

XXXIX.—*A List of Californian Diatoms.*

By C. MERESCHKOWSKY.

[Plates IV. & V.]

THE recent marine Diatoms of California are interesting in more than one respect. In the first place a list of Californian Diatoms will form a desirable contribution to our knowledge of the geographical distribution of these little Algæ, the more so as the Diatom flora of the Pacific is as yet but very little known. Then, again, the study of recent Californian Diatoms as compared with the extensive fossil deposits of this region is of interest in order to ascertain which of the fossil forms have disappeared and which are still living, and whether these latter have changed in the course of time or not.

It is for these reasons that I undertook the study of Californian Diatoms, which I intend to carry out as completely as possible—a task which will certainly require a number of years in order to accomplish it with a certain degree of completeness. At the present time I will only give a short preliminary list, partly composed of forms observed by myself so far as I have been able to determine them, partly of some species which have been previously noticed by other diatomists, especially by Cleve in his 'Synopsis of the Naviculoid Diatoms,' as well as by a few others (Grunow, Greville). This list will also contain the species which I have already mentioned and partly described in a previous publication entitled 'On Polynesian Diatoms,' the fourth chapter of which deals with Diatoms belonging to the Californian coast.

The reader will find in this paper the description of a number of new species and varieties, accompanied by figures. Some of them are small and delicate forms which I have observed in a living state or in preserved crude material, and which can hardly be expected to be found in slides, as such forms usually completely disappear during the cleaning of the material. Certain details of their structure (such as the striæ when very fine) could not, for this reason, be ascertained.

In the list I indicate the person who has observed the species by the first letter of his name—C. meaning Cleve, G. Grunow, Gv. Greville, and M. myself.

1. *Diploneis bombus*, var. *bullata*, Cl. [C.]
2. *Diploneis bombus*, var. *densestriata*, Cl. [C.]
3. *Diploneis contigua*, var. *eudoxia*, A. S. [C.]

4. *Diploneis gemmata*, var. *typica*, Cl. Calif. guano. [C.]
5. *Diploneis papula*, A. S. Santa Monica, amongst *Macrocystis*, not rare; Monterey, rare. [M.]

The endochrome of this species (Pl. IV. fig. 26) is very interesting; it is composed of two plates, which, however, are not disposed only along both sides of the valve, leaving its apices free, as is usually the case in the Naviculoid Diatoms, but partly enter into the other half of the valve, thus occupying both ends of the frustule.

6. *Diploneis splendida*, var. *puella*, A. S. [C.]
7. *Diploneis subcincta*, A. S. [C.]
8. *Diploneis vacillans*, A. S. [C.]
9. *Diploneis vacillans*, var. *delicatula*, Cl. Santa Monica, recent. [M.]

Length 0.043 mm., breadth of the valve 0.017 mm.

10. *Caloneis formosa*, Greg. San Pedro, not rare. [C., M.]
11. *Caloneis formosa*, var. *quadrilineata*, Grun. [C.]
12. *Caloneis liber*, var. *elongata*, Grun. Rare. [M.]
13. *Caloneis Schumanniana*, var. *trinodis*, Lewis. [C.]
14. *Navicula approximata*, Grev. Calif. guano. [C.]
15. *Navicula (Schyzonema) avenacea*, Bréb. San Pedro, common. [M.]
16. *Navicula cancellata*, Donk. San Pedro, not very common. [M.]

Striæ 5 in 0.01 mm. Chromatophores with margins profoundly sinuated.

17. *Navicula clavata*, var. *caribæa*, Cl. (forma minor). Northern California, not very rare. [M.]
18. *Navicula directa*, var. *heterostriata*, Mer. (Mereschkowsky, On Polyn. Diat. part iv.). Northern California, rather common. [M.]
19. *Navicula Febigerii*, Cl. [C.]
20. *Navicula forcipata*, Grev. San Pedro, rare. [C., M.]
21. *Navicula forcipata*, var. *densestriata*, A. S. San Pedro, not rare. [M.]

The form which I have observed has the fine striation characteristic of this variety, but the lateral areas are not or scantily constricted in the middle. I have succeeded in examining a frustule in a vertical position and obtaining in this way an optical section through it, which is represented

in the fig. 24 of Plate IV. The raphe is to be seen as a crack in the wall of the frustule, and the areas are deep invaginations of the surface of the valve on both sides of the raphe.

22. *Navicula forcipata*, var. *nummularia*, Grev. Calif. guano. [C.]
23. *Navicula* (*Rhoiconeis*) *garkeana*, Gr. California, North Pacific. [C.]
24. *Navicula* (*Rhoiconeis*) *genuflexa*, Kütz. San Pedro, rather common. [M.]

The endochrome is composed of two chromatophore-plates, with a deep and narrow sinus on each side in the middle of the plates, and usually two, sometimes more, elæoplasts (Pl. IV. fig. 25).

25. *Navicula granulata*, Bail. (*Navicula Baileyana*, Gr.). Calif. guano; North California, rare. [C., M.]
26. *Navicula* (*Libellus*) *Grevillei*, Ag. [C.]
27. *Navicula* (*Libellus*) *hamulifera*, Grun.? San Pedro. [M.]
28. *Navicula* *Hennedyi*, W. Sm. [C.]
29. *Navicula* *Hennedyi*, var. *californica*, Grev. [C.]
30. *Navicula* *Hennedyi*, var. *circumsecta*, Grun. [C.]

It is on account of its synonym *Nav. californica*, A. S., that I have placed this species in the list of Californian Diatoms, although Cleve does not mention it in his 'Synopsis' as belonging to this locality.

31. *Navicula irrorata*, Grev. Calif. guano. [C.]
32. *Navicula libellus*, Greg. Santa Monica, amongst *Macrocystis*, not very common. [M.]

Length 0.084 mm. Endochrome composed of two chromatophore-plates of the same shape and disposition as in *N. complanata* *, but the inner angles of the plates are united by a loop or narrow band crossing the interior of the cell, so that in reality there is but one plate. I am very much inclined to think that such a connecting band exists also in *N. complanata*.

33. *Navicula lyra*, var. *dilatata*, A. S. San Pedro. Rare. [M.]
34. *Navicula lyra*, var. *recta*, Grev. Calif. guano. [C.]
35. *Navicula* (*Schyzonema*) *mollis*, W. Sm. San Pedro, rather common. [M.]

* Cleve, 'Synopsis of the Naviculoid Diatoms,' part i. p. 153.

36. *Navicula mutica*, forma *Cohnii*, Hilse. Lost Spring Rancho, foss. ? [C.]

37. *Navicula ostrearia*, Turp. (*N. fusiformis*, var. *ostrearia*). San Pedro, not very common. [M.]

I have not seen the characteristic blue colour at the apices of the frustule; but this is not a constant character, and in the Black Sea, where this species is very common, I often met with specimens showing no trace of blue colour.

38. *Navicula pennata*, A. S. Northern California, not rare. [M.]

I have already mentioned the occurrence of this species in the Glacial Ocean (Wankarema, North Siberia) *.

39. *Navicula prætexta*, Ehr. [C., M.]

I have seen only a fragment of a valve in a slide containing diatoms from San Pedro Bay.

40. *Navicula punctulata*, W. Sm. Rather common in a lagoon near San Pedro. [C., M.]

41. *Navicula (Libellus) reticulata*, Mer. San Pedro, Santa Catalina Island, very common. [M.]

A detailed description of this species will be found in my paper on the Diatoms of the Black Sea, where it is also very common, as well as in the Mediterranean (Villefranche). Its endochrome is very curious, the single plate forming a complicated network covering the surface of both connecting membranes with transverse bands crossing the interior of the cellule.

42. *Pinnularia cruciformis*, Donk. Northern California, rare. [M.]

43. *Brebissonia Boeckii* (Kütz.), Grun. San Pedro, rare. [M.]

Length 0.097 mm., breadth of the valve 0.021 mm., striæ 8 in 0.01 mm. in the middle (not 10, as stated by Cleve).

44. *Frustulia interposita*, Lewis. Oakland, Calif., brackish. [C.]

45. *Anomæoneis sculpta*, var. *major*, Cl. Santa Rosa, brackish. [C.]

46. *Scoliotropis latestriata*, Cl. [C.]

47. *Gomphonema kamtschaticum*, var. *californica*, Grun. Monterey, not very rare; San Francisco. [C., M.]

According to Cleve, length 0.03 mm., striæ 15 in 0.01 mm., valve linear.

* See my paper "On Polynesian Diatoms," chapter iv.

48. *Trachyneis aspera*, Ehr. San Pedro, common; Monterey, rather common. [M.]

49. *Trachyneis aspera*, var. *intermedia*, Grun. San Pedro, not rare. [M.]

Valve lanceolate, axial area rather broad on one side of the raphe, absent on the other.

50. *Pleurosigma æstuarii*, Bréb. San Pedro, rare. [C., M.]

51. *Pleurosigma cuspidatum*, Cl. San Pedro, not rare. [M.]

Endochrome composed of four narrow bands, having the same disposition as in *P. Normanii*.

52. *Pleurosigma elongatum*, W. Sm. Laguna near San Pedro, marine and brackish, common. [M.]

Endochrome composed of four elongate and straight bands.

53. *Pleurosigma formosum*, W. Sm. Northern California, rather common. [M.]

Endochrome composed of four very elongate and tortuous bands.

54. *Pleurosigma formosum*, var. *longissima*, Grun. San Pedro, not rare. [M.]

Length of the valve	0.463	0.538
Breadth	0.042	0.055
Oblique striæ	10-11	11-12.5

Valves broader than in the type species; differs from var. *balearica*, which has the same broad valves, by the striæ, which in the latter are 8-9 in 0.01 mm.

55. *Pleurosigma latum*, Cl. Santa Monica, on *Macrocystis*, rather common. [M.]

Endochrome composed of four bands forming several undulations of exactly the same kind as in *P. Normanii* and *P. cuspidatum*.

