzeri*, from the Tegel. *A. Gründleri* has two nodules, and is larger, but does not otherwise differ.

A. Moronensis (Grev.), Cl. *Omphalopelta Moronensis*, Grev. T.M.S. xiv., p. 122, Pl. 2, f. 14 (1866). This species does not seem to be rare in the Tegel, and varies in size from $\cdot 08$ - $\cdot 26$ mm. in diameter. Small specimens agree with Greville's figure, but the large valves are more flattened and are slightly hexagonal.

Asterolampra Marylandica, Ehr. (1844). Diameter of valve $\cdot 11$ mm., rows of puncta 8 in $\cdot 01$ mm.

THAUMATODISCI CLEVE.

In this family I propose to include some very remarkable forms of Diatomaëcæ, the valves of which have prominent central processes. I place in this family the genera *Thaumatonema*, Greville,

T.M.S., 1871. *Strangulomena*, Greville, T.M.S. (1873), and a new and undescribed genus from the Tegel, *Pyrgodiscus*, Kitton, MS.

The genus *Thaumatonema* bears a long process, proceeding from the centre of the circular valve, which afterwards becomes widely forked. The apices of the forks articulate with those of the adjoining frustule. Valve (discoid) turgid, with a flattened centre.

Pyrgodiscus (from *Πύργος*, a tower), has a conspicuous square, tower-like elevation, bearing large spines on its sides and angles. Valve orbicular, with a large square central elevation, armed with long and stout spines; margin with small processes placed on elevations. Surface with irregular line of radiating puncta. The processes are connected with the central elevation by smooth radiating lines.

Pyrgodiscus armatus, n.g. Kitton. End of the central elevation flattened, with rows of small puncta, which do not reach the centre, margins with four stout spines, below which and alternating with them are four similar spines. Diameter of disc $\cdot 08\text{-}\cdot 1$ mm. (height of "tower" $25\cdot 4$ F.K.) The structure of the valve seems to bear some resemblance to that of *Polymyxus* (?) *pulchellus*, Grun. (in Van Heurck Sy., Pl. 123, f. 5) and *Thaumatonema costatum*, Grev. (T.M.S. 13, Pl. 8, f. 3). Pl. 13, f. 13 *a.b.c.*

Herr Thum has not yet succeeded in finding an entire frustule; it is therefore uncertain whether the two valves are alike. I am much inclined to believe that they are not. My reason for this is that he has sent me a specimen, which seems to me to be either the opposite valve of a frustule or an abnormality. It is certainly nearly allied to *P. armatus*. The following is a description of it: Valve more irregular in structure; it has 5 spines and a slight indication of a sixth, but which do not project from a central elevation. Pl. 13, f. 13, *d.* $\frac{480}{1}$.

ARACHNOIDISCA CL., N. FAM.

Arachnoidiscus ornatus, Ehb. (1849). A. Schm. Atl., Pl. 73, f. 4-6. Several corroded specimens.

Stictodiscus Californicus, Grev., var. *areolata*, Grun. A. Schm. Atl., Pl. 74, f. 1. (1882). I have seen five specimens agreeing well with the figure in the Atlas, taken from a somewhat corroded valve from the Moron deposit. Diameter $\cdot 08\text{-}\cdot 15$ mm. On uninjured specimens, the lines of marginal puncta split up into 2-3 rows of small puncta.

ACTINOCYCLÆ.

Actinocyclus Ehrenbergii, Ralfs. (1861). Van Heurck Syn., Pl. 123, f. 7.

A. (alienus, var.? Grun.) undatus, Cleve., Disc. .07-.1 mm. in diameter; pseudo nodule indistinct; valve with radiating and branching lines of puncta (or small cellulæ) 5-6 in .01 mm.; surface concentric, elevations and depressions. It is with some hesitation I refer this form to *A. alienus*; the radiating lines of puncta do not form such distinctly oblique and decussating transverse rows as shown in Grunow's figures in Van Heurck's Syn., Pl. 125, f. 10 and 12; near the margin they have this arrangement, but on the other part of the valve they resemble *A. subtilis*, fig. 7. (Pl. 124), Pl. 13, f. 14 $\frac{480}{1}$.

MELOSIREÆ.

Paralia sulcata (Ehb.), Cleve (1864), *Gallionella sulcata*. Ehb., (1838). *Orthosira marina* Sm. S.B.D. II., p. 59 (1856), *Paralia marina*, Heib. (1863).

