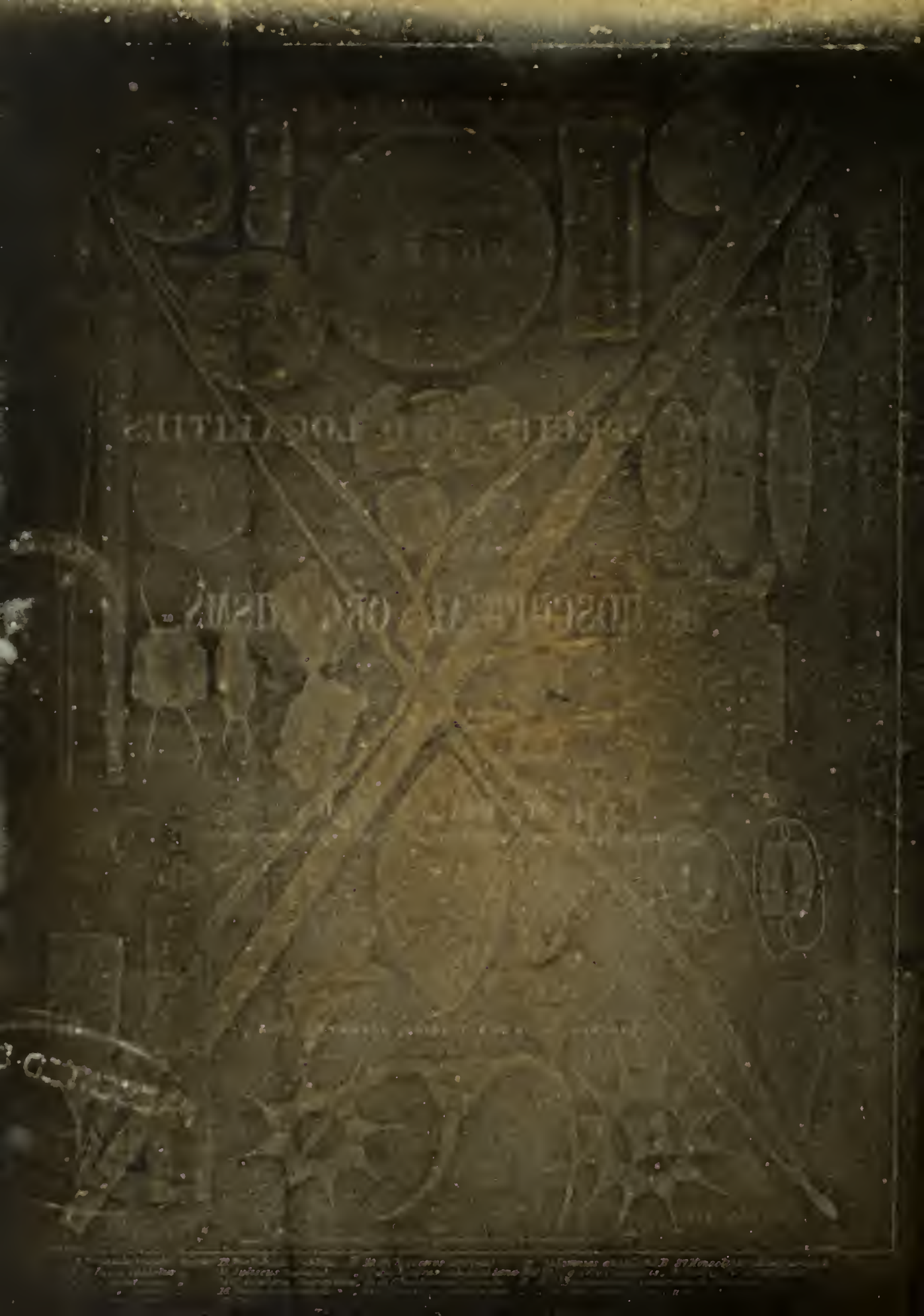

SMITHSONIAN CONTRIBUTIONS TO KNOWLEDGE.

NOTES

ON

NEW SPECIES AND LOCALITIES

OF

MICROSCOPICAL ORGANISMS.