56. *Pleurosigma nubecula*, W. Sm. Santa Monica, amongst *Macrocystis*; Monterey, common. [C., M.]

Endochrome composed of four elongate and very tortuous bands.

57. *Pleurosigma rhombeum*, Grun. [C.]

58. *Gyrosigma attenuatum*, Kütz. San Pedro, rare. [M.]

59. *Gyrosigma balticum*, var. *californica*, Grun. Laguna near San Pedro, not rare. [C., M.]

Endochrome composed of two perforated chromatophore-plates; perforations narrow, oblique.

60. *Gyrosigma fasciola* (Ehr.), Cl. San Pedro, common. [M.]
 61. *Gyrosigma Febigerii* (Grun.), Cl. Laguna near San Pedro
 in nearly marine water, rather common. [C., M.]
 62. *Gyrosigma prolongatum*, W. Sm. San Pedro, very
 common. [M.]

I do not see any difference between *G. prolongatum* and var. *closteroides*, Grun., the prolongations of the valve being turned on opposite sides or on the same side, according to the position of the frustule.

63. *Gyrosigma Spencerii*, var. *exilis*. Grun. Laguna near San Pedro, very common. [M.]
 64. *Gyrosigma tenuissimum*, W. Sm. [C.]
 65. *Gyrosigma Wansbeckii* (Donk.), Cl. Laguna near San Pedro, rare. [M.]

Looks like *G. balticum*, but the striæ are much finer.

In all the species of *Gyrosigma* above mentioned which I have observed myself, as well as in many others from the Mediterranean and the Black Sea, I have invariably found the endochrome to be composed of two plates, while in all species of *Pleurosigma* (with the only exception of *P. rigidum*, where it is granular) the endochrome consists of four narrow, usually tortuous bands. This proves that *Gyrosigma* and *Pleurosigma* must be regarded as two natural and distinct groups, which should not be united in one genus, as has been done by certain diatomists.

66. *Mastogloia (Orthonois) Wrightii*, O'Meara* (nec Cleve). (Pl. IV. figs. 22, 23.) Northern California, not rare. [M.]

Valve elliptic, with apices broadly rounded.

Length: 0.015 0.018 0.020 0.020 0.021 0.028
 Breadth: 0.011 0.0125 0.014 0.014 0.014 0.020

Median line straight, enclosed between two parallel rows of puncta not differing from the rest; axial area linear, distinct. Puncta of the valve forming transverse and decussating rows, the former radiate, about 8-9 in 0.01 mm.†; two of the median decussating rows more distant, forming a double lyre-like figure with both halves uniting at the centre with the axial area; marginal rim narrow, with quadrangular loculi, 8-9 in 0.01 mm.

* 'Diatomeentafeln zusammengestellt für einige Freunde,' pl. lxxvii. fig. 6.

† The engraver did not succeed in representing the great regularity in the disposition of the puncta, the transverse rows which the latter form being therefore invisible in figures 22 and 23 of the Plate.

The double lyre-like figure has been reproduced by O'Meara in an exaggerated way; it is not nearly so distinct as in his figure, and is not limited by lines, but by two decussating rows a little more distant than the others.

As to the diatom which has been described by Cleve* under this name, it belongs in all probability to another species, as he does not mention the lyre-like figure; but, on the other hand, he mentions the existence of a double row of puncta between which the median line is enclosed, which means, I suppose, that these puncta are distinct from the rest, as they are, for instance, in *M. (O.) barbadensis*, Grev.†, and which is not the case in *M. (O.) Wrightii*, these puncta not differing from the others. This would explain the remark which Cleve makes at the end of his description, when he says, "None of the figures (that of O'Meara inclusive) corresponds exactly with this species, so that the identification is doubtful." It is evident that this author has had in view some other species than the original *M. (O.) Wrightii* of O'Meara, or some variety of the latter.

67. *Mastogloia pumila*, Grun. San Pedro, not very rare. [M.]

68. *Amphora acuta*, var. *arcuata*, A. S. San Pedro, rare. [M.]

Length 0.086, breadth of the frustule 0.068 mm.; zone with 4 longitudinal divisions in 0.01 mm.

69. *Amphora acutiuscula*, Kütz. Laguna near San Pedro, common. [M.]

70. *Amphora angusta* (Greg.), Cl. San Pedro, rather rare. [M.]

71. *Amphora angusta*, var. *ventricosa*, Greg. [C.]

72. *Amphora coffæiformis*, Ag. San Pedro, common. [M.]

73. *Amphora costata*, W. Sm. San Pedro, not common. [M.]

74. *Amphora hyalina*, Kütz. San Pedro, rare. [M.]

75. *Amphora lineolata*, Ehr. San Pedro, common. [C., M.]

76. *Amphora marina*, W. Sm. Monterey, rare. [M.]

77. *Amphora ostrearia*, Bréb. San Pedro, common. [M.]

78. *Amphora proteus*, Greg. Northern California, rare. [M.]

79. *Amphiprora alata*, Kütz. Santa Monica, brackish, very common. [C., M.]

Endochrome composed of two plates disposed transversely, leaving in the centre a circular hyaline space.

80. *Amphiprora paludosa*, W. Sm. San Pedro. [M.]

* Cleve, 'Synopsis of the Naviculoid Diatoms,' part ii. p. 148.

† 'Diatomeentafeln zusamm. f. ein. Fr.' pl. lv. fig. 10.

81. *Amphiprora paludosa*, var. *hyalina*, Eul. San Pedro, not rare. [M.]

Endochrome composed of one plate with margins indented. Length 0.033 mm.

82. *Tropidoneis elegans* (W. Sm.), Cl. San Pedro, not very common. [M.]

Endochrome composed of two plates.

83. *Tropidoneis vitrea* (W. Sm.), Cl. [C.]

84. *Campyloneis Grevillei* (W. Sm.), Grun., var. *typica*. San Pedro, rare; Monterey, rare. [M.]

85. *Campyloneis Grevillei*, var. *regalis*, Grev. Calif. guano; San Pedro, rare. [C., M.]

86. *Cocconeis costata*, Greg. Northern California, common. [M.]

87. *Cocconeis costata*, var. *hexagona*, Grun. San Pedro; Monterey, rare, marine. [M.]

Length 0.016-0.0205 mm., breadth 0.008-0.0115 mm.; axial area narrow, lanceolate.

88. *Cocconeis costata*, var. *pacifica*, Grun. Southern California (*Haliotus washings*), very common; Monterey, very common. [M.]

89. *Cocconeis dirupta*, var. *typica*, Cl. [C.]

90. *Cocconeis heteroidea*, var. *sigmoidea*, Grun. Santa Monica, on *Macrocystis*, not very rare. [M.]

91. *Cocconeis pellucida*, Hantzsch. Northern California, rare. [M.]

92. *Cocconeis placentula*, Ehr. [C., M.]

93. *Cocconeis placentula*, var. *lineata*, Ehr. [M.]

94. *Cocconeis pseudomarginata*, Greg. San Pedro; Monterey, not common. [M.]

95. *Cocconeis scutellum*, Ehr. Rare. [C., M.]

96. *Cocconeis scutellum*, var. *adjuncta*, A. S.* Northern California, rather rare. [M.]

97. *Cocconeis scutellum*, var. *californica*, Grun. [C.]

98. *Cocconeis scutellum*, var. *ornata*, Grun. Northern California; Monterey, rare. [M.]

Length: 0.042 0.047 0.053

Breadth: 0.028 0.031 0.035

Four rows of puncta in 0.01 mm.; puncta very large, quadrangular.

* H. Peragallo, 'Diatomées marines de France,' plate iv. fig. 2.

99. *Achnanthidium delicatula*, Kütz. [C.]
 100. *Achnanthidium glabrata*, Grun. San Pedro, not rare.
 [C., M.]
 According to Grunow (Arct. Diat. p. 22) very common in the Pacific, especially on the coast of North and South America. Striæ 12-13 in 0.01 mm. Valve narrow, linear; looks like a small *A. brevipes*, var. *angustata*, of which it might be a variety. Length 0.046 mm.
 101. *Achnanthes longipes*, C. Ag. San Pedro, rather rare.
 [M.]
 102. *Rhoicosphenia curvata*, Kütz. San Pedro, rare. [M.]
 103. *Epithemia gibba*, Kütz. Northern California, not very rare. [M.]

[To be continued.]

MISCELLANEOUS.

The Locality of the Type of Prionastræa Vaughani, Gregory.

To the Editors of the 'Annals and Magazine of Natural History.'

GENTLEMEN,—In the 'Annals and Magazine of Natural History' for December 1899, pp. 458, 459, figs. 2a & 2b, Prof. J. W. Gregory has described and named an Eocene coral from Alabama as *Prionastræa Vaughani*, doing me the honour to use my name in the specific designation. Prof. Gregory makes the following remark under the side-heading "*Affinities*":—"Mr. Vaughan informs me that the precise locality is, no doubt, Huntsville, Ala." I pointed out to Prof. Gregory, when I was in the British Museum (Natural History), that this coral was undescribed and unnamed, and requested him to please name and describe it, but he is mistaken in saying that I told him it came from Huntsville, Alabama. Huntsville, Alabama, is in the extreme northern portion of the State, in Madison County, and is only 18 miles south of the Tennessee line. Geologically, it is situated on rocks near the base of the Subcarboniferous, the Tusculumbia limestone (see Eugene A. Smith's Geological Map of Alabama, Ala. Geol. Surv. 1894). I am not sure whence the type of *Prionastræa Vaughani* comes, but I am under the impression that it is from Gregg's Landing, on the Alabama River, in Monroe County. Mr. T. H. Aldrich, of Birmingham, Ala., sent the specimen to the British Museum (Natural History), but, unfortunately, seems to have no other.

Very respectfully yours,

T. WAYLAND VAUGHAN.

U.S. Geological Survey.
 Jan. 21, 1901.

LX.—A List of Californian Diatoms.