Melosira? clavigera, Grun. Van Heurck Syn., Pl. 91, f. 1-2, (1881). *M. Sol.* (Ehr.) Kütz. *Gallionella Sol.*, Ehb. (1844). *M. Sol.*, Kütz. (1849). Van Heurck Syn., Pl. 91, f. 9.

M. Omma Cl. n.sp. Valve orbicular with a circle of puncta (6-7 in .01 mm.) between the margin and the centre (but nearer the former), the margin finely striate (21 in .01 mm.), the remainder of the valve smooth. Diameter, .085 mm. Pl. 13, f. 15. $\frac{480}{1}$.

M. Borreri, Grev. Brit. Flora.

Podosira antediluviana, Cl. Valve very convex and robust, with minute puncta scattered at the centre, but forming minute irregularly radiating lines on the other parts of the valve. Pl. 13, f. 16, $\frac{480}{1}$.

Pyxidicula cruciata, Ehr. (1841), Mg., Pl. 33, f. 7. One specimen. Dia. .056. Cellules 3-4 in .01 mm.

Endictya oceanica, Ehr. (1845). A. Schm. Atl., Pl. 65, f. 10. Diameter .09-.15 mm. Cellules 2 in .01 mm.

E. minor. A. Schm. Atl., Pl. 65, f. 4 (1881), *E. oceanica* in Cl. and Möll, Diat. No. 110. Diameter .09 mm. Cellules 3 in .01 mm. *Craspedodiscus Coscinodiscus*, Ehr. (1844.) A. Schm. Atl., Pl. 66, f. 3-4. One specimen .11 mm. in diameter. Cellules in the limbus 2 in .01 mm.; in the concave part 4 in .01 mm.

Coscinodiscus griseus, Grev. T.M.S., III., p. 230, Pl. 9, f. 7

(1863.) I have seen one valve ; it has a small central space without granules. Row of granules 9 in $\cdot 01$ mm., margin with short granulated striæ $\cdot 16\text{-}\cdot 01$ mm. Diameter $\cdot 055$ mm. The arrangement of the lines of puncta agrees very [well with Greville's figure, but differs from that in Van Heurck (Syn., Pl. 132, f. 1), which has also very much coarser marginal striæ. The "Tegel" specimen also differs very much from figures 13 and 14 (Pl. 58 in Schmidt's Atlas), which have coarser granules, and the margins are not striate.

C. elegans, Grev. T.M.S. xiv, p. 3, Pl. 1, f. 6 (1860). A. Schm. Atl., Pl. 58, f. 7. Several specimens from $\cdot 05$ to $\cdot 08$ mm. in diameter. Rows of puncta 3 to 4 in $\cdot 01$ mm., marginal striæ 12 in $\cdot 01$ mm. I regard as a variety *C. biradiatus*, Grev. (T.M.S. ix, p. 42, Pl. 4, f. 7 (1861)., and A. Schm. Atl., Pl. 58, f. 2). This form also occurs in the Tegel.

C. Thumii, Cle., n.sp. Valve $\cdot 075$ mm. in diameter ; lines of granules radiant, unequal in length, not reaching the centre ; crowded near the margin, where they are 6 in $\cdot 01$ mm. Pl. 13, f. 17, $\frac{480}{1}$.

C. nitidus, Greg. (1857). A. Schm. Atl. Pl. 58, f. 18. Valve $\cdot 088$ mm. in diameter. The puncta exhibit a tendency to form radiating lines.

C. radiatus, Ehb. (1839), Grun. Diat. Fr. Jos. Land, p. 19. Cellules about 2.5 in $\cdot 01$ mm., in the margin about 4 in $\cdot 01$ mm. Diameter $\cdot 12$ mm. Some varieties approach near to *C. crassus*, *C. heteroporus*.

C. Argus, *C. marginatus*, and *C. Oculus Iridis*, but they are not typical specimens of these species.

C. robustus, Grev. (T.M.S. xiv., p. 3, Pl. 1, f. 8, 1866). Specimens from the Tegel are $\cdot 09\text{-}\cdot 01$ mm. in diameter, and have 2 cellules in $\cdot 01$ mm. Some of the Tegel specimens very much resemble A. Schm., figure 3, Pl. 62, in Atl. Others having smaller cellules ($3\text{-}\cdot 01$ mm.) approach closely to *C. marginatus*, *C. bi-marginatus*, and *C. radiatus*.

C. Asteromphalus Ehb. (1844). Some splendid specimens occur in the Tegel of the varieties *eximia*, Grun. (A. Schm. Atl., Pl. 63, f. 12), and var. *hybrida*, Grun., Fra. Jos. Land Diat. 79, Pl. c., f. 9. *C. centralis* (Atl., Pl. 63, f. 1.)

Xanthiopyxis oblonga, Ehb. (Mg.; Pl. 33, 17, f. 17). This curious form is probably an auxospore of some Diatom, perhaps a

Hemiaulus, and is nearly related to *Stephanopyxis limbata*, Ehr. (Van Heurck Syn., Pl. 83, ter. f. 13-14.) Pl. 13, f. 18.

Some 80 species of Diatoms have been found in the Tegel of Brünn, and with the two exceptions *Campylodiscus hibernicus* and *C. Clypeus* (the former occurring in fresh and the latter in brackish water); all are decidedly marine. Only a comparatively few appear to be extinct, and of those a remarkable number have been detected in the "Moron deposit," which is said to be found near Seville, in Spain.

Of the recent species many forms are now living in the far-distant seas of Japan, California, West Indies, &c., proving that the Tegel was a deposit in a sea of a tropical or sub-tropical character.

It is of great interest to compare these fossil forms with recent specimens, and to note how little their characteristics have been altered by the conditions to which they have been exposed during the long period that has elapsed since the later tertiary and the present time.

Specimens of the Tegel Diatoms, mounted as "Typen Platten" can be obtained of Herr Thum, 2, Teichstrasse, Leipzig.

ADDITIONAL FORMS FOUND BY F. KITTON IN A SAMPLE OF THE
TEGEL, CLEANED BY HERR THUM.

Campylodiscus Echeneis, not unfrequent.

Nitzschia circumscuta, several valves.

Surirella elegans? several valves, only differs from the fresh-water form in the canaliculi being more robust.

Stauroneis phæniceron, fragment of a valve.

Nitzschia scalaris, fragment of a valve.

Navicula major, two valves.

Trinacria excavata, one valve.

Aulacodiscus angulatus, one valve agreeing exactly with a specimen in my collection, identified by Dr. Greville.

Aulacodiscus, n.sp. When the lower surface is in focus it is somewhat like a coarse *A. margaritaceus*, but when the objective is focussed on the upper surface the markings very much resemble those in *Aulacodiscus (Eupodiscus) Argus*. The furrows are much more distinct than those on *A. margaritaceus*; number of processes, 6; diameter of valve .0040.

A. Grunowii does not appear to be very rare in the Tegel, as

fragments frequently occur; my specimen is imperfect (about two-thirds of a valve.) This form has also some resemblance to *A. superbus*, Kitton.

Cosmiodiscus, Barbadosis, Grev., (?) var. I have seen two or three valves of what I take to be Greville's species. This form is very common in a Tegel from Struhar, Hungary.

Arachnoidiscus Ehrenbergii. One specimen.

Asterolampra Marylandica. One specimen.

Navicula aspera, var. *intermedia*. If the fact of the lines of striæ on one side of the median line being shorter than on the other is of any generic value, the above-named diatom belongs to the genus *Alloioneis*; but I have found forms with the pseudo stauros and the lines of striæ equal (*N. aspera* type); without the stauros and the lines of striæ also equal; with the striæ unequal (*Alloioneis*); with striæ nearly touching the median line, and an inconspicuous blank space round the central nodule. All these forms have the characteristic striæ of the type form, and gradually merge into each other.