By C. MERESCHKOWSKY.

[Continued from p. 300.]

104. *Nitzschia angularis*, W. Sm. Santa Monica, amongst *Macrocystis*, not rare. [M.]
105. *Nitzschia bilobata*, W. Sm. Santa Monica, amongst *Macrocystis*, not rare. [M.]
106. *Nitzschia circumsuta* (Bail.), Grun. San Pedro, marine, rather rare. [M.]

Length: 0·252 0·311

Breadth: 0·070 0·069

107. *Nitzschia distans*, Greg. San Pedro; Santa Monica, amongst *Macrocystis*, not rare; Northern California, rare. [M.]
108. *Nitzschia fraudulenta*, Cl. San Pedro, rare. [M.]

I have seen only one short chain composed of four individuals united by their ends. Length 0·035 mm. Endochrome composed of two plates.

109. *Nitzschia granulata*, Grun. San Pedro, rather common. [M.]
110. *Nitzschia incolor*, Mer. San Pedro, very common. [M.]
- This species, which I have described in my paper on the Diatoms of the Black Sea, is remarkable for the complete absence of chromatophores, of which there is not the slightest trace, the frustules being absolutely colourless. It is also very common in the Mediterranean Sea (Villefranche).
111. *Nitzschia insignis*, var. *Smithii*, Ralfs. Santa Monica, amongst *Macrocystis*; Northern California, not rare. [M.]
112. *Nitzschia obtusa*, var. *scalpelliformis*, Grun. San Pedro, not common. [M.]
113. *Nitzschia palea*, var. *subtilis*, Grun. San Pedro, rather rare. [M.]
114. *Nitzschia paradoxa* (Gmel.), Grun. San Pedro, common. [M.]
115. *Nitzschia sigma*, var. *intercedens*, Grun. Santa Monica, marine, not rare. [M.]

Length 0·262 mm. Usually to be found in brackish water.

116. *Nitzschia spathulata*, var. *hyalina*, Greg. San Pedro, not common. [M.]

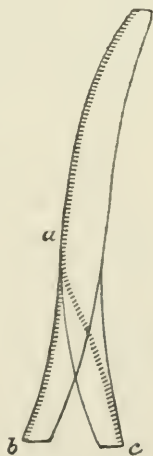
Length 0.043 mm. Endochrome composed of two plates.

117. *Nitzschia spiralis*, sp. n. (Pl. V. figs. 18-20.) San Pedro, rather rare. [M.]

Valve narrow, linear lanceolate, with rounded ends; girdle-face narrow, linear, slightly attenuated towards the ends; carinal dots elongated, not accompanied by lines, 9 in 0.01 mm. Frustule arcuate and twisted near one of the ends, where the keels cross one another, passing from one side of the frustule to the other. Length 0.140-0.175 mm., breadth of the girdle-face 0.007-0.008 mm.

This curious form has a very different appearance according to the position of the frustule, as can be seen from the three figures, 18-20, representing the same individual—fig. 18 showing it in an almost quite horizontal position, fig. 19 when slightly turned around its axis to the left, and fig. 20 when still more turned in the same direction. In fig. 19 the upper end is elevated and the lower turned down; in fig. 20 the lower end is horizontal, while the upper one is turned upwards.

The structure of this diatom can be easily understood if we imagine a frustule having the form of *Nitzschia sigma*, in which one end (the inferior) has been twisted to the right side at an angle of about 150° : the accompanying diagram shows how by such a process a frustule of *N. spiralis* would be formed; and as a consequence of this the lower part of the left keel *ab* would change its place from the left to the right side of the frustule (*ac*), while the other keel on the opposite side of the frustule would naturally take the opposite place, thus producing a crossing of both keels. The upper end is also slightly twisted, but in a much less degree than the lower one. The endochrome seems to be composed of six granules; but this requires further examination, as the material was not in a very fresh condition.



118. *Nitzschia Lorenziana* (var. *incurva*?), Grun. San Pedro, rather rare. [M.]

119. *Nitzschiella longissima* (Bréb.), Ralfs. San Pedro, not very common. [M.]

120. *Nitzschiella biplacata*, var. *pacifica*, nov. var. (Pl. IV. figs. 15-17.) San Pedro, very common. [M.]

In the Black Sea I have repeatedly observed a form greatly resembling *N. longissima*, but much smaller and more delicate, varying in length from 0.060 mm. to 0.175 mm., while *N. longissima* varies from 0.162 to 0.483 mm. The main difference between these two forms consists, however, in the endochrome, which in *N. longissima* is composed of numerous elongated bacilliform granules, while in the small form there are two plates, a difference which shows that they are specifically different. This smaller species, which I have named *N. biplacata**, is the same which Van Heurck, not knowing of the difference existing in the endochrome, has mentioned in his treatise on the Diatomaceæ (p. 404) simply as a form (forma parva) of *N. longissima*.

In the Pacific I have found a variety of *N. biplacata* which is smaller and has a much broader girdle-face (fig. 16); the latter has a very different appearance from the valve-face (figs. 15, 17). The rostra are usually quite straight, their apices sometimes inflated, sometimes not. Endochrome composed of two plates. While moving the frustule does not turn around its longitudinal axis. Length 0.056-0.098 mm., breadth of the valve 0.006-0.0065 mm., of the girdle-face in the middle 0.0058-0.01 mm. (usually 0.01), at the apices 0.003-0.0055 mm.

121. *Nitzschiella tenuirostris*, Mer. (Pl. IV. figs. 1-3.) San Pedro, common. [M.]

Under the name of *N. closterium* there have been confounded a number of forms belonging partly to *N. tenuirostris*, partly to another species (*N. gracilis*, Mer.); and as it is impossible to know what the different authors meant by this name, I proposed in my paper on the Diatoms of the Black Sea a new arrangement of the various forms belonging to this group, in which, in order to avoid confusion, I abandoned the old name *closterium*. Under the name *N. tenuirostris* I understand the following form:—

Valve fusiform, abruptly terminating in long very fine rostra, slightly curved on the same side, the whole frustule being arcuate. Striæ and carinal dots invisible. Girdle-face not differing from the valve-face. Endochrome composed of two plates. General length 0.082-0.180 mm. (usually

* See my paper on the Diatoms of the Black Sea.

0·120-0·150 mm.), length of the body 0·028-0·042 mm., breadth of the valve 0·003-0·008 mm.

This I consider now as the type species, the var. *genuina*, which I formerly thought to represent the type, having proved to be much rarer.

It is a very delicate, almost membranaceous diatom; the rostra are very fine, flexible, usually slightly inflated at the apices; while moving, the frustule is constantly turning around its longitudinal axis in the same way as in *Cylindrotheca*. The girdle-face does not differ from the valve aspect as it does in *N. gracilis*, *N. biplacata*, *N. acicularis*, *N. longissima*, &c., the rostra being cylindrical, not flattened as in the above-mentioned species, and the inflated lanceolate part of the frustule or "body" being as distinctly separated from the rostra in the valve- as in the girdle-face (compare *a* and *b* in fig. 2). A form with straight rostra can be distinguished from the type species as

Forma *directa*. (Pl. IV. figs. 4, 5.) San Pedro, very common. [M.]

General length 0·098-0·166 mm., length of the body 0·020-0·038 mm., breadth of the valve 0·003-0·0075 mm.

Although I have occasionally seen such forms in other localities (Black Sea, Villefranche), it is only in California (San Pedro) that I have met with it in great abundance, always, however, in company with the type. I do not think it advisable to consider such forms as a variety unless they are found in unmixed assemblages.

122. *Nitzschiella tenuirostris*, var. *parva*, Mer. (Pl. IV. figs. 8-10.) San Pedro, not rare. [M.]

Differs from the type only by its smaller size, being about 0·055 mm. in length.

In my paper on the Diatoms of the Black Sea I did not separate this smaller form from the larger ones which I now consider as the type species, and I would not do it even now, preferring to consider the small forms merely as reduced individuals of the type; but since then I have examined a gathering from Theodosia (Crimea) in which this small form is extremely abundant and in a perfectly pure condition, all the individuals having the same aspect and *never* attaining the size of the type species. This fact compels me (I must confess against my will) to regard it as a distinct variety.

The same form is not rare in San Pedro, although mixed with the larger type species.

A still smaller form, 0.035–0.040 mm. in length, with very short rostra, can be distinguished as

Forma minutissima. (Pl. IV. fig. 11.) San Pedro, rather rare. [M.]

The forma *semicircularis* and varietas *arcus*, Mer. (the latter attaining 0.364 mm. in length), belonging to the same group, are mentioned in my paper on the Diatoms of the Black Sea. I have not seen them in the Pacific.

123. *Nitzschiella tenuirostris*, var. *hamulifera*, Mer. (*N. tenuirostris*, var. *genuina*, Mer. Diat. Black Sea). (Pl. IV. figs. 6, 7.) San Pedro, rare. [M.]

Differs by the very thin elongated rostra, which are straight, becoming curved and spirally twisted at the apices only, where they form a hook. General length 0.140–0.194 mm., length of the body 0.045 mm., breadth of the valve 0.006 mm.

This variety is very frequent in some localities of the Black Sea. I have found it also in the Mediterranean (Villefranche). The hooks are not always so distinct as represented in fig. 6.

124. *Nitzschiella gracilis*, Mer. (Pl. IV. figs. 12, 13.) San Pedro, rare. [M.]

This is quite a distinct species, differing from *N. tenuirostris* by the more robust frustule, the rostra being broader, straight, curved in the same direction at the ends only; they are flattened, especially at the apices, which makes them appear broader and more hyaline at the girdle-face. Endochrome composed of two plates. While moving, the frustule does not turn around its longitudinal axis. Length 0.126–0.165 mm., attaining 0.245 mm., breadth of the valve 0.0052–0.008 mm.

125. *Nitzschiella gracilis*, var. *reversa*, Mer. (Pl. IV. fig. 14.) San Pedro, very common. [M.]

Rostra curved in opposite directions. General length 0.1–0.175 mm., length of the body about 0.05 mm. breadth of the valve 0.008–0.009 mm. Very common in San Pedro, where the type species is very rare; the opposite is the case in Villefranche (Mediterranean) and the Black Sea. Var. *reversa* is also frequent in fresh water, California (Los Angeles).

The following table will facilitate the distinction between

all these forms which have been confounded under the name of *N. closterium** :—

- I. Girdle-face not differing from the valve-face.
- A. Length over 0.06 mm.
- a. Frustule arcuate.
- aa. Both or one end curved backwards; very large forms, attaining 0.364 mm. *N. tenuirostris*, var. *arcus*.
- bb. Ends not curved backwards.
- Frustule gently arcuate *N. tenuirostris* (typica).
- Frustule strongly arcuate, semi-circular *N. tenuirostris*, forma [semicircularis].
- b. Frustule straight.
- Ends forming a hook *N. tenuirostris*, var. [hamulifera].
- Not forming a hook *N. tenuirostris*, forma [directa].
- B. Length 0.06 mm. or less.
- Length about 0.05 mm. *N. tenuirostris*, var. *parva*.
- Length about 0.035 mm. *N. t.* var. *parva*, forma [minutissima].
- II. Girdle-face differing from the valve-face.
- Rostra curved on the same side *N. gracilis*.
- Rostra curved in contrary directions *N. gracilis*, var. *reversa*.

126. *Nitzschiella californica*, sp. n. (Pl. IV. figs. 18–20.)
Redondo Beach, common. [M.]

Valve fusiform, abruptly terminating in straight rostra (fig. 18). Girdle-face (figs. 19, 20) asymmetrical, with one side straight and the other convex; rostra forming a knee-like curve at their junction with the body, thus being carried to one side. Endochrome composed of two plates. General length 0.056–0.063 mm., length of the body 0.023–0.029 mm., breadth 0.0035–0.0055 mm.

127. *Cylindrotheca gracilis* (Bréb.), Grun. (Pl. IV. fig. 21.)
San Pedro, rather common. [M.]

I first observed this freshwater diatom in the Mediterranean (Villefranche) in purely marine water, and now I have met with it again in San Pedro, in marine water too and in great abundance. The size is extremely variable, from 0.035–0.221 mm., breadth from 0.015–0.008 mm. The frustule is sometimes arcuate, especially in small individuals. The endochrome is composed of 2 to 36 rounded or elliptic granules arranged in a spiral along the inner walls of the frustule.

128. *Cymatopleura angulata*, Grev. Calif. guano. [Gv.]

* Small individuals of *N. biplicata* have been probably also confounded under this name.

129. *Surirella fastuosa*, var. *lata*, W. Sm. Monterey, rare. [M.]
 130. *Campylodiscus echeneis*, Ehr. San Pedro, rare. [M.]
 131. *Campylodiscus marginatus*, C. Johnston *. Calif. guano. [Gv.]
 132. *Campylodiscus stellatus*, Grev.† Calif. guano. [Gv.]
 [To be continued.]

LXI.—*Descriptions of Seventeen new Genera of Ichneumonidæ from India and One from Australia.* By P. CAMERON.

[Continued from p. 385.]

MAGRETTIA, gen. nov.

Head large, cubital, largely developed behind the eyes, which are large, parallel, and distinctly distant from the base of the mandibles. Occiput not margined. Clypeus not distinctly separated, its apex margined, foveate laterally. Mandibles bidentate at the apex. Mesonotum not lobate. Scutellum flat, its sides stoutly carinate to near the apex, which is incised. Median segment with the basal area indicated; its spiracles large, about four times longer than broad, and placed near the base. Legs stout; the hinder coxæ stout, not elongate; their lower inner side armed with a stout tooth; the claws simple. Areolet slightly oblique, triangular, the transverse cubital nervures uniting at the top; the recurrent nervure with a short branch issuing from its middle. Petiole dilated at the apex, its spiracles placed near the apex, oblique, about three times longer than broad. Gastrocœli deep, narrowed.

This genus has the petiole widely dilated at the apex, as it is in the *Platyuri*, the postpetiole being widely separated. Its distinctive features are the large head, well developed behind the eyes, the toothed hinder coxæ, the stoutly keeled scutellum, incised at the apex, and the mandibles with a long sharp apical tooth, and a blunt, short, hardly projecting sub-apical one. Characteristic is the pronotum, which is roundly incised near the apex; the mesonotum is broadly raised in front of the scutellar keels; the supramedian area is distinctly defined, as is also the posterior median, the two lateral and

* 'Diatomeentafeln zusammengestellt für einige Freunde,' pl. xxvii. fig. 11, pl. xxx. fig. 2.

† *L. c.* pl. xxi. fig. 3.

observations, pointing out that some, but not all, are to be looked upon as the traces of rudimentary hairs. For instance, Dr. A. Fjelstrup, of Copenhagen (Zool. Anz. xi. p. 14, 1888), writes as follows:—"Bei den meisten in Midvag getödteten *Globiocephalen* zeigte die Haut, zumal in der Unter- und Oberkieferregion, eine Menge kreisförmiger Porenfiguren, in Grösse und Anordnung individuell sehr verschieden. Die Kreise haben meistens einen Diameter von $\cdot 5$ - 1 cm., einzelne bis über $1\cdot 5$ cm. Die Anzahl der Poren in jedem Kreise variirt der Grösse gemäss von etwa 20-50; ihr Diameter ist durchschnittlich $\cdot 16$ mm. Es finden sich sowohl unvollständige, sich schneidende oder beinahe concentrische Kreise als vereinzelte Poren." The general description of these structures, their size, the manner in which the circles intersect or overlap, their irregular arrangement, in various parts and on some individuals only, and the further statement that no sign of them is visible in the foetus, all incline me to think that here also we have to do with scars left by a cuttlefish. Similar structures have evidently been observed in *Globiocephalus* by Bennett, quoted by Eschricht and again by Fjelstrup:—"On the head, and chiefly around the lips, the skin is marked with many scattered circles, each the size of a sixpence, and composed of a single row of small depressed dots, which would appear to mark a disposition to the formation of vibrissæ or whiskers." I need hardly repeat that I do not agree with this interpretation of their cause.

LXV.—*A List of Californian Diatoms.*

By C. MERESCHKOWSKY.

[Concluded from p. 480.]

133. *Campylodiscus Thuretii*, Bréb. San Pedro, Monterey,

not rare. [M.]

134. *Striatella unipunctata*, Agardh. San Pedro, Monterey,

not rare. [M.]

135. *Rhabdonema lineare*, Mer. Common in Northern California; Monterey, rare; San Pedro, very rare. [M.]

This species has been described and figured in my paper "On Polynesian Diatoms" (see chapter iv.).

136. *Rhabdonema*, sp.? (Pl. V. figs. 21, 22.) Northern California, rather rare. [M.]

Valve linear-rhombic or rhombic, strongly gibbous in the
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middle, with rounded ends; length 0.04–0.140 mm., breadth 0.022–0.028 mm. Structure composed of costæ, which, however, are very indistinct, almost invisible with an ordinary magnifying-power, the intercostal alveoli forming parallel striæ becoming radiate near the ends, which are smooth. Pseudoraphe very narrow, sometimes indistinct. Number of striæ 5.5–6.5 in 0.01 mm. Number of puncta 8 in 0.01 mm. Girdle-face as in *R. arcuatum*, but with finer transverse costæ, usually 8 (from 6 to 10) in 0.01 mm.

Fig. 21 shows a valve as it appears under an ordinary magnifying-power, the costa not being seen and the rows of puncta resembling those of *Achnanthisidium brevipes*; fig. 22 is a part of the valve under a greater magnifying-power.

This species, which has probably already been described*, but which for lack of necessary books I am unable to determine, is very frequent in the Aleutian Islands, and I possess it also in a slide labelled "California," without further indication of locality. Other species which this slide contains indicate that it comes from Northern California.

137. *Entopyla incurvata* (Arn.), Grun. Not rare in Southern California (Catalina; Clemente Islands and the coast, *Haliotus* washings); Californian guano. [M.]

Length 0.121–0.217 mm.; girdle-face of a large specimen 0.01 mm.; distance between two costæ 0.007 mm.

138. *Gephyria media*, Arn. Redondo Beach, not rare; Monterey, rare. [M.]

Length 0.196 mm., breadth of the girdle-face attaining 0.057 mm.; striæ 5 in 0.01 mm. Endochrome granular, composed of 30–40 large granules.

139. *Grammatophora angulosa*, Ehr. San Pedro, very rare. [M.]

140. *Grammatophora angulosa*, var. *hamulifera*, Kütz. San Pedro, Monterey, very rare. [M.]

141. *Grammatophora arctica*, Cl. Not rare in Monterey and in Northern California, rare in Southern (*Haliotus* washings). [M.]

Valve linear, very slightly attenuated towards the apices, breadth 0.007 mm.; striæ distinct, 12 in 0.01 mm., composed of distinct puncta; length of the frustule 0.028–0.054 mm., breadth 0.013–0.021 mm.; septa forming two or

* If not, its proper name would be *R. gibbosum*.

three undulations, upper end bent in a hook as in *Gr. angulosa*.

142. *Grammatophora costata*, Mer., sp. n. (Pl. V. figs. 15, 16.) Monterey, very rare. [M.]

Valve somewhat broad, perfectly linear, with broadly rounded apices; structure composed of costæ 8.5 to 9 in 0.01 mm.; intercostal spaces with a double row of small but distinct puncta forming decussating rows, pseudoraphe rather indistinct. Length 0.0417–0.0565 mm., breadth of the valve 0.0115–0.0133 mm.; diameter of the openings 0.0076–0.013 mm.