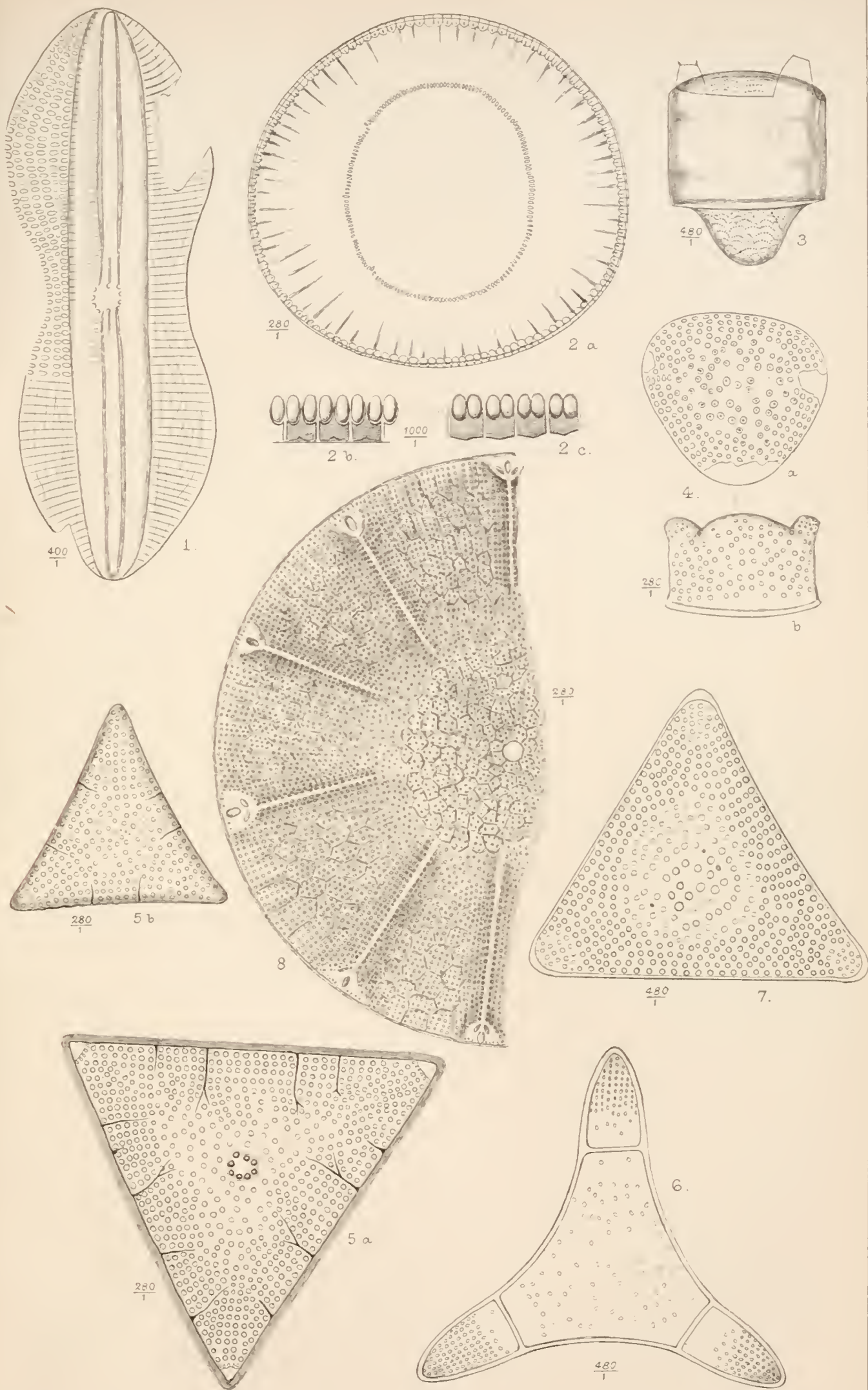
DESCRIPTION OF PLATES.