I have seen only three valves of this species, which has the same structure of the valves as in *Achnanthes longipes* or *Diploneis Smithii*. The septa, as can easily be seen from fig. 16, form more than one undulation (probably two or three); the openings of the septa are quadrangular, in small specimens they are rounded.

143. *Grammatophora decussata*, Mer. Monterey, very rare. [M.]

For the description of this species see my paper "On Polynesian Diatoms."

144. *Grammatophora marina*, var. *communis*, Grun. San Pedro, Redondo, common; Monterey, not rare. [M.]

145. *Grammatophora marina*, var. *hawaiensis*, Mer. Monterey, rare. [M.]

Length 0.065 mm., breadth of the girdle-face 0.024 mm., diameter of openings 0.0065 mm. Described and figured in "Polynesian Diatoms."

146. *Grammatophora marina*, var. *macilenta*, W. Sm. San Pedro. [M.]

147. *Grammatophora maxima*, Grun. San Pedro, very rare. [M.]

This might be the *G. robusta*, Dippel. I do not understand the difference existing between the latter and *G. maxima*.

There are a number of other species and varieties of *Grammatophora* to be found in California, which, however, require further examination and a careful comparison with similar forms from other localities.

148. *Plagiogramma californicum*, Grev. San Pedro, very rare; Calif. guano. [Gv., M.]

Occurs in Californian guano. *Plagiogramma inaequale*, Greville, seems to me to be the same as this species.

149. *Plagiogramma pulchellum*, Grev. Californian guano. [Gv.]
150. *Plagiogramma pulchellum*, var. *ornata*, Grev. Californian guano. [Gv.]
151. *Plagiogramma validum*, Grev. Californian guano. [Gv.]
152. *Climacosphenia pacifica*, Mer. San Pedro, very common. [M.]

This species has been described and figured in my paper "On Polynesian Diatoms." The stypes are broad, elongated, and always contain in great number a small parasitic *Navicula*, so that at first glance the frustules of *Climacosphenia* appear to be sessile and fixed on some *Schyzonema*.

153. *Licmophora californica*, Grun. San Pedro, very common; Catalina Island, common; Redondo Beach, common; Monterey, rare. [G., M.]

Endochrome composed of numerous rounded granules. Stypes short, structureless, with dichotomic ramification, colonies small.

154. *Licmophora capensis*, Grun. Rather rare. [G., M.]

A sessile form.

155. *Licmophora debilis* (Kütz.), Grun. San Pedro, common; Catalina Island, very common on *Macrocystis*. [M.]

156. *Licmophora dubia*, Grun. San Pedro, very common; Catalina Island, rare; Monterey, rare. [M.]

Grunow considers this *Licmophora* as being a variety of *L. Jürgensii*, from which it differs by the strictly superficial septa, with septal puncta disposed on the extreme upper margin of the frustule. This characteristic, as well as a few others, being very constant in *L. dubia*, I prefer to regard it as a separate species, the more so as *L. Jürgensii* does not occur in the Pacific Ocean, while *L. dubia* is very common. This species seems to be a widely distributed one, reaching even the Indian Ocean (Sumatra).

In California the frustules are always sessile, while in the Black Sea they are fixed on somewhat elongated structureless stypes.

157. *Licmophora dubia*, var. *latior*, Mer. (Pl. V. figs. 10, 11.) Catalina Island, on *Macrocystis*, common. [M.]

Valve rather broad, cuncate, or elongated-ovoid, slightly and gradually attenuated from the summit to the inferior

apex, which is broad and rounded* ; margins straight, superior apex broadly rounded. Pseudoraphe indefinite; striæ very fine, not less than 24-25 in 0.01 mm. Girdle-face narrow, cuneate, with rather delicate margins, upper angles rounded. Septa superficial, very thin, straight, septal puncta small, strongly marginal. Endochrome granular. Length 0.031-0.041 mm., breadth of the girdle-face 0.0077-0.0125 mm., breadth of the valve 0.010-0.011 mm.

This variety differs from the type species, into which it gradually passes, by its broader valves and the more delicate appearance of the frustule. The breadth of the valves of *L. dubia* is about 0.009 mm., sometimes only 0.006 mm. (and even 0.0053 mm.), while here they are never below 0.01 mm., and their form is somewhat different, being more ovoid.

158. *Licmophora flabellata* (Carm.), Agardh. Common. [M.]

159. *Licmophora flabellata*, var. *parva*, Mer. (Pl. V. figs. 12-14.) San Pedro, not rare; Monterey, very common. [M.]

I have quite a number of slides containing *L. flabellata* from the Black Sea, the Adriatic, the Mediterranean, the Californian coast, &c., in which this species, although greatly varying in size, is never represented by specimens below 0.117 mm., varying from 0.117 to 0.437 mm. In one gathering from Monterey, however, I found in great number a small form varying from 0.064 to 0.146 mm., usually being about 0.075-0.1 mm., in which larger individuals are very scarce, and this same form frequently occurs also in several gatherings from San Pedro and in one from Sumatra. These facts prove undoubtedly that such forms cannot be considered merely as small-sized individuals of *L. flabellata*, but rather represent a separate variety, peculiar as it seems to the Pacific and Indian Oceans.

The form of the valve, in the smaller specimens at least, is also somewhat different and the girdle-face is broader and more cuneate. I give here a series of individual measurements:—

Length:	0.064	0.068	0.068	0.072	0.082	0.083	0.090
Breadth of the frust.:	0.020	0.025	0.031	×	0.019	0.024	0.027
		0.094	0.098	0.100	0.127	0.146	
		0.021	0.020	0.031	×	0.020	

Breadth of the valve 0.007-0.008 mm.

* Fig. 10 has been represented by the engraver as being slightly asymmetrical, which is not the case. The upper margin of fig. 11 ought to be straight.

160. *Licmophora lata*, Mer. (Pl. V. figs. 1-3.) San Pedro, Redondo Beach, very common; Monterey, common. [M.]

Valve broad, bottle-shaped, upper part somewhat linear or slightly attenuated to the summit, abruptly attenuated towards the lower third or fourth, becoming conical; lower apex somewhat narrow, rounded, upper broadly rounded. Pseudoraphe rather broad, very distinct, striae very fine. Girdle-face moderately broad, cuneate, upper angles subrounded, upper margin convex; septa very deep, 0.012 mm. in average, arcuate; septal puncta distinct, round. Endochrome granular. Forming numerous colonies on long stypes composed of two layers, an external and a thinner but denser inner one; mode of ramification the same as in *L. dalmatica*, *L. gracilis*, and *L. paradoxa*. Length 0.055-0.077 mm., breadth of the girdle-face 0.028-0.041 mm., breadth of the valve 0.014-0.020 mm.

This species is nearly allied to *L. paradoxa*, from which it differs by the much broader valves of a somewhat different shape; the granules of the endochrome are rounded, while in *L. paradoxa* they are usually elongated, bacilliform, and the colonies are symmetrical, while in *L. paradoxa* one side of the colony is always more developed than the other.

161. *Licmophora Monksii*, Mer. (Pl. V. figs. 8, 9.) San Pedro, common; Redondo Beach, not rare. [M.]

Valve broad in the middle, slightly attenuated towards the superior apex, which is truncate, sometimes broadly rounded, more considerably attenuated towards the lower end, which is narrow; lower part forming an elongated cone with usually straight margins. Striae fine, except at the lower end, where they are distinct under an ordinary magnifying-power, about 12-13 in 0.01 mm. Girdle-face (fig. 9) cup-shaped, with more or less convex margins, upper angles rounded. Septa very deep (average 0.007 mm.), very fine, almost straight and parallel, somewhat divergent above the septal puncta, the latter small, round, very distinct; secondary puncta large, adjoining the septa. Endochrome granular. Forming small colonies on short structureless stypes. Length 0.017-0.043 mm. (usually 0.025-0.035 mm.), breadth of the girdle-face 0.012-0.021 mm., breadth of the valve 0.007-0.008 mm.

The cup-shaped girdle-face of this species is a very peculiar character, not to be found in any other species. The secondary septal puncta (*a, a* in fig. 9), which usually are situated inwards of the septa, are here so close to the latter that, if not carefully examined, they can easily be mistaken for the septal

puncta themselves, the more so as they are larger than these latter. The deepness of the septa and their parallelism below the puncta, as well as the distinct striæ at the lower part of the frustule, contribute to make out of this species a very peculiar one. It has some relation only to *L. profunde-septata*, Mer., from the Mediterranean.

162. *Licmophora montereyana*, Mer. (Pl. V. fig. 6.) Monterey, very rare. [M.]

Valve narrow, linear in its upper half, abruptly attenuated in the middle, becoming again linear and very narrow in the lower quarter; superior apex broadly rounded, inferior inflated. Pseudoraphe invisible; striæ very fine, about 23 or more in 0.01 mm. Septa deep (0.0175 mm.). Length 0.119 mm., breadth of the valve 0.008 mm.

The valve of this species has a form similar to that of *L. remuloides*, Mer., from the Black Sea, but it is a very distinct species, the septa being deep and the lower apex inflated. It differs from *L. grandis* by the indefinite pseudoraphe, which is very distinct in the latter; the valve is also different. It has no close relation to any other species.

163. *Licmophora pacifica*, Mer. (Pl. V. figs. 4, 5.) San Pedro, not rare. [M.]

Valve broad, cuneate, ovoid in small individuals, sometimes slightly attenuated towards the summit, gradually tapering from the summit, which is broadly rounded, towards the narrow and subacute inferior apex; margins straight. Pseudoraphe and striæ distinct, the latter about 11-12 in 0.01 mm. Girdle-face broadly cuneate, with upper angles rounded, walls thick, inferior apex broad. Septa comparatively deep (average 0.0053 mm.), moderately arcuate; septal puncta round, very distinct. Endochrome granular. Sessiliform. Length 0.028-0.046 mm., breadth of the girdle-face 0.028-0.036 mm., breadth of the valve 0.0085-0.01 mm.

This species has a certain resemblance to *L. Lyngbyei*, to which it seems to be allied; it differs by the valves being sometimes ovoid, by the septa, which are not so deep, and the absence of stypes. The valves of larger specimens resemble somewhat those of *L. capensis*, Grun., but the septa are much deeper than in the latter.

164. *Licmophora paradoxa*, var. San Pedro, common. [M.]

This is not the type species, as represented by a form which is extremely abundant in Villefranche (Mediterranean);

the Californian form differs from the latter by its greater size, attaining 0.1 mm., usually 0.07-0.085 mm. (the type varies from 0.035-0.088 mm., average of thirty-three cases 0.054 mm.), and by the endochrome, which is always composed of numerous moderately elongate elliptic granules, while in the Mediterranean form they are usually very elongate, bacilliform, and not numerous. I give no name to this variety, as it requires further examination.

165. *Licmophora Thumii*, Mer. (Pl. V. fig. 7.) Monterey, common. [M.]

Valve of medium breadth, strongly clavate, slightly arcuate and asymmetrical, rarely symmetrical; upper part inflated, attenuated towards the superior apex, which is broad, truncate, abruptly attenuated at the superior quarter, becoming narrow and almost linear, inferior apex slightly inflated. Pseudoraphe broad, very distinct; striæ 16-17 in 0.01 mm., at the lower end as well as in the middle. Girdle-face cuneate, with rather thick outlines, upper angles subacute. Septa deep (average 0.016 mm.), slightly arcuate, thin below the septal puncta, thick above them. Length 0.098-0.188 mm., breadth of the valve 0.0115-0.0180 mm.

It is to Mr. Ed. Thum of Leipzig, the celebrated moulder of diatoms, who on many occasions assisted me in my studies, that I dedicate this species. It has no close relation to any other.

166. *Eunotogramma*, sp. ? (Pl. V. figs. 24-27.) San Pedro, rare; Hawaii, rare. [M.]

I give the figures of a species of *Eunotogramma* which I have met many times, and which, for lack of necessary books, I am unable to determine. The striæ are sometimes fine, invisible with an ordinary magnifying-power (figs. 26, 27), sometimes distinct (figs. 24, 25), about 9 or 10 in 0.01 mm. Length 0.0175-0.023 mm., breadth of the girdle-face 0.011-0.013 mm., breadth of the valve about 0.007-0.008 mm.

167. *Raphoneis ampiceros*, var. *rhombica*, Grun. San Pedro, rare. [M.]

168. *Opephora pacifica* (Grun.), Petit. San Pedro, Monterey, common. [M.]

169. *Clavicula recens*, Mer. Northern California, very rare. [M.]

See my paper "On Polynesian Diatoms," chapter iv.

170. *Fragilaria (striatula, var. ?) californica*, Grun. [G.]

171. *Fragilaria coccochroma*, Mer. San Pedro, rare. [M.]
See my paper on the Diatoms of the Black Sea.
172. *Fragilaria hyalina* (Kütz.), Grun. San Pedro, rare. [M.]
173. *Fragilaria spicula*, Mer., sp. n. (Pl. V. fig. 17.) Santa Monica, rare. [M.]
Valve very narrow, lanceolate, with ends acute, length about 0.01 mm., striae invisible. Girdle-face very narrow, linear-lanceolate, with ends truncate. Forming small colonies in zigzag on very short narrow stipes, parasitic on *Nitzschia*. Endochrome composed of two narrow elongated plates asymmetrically disposed—one plate nearer to one end of the frustule, the second plate to the other end.
174. *Synedra affinis*, Kütz. San Pedro, not rare. [M.]
175. *Synedra affinis*, var. *parva*, Kütz. San Pedro, somewhat rare. [M.]
176. *Synedra grandis*, Mer. Monterey, common. [M.]
See my paper on the Diatoms of the Sea of Azof.
177. *Synedra investiens*, W. Sm. Santa Monica, on *Macrocystis*, very common. [M.]
178. *Synedra kamschatica*, Grun. Monterey, common. [M.]
179. *Synedra minuta*, Mer. San Pedro, not rare. [M.]
See my paper on the Diatoms of the Black Sea, parts i. & ii.
180. *Synedra nitzschioides*, Grun. San Pedro, not common. [M.]
A small form 0.053–0.056 mm. in length. Girdle-face quite straight. Endochrome granular.
181. *Synedra undulata* (Bail.), Greg. San Pedro, somewhat rare. [M.]
182. *Asterionella formosa*, Harr. (var.?). Northern California. [M.]
183. *Chætoceros californicus*, Grun. (fossil?). From Wolle, Diat. Amer. pl. lxx. fig. B.
184. *Chætoceros diadema* (Ehr.), Grun. San Pedro; Northern California. [M.]
185. *Chætoceros incurvus*, var. *angusta*, Mer. (Pl. V. fig. 23.) San Pedro, very rare. [M.]
Amongst the many endocysts of *Ch. incurvus* which I

have observed* I have never seen such narrow elongated valves as represented in fig. 23. It seems therefore advisable to distinguish it as a separate variety. The puncta of the valve are also much larger, and there is a punctum to be seen at the bifurcation of the awns which does not exist in the type species. General length 0.031 mm., length of the body 0.018 mm., breadth 0.007 mm.

186. *Chætoceros lyra*, Mer. Northern California, very rare. [M.]

See my paper "On Polynesian Diatoms," chapter iv.

187. *Rhizosolenia setigera*, Brightw. San Pedro, rare. [M.]

Bristles very long, straight or arcuate, with a small bright punctum at the summit of the calyptra, or without it. Length of the frustule (without the bristles) 0.1 mm.

188. *Rhizosolenia Stolterfothii*, Per. San Pedro, rare. [M.]

189. *Rhizosolenia styliformis*, Brightw. San Pedro, rare. [M.]

190. *Skeletonema costatum* (Grev.), Cl. San Pedro, not rare. [M.]

191. *Stephanopyxis ferox*, Grev. San Pedro, rare; Calif. guano. [Gv., M.]

192. *Stephanopyxis turgida*, Grev. Calif. guano. [Gv.]

193. *Anaulus birostratus*, Grun. [V. II.]

194. *Biddulphia* (*Triceratium*) *alternans*, var. *tenuipunctata*, Mer. Northern California, very rare. [M.]

See my paper "On Polynesian Diatoms," chapter iv.

195. *Biddulphia* (*Triceratium*) *antediluviana* (Ehr.), V. H. San Pedro, very rare. [M.]

I have seen only one specimen, which was almost identical with the figure of Brightwell representing *Amphitetras tessellata* †, and could therefore be determined as well as *B. tessellata*. I fail, however, to see any difference between this latter species and *B. antediluviana*, except in the alveoli of the first species being less coarse (which is also the case in the specimen from San Pedro) and the margins of the valve less concave than in the second one, although in this regard *B. antediluviana*

* I have given a figure of *Ch. incurvus* in my paper "Note on Diatoms from Chincha Guano," in Ann. & Mag. Nat. Hist., November 1860.

† 'Diatomeentafeln zusammengestellt für einige Freunde,' pl. iii. fig. 11.

varies greatly. If the lesser coarseness should prove to be a constant character, then, of course, a separate variety—var. *tessellata*—could be established, as the true *B. antediluviana* of Europe has invariably very coarse alveoli; but having seen only one individual of that kind, I regard this case as an accidental one. Therefore the best would be, in my opinion, to unite *B. tessellata* and *B. antediluviana* in one species.

196. *Biddulphia* (*Triceratium*) *arctica*, Brightw. Northern California; Monterey, not rare. [G., M.]

197. *Biddulphia* (*Triceratium*) *arctica*, var. *tetragona*, Grun. Northern California, common; Monterey, rather rare. [G.]

198. *Biddulphia* (*Triceratium*) *montereyi*, Brightw.* San Pedro, rare; Northern California. [G., M.]

199. *Biddulphia* (*Triceratium*) *sanpedroana*, Mer., sp. n. (Pl. IV. fig. 27.) San Pedro, not rare. [M.]

Differs from *B. (Amphitetras) punctata*, Grev.†, which is found in Ceylon, by the puncta or alveoli being more rounded and not so closely disposed, the margins of the valve not so deeply concave, and the processes less elongated, broader, and more rounded. There seems to be a difference also in the central part of the valve, which in *B. punctata* shows a well-defined central area with a few scattered granules.

The puncta are sometimes a little larger than represented in my figure, sometimes they are smaller and more distant, but the valve has always about the same shape, its processes never being so prominent and acute as in the type species. The central part of the valve is concave and the concavity has sometimes a quadrangular form with angles opposite to the middle part of the concave margins; if in such individuals the puncta are at the same time very small, they greatly resemble *B. elegans*, Grev. *B. (Triceratium) sanpedroana* is no doubt nearly allied to *B. (Triceratium) antediluviana*.

Number of puncta usually 3·5 in 0·01 mm. (from 3 to 4), greatest diameter (along a diagonal) 0·063–0·119 mm., smallest diameter 0·049–0·091 mm.

This diatom is widely distributed all over the Pacific Ocean. I have found it also in the fossil deposit of Redondo (California).

200. *Biddulphia* (*Triceratium*) *uncinnata*, Grun. (See Wolle, Diat. Amer. pl. cii. fig. 12.)

* *Loc. cit.* pl. i. fig. 18.

† *Loc. cit.* pl. xliii. fig. 8.