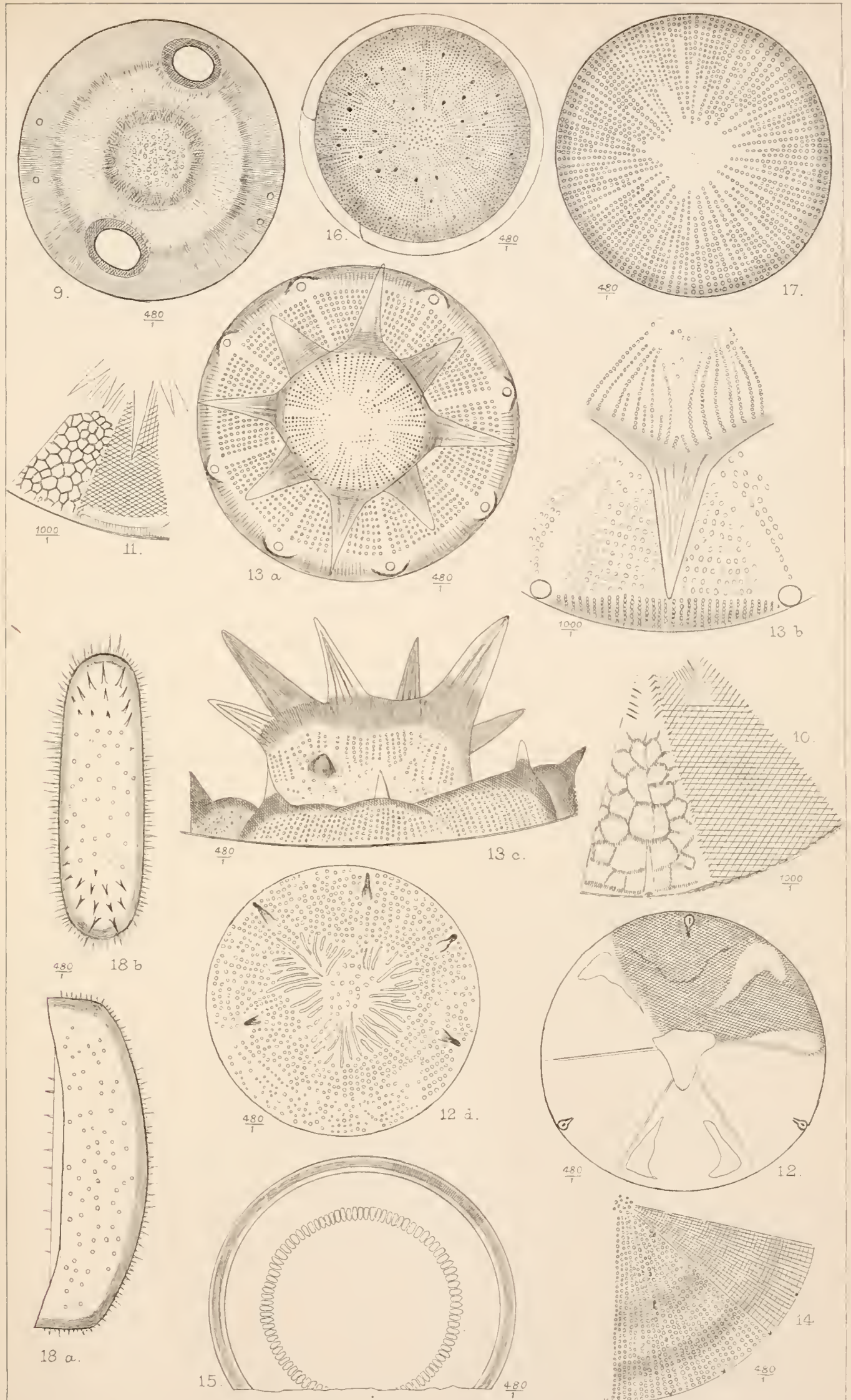
PLATE XII.

- Fig. 1. *Navicula gemmatula*, var. ? $4\frac{0}{1}^0$.
 " 2. *Campylodiscus obsoletus*, Cl., n.sp., *a.* $2\frac{8}{1}^0$, *b. c.* $1\frac{0}{1}^{00}$.
 " 3. *Syringidium*, sp., $4\frac{8}{1}^0$.
 " 4. *Triceratium turgidum*, Cl., n.sp., $2\frac{8}{1}^0$.
 " 5. " *Stokesianum*, *a. b.*, $2\frac{8}{1}^0$.
 " 6. " *trisulcum*, var. *minor*, Cl., $4\frac{8}{1}^0$.
 " 7. " *tesselatum*, $4\frac{8}{1}^0$.
 " 8. *Aulacodiscus Grunowii*, Cl., n.sp., $2\frac{8}{1}^0$.

PLATE XIII.

- Fig. 9. *Auliscus pulvinatus*, Cl., n.sp., $4\frac{0}{1}^8$.
 " 10. *Actinoptychus vulgaris*, var. $1\frac{0}{1}^{00}$.
 " 11. " " var. *Virginica*, $1\frac{0}{1}^{00}$.
 " 12. " *Boliviensis*, var. *Pfitzeri*, $4\frac{8}{1}^0$.
 " 13. *Pyrgodiscus armatus* N.G. et. sp. Kitton, *a.* S.V. $4\frac{8}{1}^0$, *b.* part of do. $1\frac{0}{1}^{00}$, *c.* F.V. $4\frac{8}{1}^0$, *d.* opposite valve of do. ? or abnormal form ?
 " 14. *Actinocyclus* (*alienus* ?) *undatus*, Cl., $4\frac{8}{1}^0$.
 " 15. *Melosira Omma* Cl., n.sp., $4\frac{8}{1}^0$.
 " 16. *Podosira antediluviana* Cl., n.sp., $4\frac{8}{1}^0$.
 " 17. *Coscinodiscus Thumii* Cl., n.sp.
 " 18. *Xanthiopyxis oblonga*, $4\frac{8}{1}^0$, *a.* F.V. *b.* S.V.





F.T. Cleve del.

W. Rhein sc.

DIATOMS FROM THE BRÜNN "TEGEL."