201. *Biddulphia aurita* (Lyngb.), Bréb. San Pedro, rare ;
Monterey, common. [M.]
202. *Biddulphia Baileyi*, W. Sm. San Pedro, rare. [M.]
203. *Biddulphia Edwardsii*, Febiger. Northern California,
common. [G., M.]
Usually with 2-4 very robust spines.
204. *Biddulphia lævis*, var. *minor*. San Pedro, common ;
Northern California, rare. [M.]
Diameter attaining 0.112 mm.
205. *Biddulphia longicrucis*, Grev. (Diatomeentaf. zus. f. e.
Fr. pl. xxii. fig. 10). Calif. guano. [Gv.]
206. *Biddulphia pulchella*, Gray. San Pedro, very common.
[M.]
207. *Biddulphia reticulata*, Roper. San Pedro, somewhat
rare. [M.]
208. *Biddulphia reticulata*, var. *rhombica*, Mer. Northern
California, very rare. [M.]
209. *Biddulphia Roperiana*, Grev. San Pedro, not very rare ;
Calif. guano. [Gv., M.]
210. *Biddulphia simplex*, Mer., sp. n. (Pl. IV. figs. 28-30.)
San Pedro, rare. [M.]
Valve delicate, membranaceous, elliptic-lanceolate, with
ends acute, without spines or any visible structure. Girdle-
face with lateral margins straight (fig. 29) or with valves
being separated by only a very slight concavity (fig. 30, *a, a*)
from the connecting membrane ; processes short, acute, middle
part of the valve slightly convex, showing two concave
arcuate lines uniting in the centre. Length of the valve
0.042 mm., breadth 0.018 mm.
211. *Biddulphia tumida*, Roper. (Diatomeent. zusamm. f. e.
Fr. pl. xxvi. figs. 18, 19). Calif. guano. [Gv.]
212. *Biddulphia Tuomeyi*, Bail. Calif. guano ; San Pedro,
rare. [Gv., M.]
In San Pedro I have seen a narrow valve 0.187 mm. in
length and 0.042 mm. in breadth, probably belonging to a
variety of this species.
213. *Biddulphia* (*Cerataulus*) *turgida*, W. Sm. San Pedro,
rare. [M.]
214. *Porpeia quadrata*, Grev. (Diatomeentaf. zus. f. e. Fr.
pl. lxxvii. fig. 20). San Pedro, very rare. [M.]

215. *Isthmia nervosa*, Kütz. Monterey, Santa Barbara, very common; San Pedro, very rare. [M.]
216. *Melosira Borreri*, Grev. San Pedro, very common. [M.]
217. *Melosira Jurgensii*, Ag. San Pedro, rare. [M.]
218. *Melosira nummuloides* (Bory), Ag. San Pedro, rare. [M.]
219. *Melosira sol*, Kütz. (*Cyclotella radiata*, Br. Diatomeent. zus. f. ein. Fr. pl. xxix. fig. 11.) San Pedro, common; Monterey, somewhat rare. [M.]
220. *Podosira Febigerii*, Grun. (Arct. Diat. p. 119). [G.]
221. *Podosira fusca*, Mer. San Pedro, rather rare. [M.]
See my paper on the Diatoms of the Black Sea.
222. *Podosira maxima*, var. *californica*, Grun. (Arct. Diat. p. 118). [G.]
223. *Hyalodiscus subtilis*, Bail. Northern California, very common; San Pedro, not rare. [G., M.]
224. *Hyalodiscus subtilis*, var. *scotica* (Kütz.), Grun. San Pedro, not very rare. [M.]
225. *Eupodiscus californicus*, Grun. (V. Heurek, Synops. pl. cxviii. fig. 8). Gulf of California. [V. H.]
226. *Aulacodiscus circumdatus*, A. S. (A. S., Atlas, pl. xxxv. fig. 5; Wolle, Am. Diat. pl. lviii. fig. 7). [A. S.]
227. *Aulacodiscus Kittonii*, Arn. San Pedro, very common. [M.]
228. *Aulacodiscus oregonus*, Grev. San Pedro and Northern California, common. [V. H., M.]
229. *Aulacodiscus orientalis*, Grev. San Pedro and Northern California, very rare and somewhat doubtful. [M.]
230. *Auliscus sculptus*, var. *cœlata*, Bail. San Pedro, not rare; Northern California. [M.]
231. *Auliscus sculptus*, var. *punctulata*, Mer. Northern California, not very rare. [M.]
See my paper "On Polynesian Diatoms," chapter iv.
232. *Actinoptychus heliopelta*, Grun. San Pedro, rare. [M.]
233. *Actinoptychus splendens* (Schadb.), Ralfs. San Pedro, not very rare. [M.]
234. *Actinoptychus undulatus*, Ehr. San Pedro, not rare. [M.]

235. *Asteromphalus elegans*, Grev. (Diatomeentaf. pl. xxi. fig. 6). Calif. guano. [Gv.]
236. *Asteromphalus flabellatus*, Grev. (Diatomeentaf. pl. xxi. figs. 4, 5). Calif. guano. [Gv.]
237. *Asteromphalus heptactis* (Bréb.), Ralfs (*Spatangidium Ralfsianum*). Calif. guano. [Gv.]
238. *Arachnoidiscus Ehrenbergii*, Bail. San Pedro, rather rare; Northern California, common. [M.]
239. *Arachnoidiscus ornatus*, Ehr. San Pedro, rather common. [M.]
240. *Stictodiscus californicus*, Grev. Calif. guano; San Pedro, not rare. [Gv., M.]
241. *Actinocyclus Ehrenbergii*, Ralfs. San Pedro, rare. [M.]
242. *Actinocyclus subtilis* (Greg.), Ralfs. Monterey, common. [M.]
243. *Coscinodiscus curvatulus*, Grun. Northern California, not very rare. [M.]
244. *Coscinodiscus excentricus*, Ehr. Northern Pacific, rather rare. [A. S., M.]
245. *Coscinodiscus gigas*, Ehr. San Pedro, rare; Northern California, very common. [M.]
246. *Coscinodiscus lineatus*, var. *leptopus*, Grun. San Pedro, rare; Northern California, rather rare. [M.]
247. *Coscinodiscus nitidus*, Greg. San Pedro, rare. [M.]
248. *Coscinodiscus nitidus*, var. *radiata*, Mer. San Pedro, rare. [M.]
249. *Coscinodiscus radiatus*, Ehr. San Pedro, very common; Northern California, not rare. [M.]
250. *Coscinodiscus radiatus*, var. *centralis* (Ehr.), Rattr. San Pedro, rare. [M.]
251. *Coscinodiscus radiatus*, var. *concinna*, W. Sm. Northern California, rather rare. [M.]
252. *Coscinodiscus radiatus*, var. *oculus iridis*, Ehr. San Pedro, rare; Northern California, not rare. [M.]
253. *Coscinodiscus subtilis* (Ehr.?), Grun. San Pedro, not rare; Northern California, rather common. [M.]

EXPLANATION OF THE PLATES.

PLATE IV.

- Fig. 1. *Nitzschia tenuirostris*, Mer. (typica). San Pedro. $\frac{600}{1}$.
- Fig. 2. Ditto. *a*, valve; *b*, girdle-face. San Pedro. $\frac{600}{1}$.
- Fig. 3. Ditto. San Pedro. $\frac{600}{1}$.
- Figs. 4, 5. *N. tenuirostris*, forma *directa*. San Pedro. $\frac{600}{1}$.
- Fig. 6. *N. tenuirostris*, var. *hamulifera*, Mer. Mediterranean (Villefranche). $\frac{600}{1}$.
- Fig. 7. Ditto. Diagram showing the spiral torsion of the ends.
- Fig. 8. *N. tenuirostris*, var. *parva*, Mer. Valve. Black Sea (Theodosia, Crimea). $\frac{600}{1}$.
- Fig. 9. Ditto. Girdle-face of the same individual.
- Fig. 10. Ditto. San Pedro. $\frac{600}{1}$.
- Fig. 11. *N. tenuirostris*, forma *minutissima*. San Pedro. $\frac{600}{1}$.
- Fig. 12. *Nitzschia gracilis*, Mer. (typica). Valve. San Pedro. $\frac{600}{1}$.
- Fig. 13. Ditto. Girdle-face of the same individual.
- Fig. 14. *N. gracilis*, var. *reversa*, Mer. San Pedro. $\frac{600}{1}$.
- Figs. 15-17. *Nitzschia biplicata*, var. *pacifica*, Mer. Figs. 15 & 17, valves; fig. 16, girdle-face. San Pedro. $\frac{600}{1}$.
- Figs. 18-20. *Nitzschia californica*, Mer. Fig. 18, valve; figs. 19 & 20, girdle-faces. Redondo, California. $\frac{600}{1}$.
- Fig. 21. *Cylindrotheca gracilis* (Bréb.), Grun. San Pedro. $\frac{600}{1}$.
- Figs. 22, 23. *Mastogloia (Orthoneis) Wrightii*, O'Meara. Northern California. $\frac{900}{1}$.
- Fig. 24. Optical section through a frustule of *Navicula forcipata*, Grv. $\frac{900}{1}$.
- Fig. 25. *Navicula (Rhoconeis) genuiflexa*, Kütz., with cell-contents. San Pedro.
- Fig. 26. *Diploneis papula*, A. S., with cell-contents. San Pedro.
- Fig. 27. *Biddulphia (Triceratium) sanpedroana*, Mer. San Pedro. $\frac{600}{1}$.
- Figs. 28-30. *Biddulphia simplex*, Mer. San Pedro. Figs. 28 & 29 $\frac{600}{1}$.

PLATE V.

- Figs. 1-3. *Licmophora lata*, Mer. San Pedro. $\frac{600}{1}$.
- Figs. 4, 5. *Licmophora pacifica*, Mer. In fig. 4 the striae are not represented. San Pedro. $\frac{600}{1}$.
- Fig. 6. *Licmophora montereyana*, Mer. Monterey. $\frac{600}{1}$.
- Fig. 7. *Licmophora Thumii*, Mer. Monterey. $\frac{600}{1}$.
- Figs. 8, 9. *Licmophora Monksii*, Mer. San Pedro. $\frac{900}{1}$.

- Figs. 10, 11. *Liemophora dubia*, var. *latior*, Mer. Santa Catalina Island. $\frac{600}{1}$.
- Figs. 12-14. *Liemophora flabellata*, var. *parvu*, Mer. Figs. 12 & 13, San Pedro; fig. 14, Monterey. $\frac{600}{1}$.
- Figs. 15, 16. *Grammatophora costata*, Mer. Monterey. $\frac{600}{1}$.
- Fig. 17. *Fragilaria spicula*, Mer., fixed on a *Nitzschia*. Santa Monico. $\frac{900}{1}$.
- Figs. 18-20. *Nitzschia spiralis*, Mer.: the same frustule in three different positions. San Pedro. $\frac{600}{1}$.
- Fig. 21. *Rhabdonema*, sp. Northern California. $\frac{600}{1}$.
- Fig. 22. Ditto. Part of a valve at $\frac{900}{1}$.
- Fig. 23. *Chatoceros incurvus*, var. *angusta*, Mer. San Pedro. $\frac{600}{1}$.
- Figs. 24-27. *Eunotogramma*, sp. San Pedro. $\frac{900}{1}$.

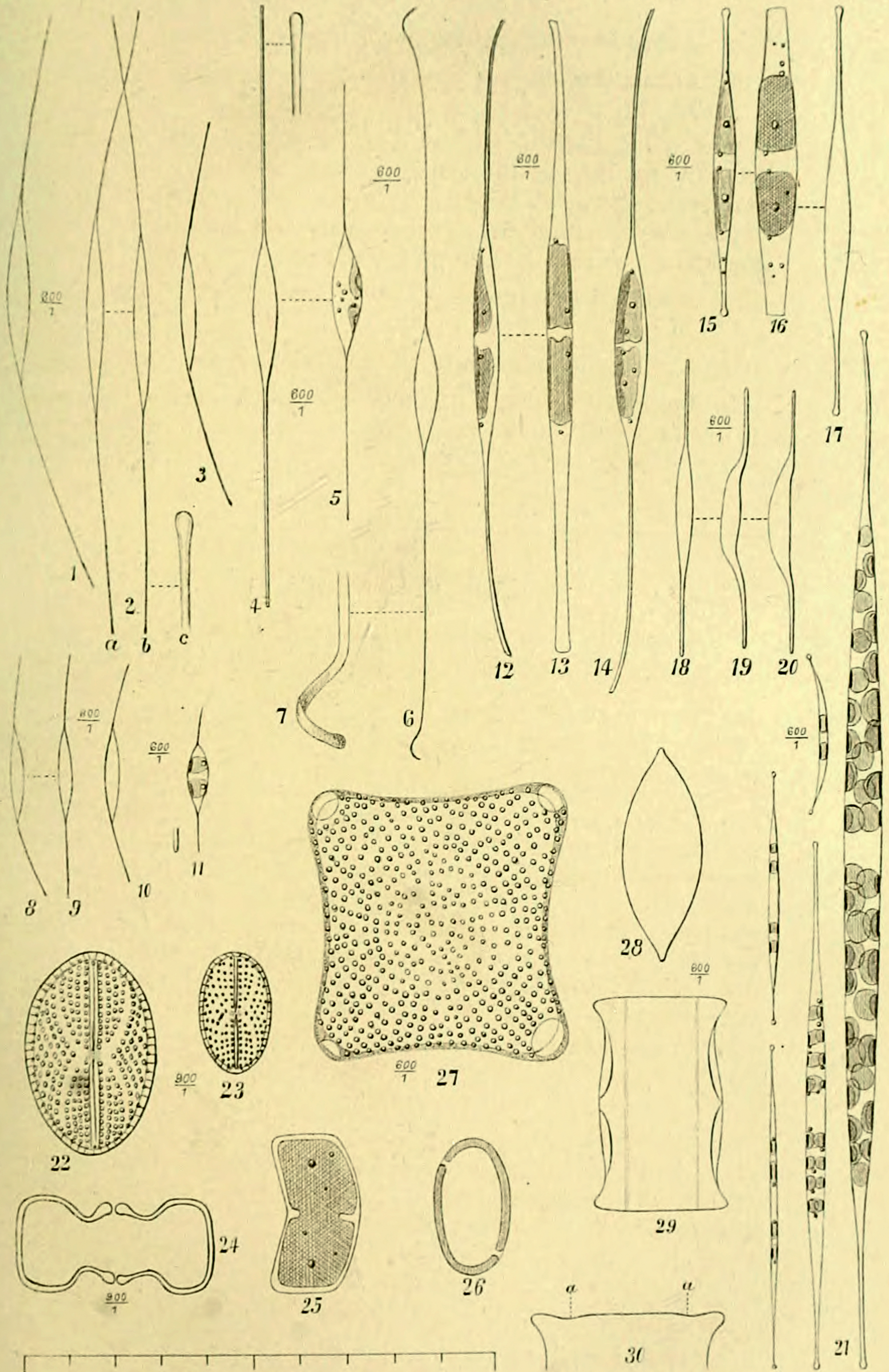
LXVI.—*Two new Genera of Coleoptera belonging to the Cupesidæ and Prionidæ.* By CHAS. O. WATERHOUSE, F.E.S.

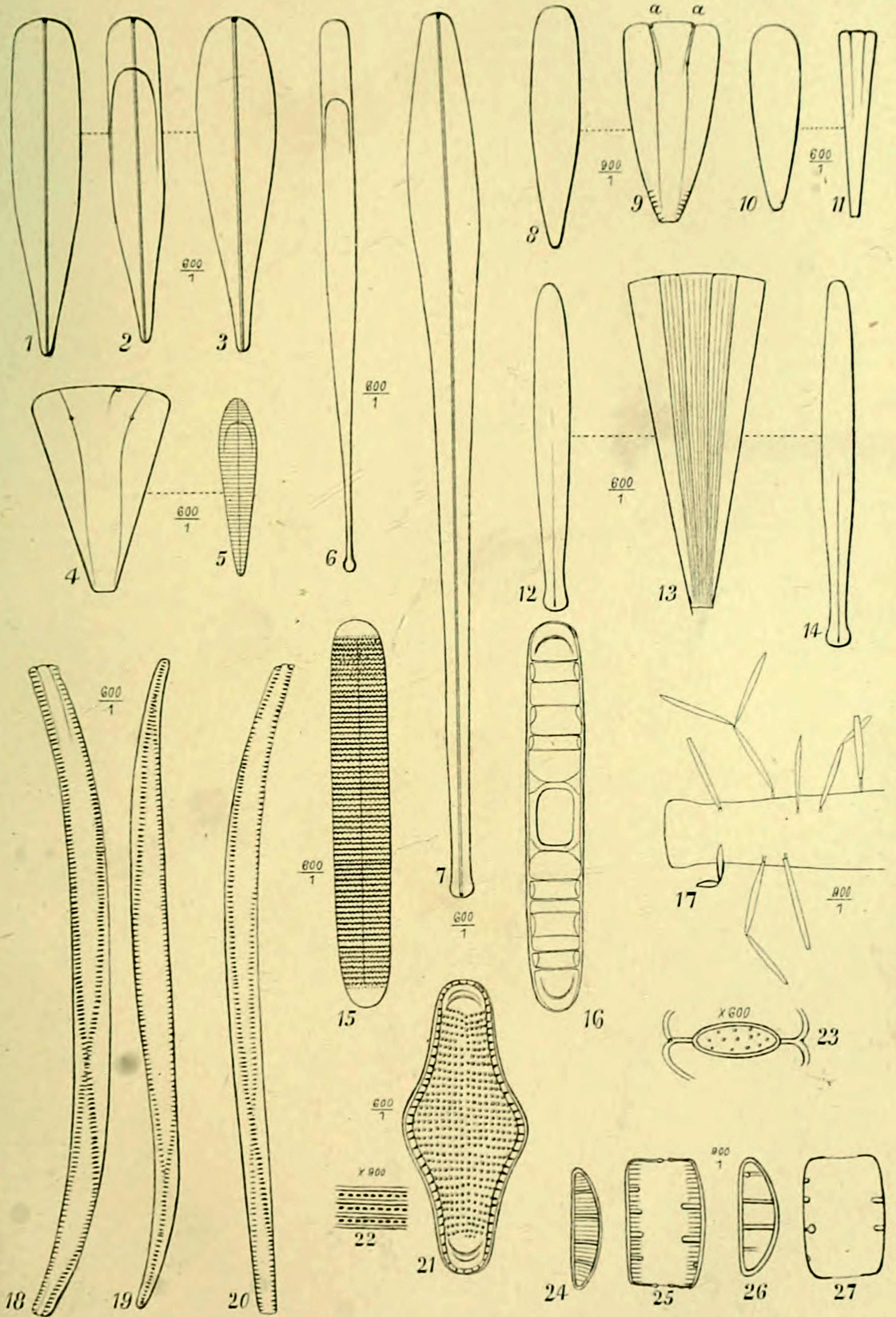
THE British Museum has lately received a small collection of Coleoptera from Rio Janeiro. It contained two remarkable genera, which I have no hesitation in describing as new. One belongs to the Cupesidæ, but differs from all known species in the form of the head and in having smooth antennæ; the other to the aberrant Prionidæ, and is allied to *Mysteria*.

Cupesidæ.

TETRAPHALERUS, gen. nov.

General form and characters of *Cupes*. Head elongate, narrowed anteriorly. Eyes somewhat prominent. Antennæ smooth and shining, nearly as long as the head and thorax taken together, widely separated, placed in a deep impression near the base of the mandible, the impression continued posteriorly beneath the head close to the eye and forming a deep channel, so that the antenna can lie in it when at rest. The two grooves are rather wider posteriorly, so that the flat under surface of the head between them is narrower behind than in front. The mentum is small, concave, longer than broad, obliquely narrowed in front, rectilinear at the sides. [The palpi are wanting.] The maxillary palpi have the apical joint fusiform, rather more narrowed at the base than at the apex. Mandibles very prominent, incurved and enlarged at the apex, where they are bisinuate. Thorax a





0.01 mm. X 600

C. Mereschkowsky del.
R. E. Mintern sc.

Mintern Bros. imp.