BY

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NOTES ON NEW AMERICAN SPECIES AND LOCALITIES

OF

MICROSCOPIC ORGANISMS.

I.

Fossil Marine Diatomaceae in California.

In examining, at the request of Dr. J. R. Chilton, of New York, some specimens of earthy minerals which were collected in California by Washington Chilton, Esq., I found one highly interesting specimen resembling a white clay, which the microscope proved to be almost entirely composed of fossil marine species of Diatomaceae.

The specimen was from Suisun Bay, twenty-five or thirty miles above San Francisco, California, where Mr. Chilton says a large deposit of a similar character occurs. This is the first locality of fossil marine *Diatomaceae* which has been detected on the Pacific side of this Continent. It abounds in numerous species of *Coscinodisci*, *Actinocycli*, *Actinoptychi*, *Mastogonia*, &c. which I cannot distinguish from the common species in the "infusorial strata" of Maryland and Virginia.

The predominant species, however, which forms a large portion of the mass, is a minute silicious shell which I believe to be undescribed, and which appears most nearly allied to some of the species of Kützing's genus *Denticula;* I shall refer to it as *Denticula lanta*, B. (See Plate, Figs. 1, 2, and description, page 9.) Among the other species from this locality I recognized the following, which also occur fossil at Richmond, Virginia, viz: *Coscinodiscus radiatus*, *C. lineatus*, *C. oculus-iridis*, *C. gemmifer*, *Pyxidicula cruciata*, and *Dictyocha fibula* of Ehrenberg, while no trace was found of other characteristic forms of the Virginian deposits, such as the *Gallionella sulcata*, *Zygoceros rhombus*, *Denticella tridentata*, *Goniothecium Rogersii*, *Eupodisci*, &c. of Ehrenberg. The Californian deposit also appears to be entirely free from any Polythalamian shells.

Should this notice meet the eye of any scientific traveller in California, it may induce him to furnish further information concerning the geological relations of this interesting deposit, and to collect a good supply of specimens for a more complete study.

II.

New Species of Limnias.

Limnias annulatus, B.

(Plate, Fig. 28.)

Case of the animal having numerous transverse rings.

In searching, in various parts of the United States, for Desmidieae, my attention was long ago drawn to the frequent occurrence in lakes, ponds, &c. of short cylindrical membranaceous tubes, closed at one end and marked with rings so as to resemble the trachea of insects.

The real nature of these bodies remained unknown to me until the summer of 1851, when I detected great numbers of similar forms attached to various aquatic plants in pools near West Point, and found them to be the cases of a species of Limnias, not noticed in books prior to the publication of Pritchard's *Infusorial Animalcules*, second edition in 1852, where may be found, on page 619, the following description:—

"Limnias ———? appears to be a distinct species which I do not find described. The case is ribbed and semi-transparent, and is composed of a series of lateral rings, found in a ditch near Witlingham, Norwich, on duck-weed (Brightwell)."

This description leaves no doubt that the species referred to by Pritchard is the same as our own, and as he has refrained from giving it a specific name, I propose to call it *L. annulatus*. It is the only species which I have yet noticed in the United States, and occurs in vast numbers at West Point, New York, where I have found large plants, such as *Ludwigia palustris*, literally covered with the brown cases of these animals; affording, when the animals, with their rotatory organs, were protruded, an exceedingly beautiful spectacle when moderately magnified. Our figure is only intended to show the form and markings of the case, with the *general* appearance of the animal, the details of the latter being reserved for further study.

III.

New Species of Ehrenberg's Genus Auliscus.

The generic characters, as given by Ehrenberg, for the genus *Auliscus* are as follows:—

"Lorica bivalve, cylindrical (or orbicular), multiplying by perfect self-division; two large (not tubular) apertures on each surface of the disk laterally, which also is not cirrhose. This genus differs from *Cerataulus* in wanting the cirrhose surface of the lateral disks, as also the tubular apertures." (See *Pritchard's Infusoria*, second edition, page 320.)

Although it has long been known to me that, in most if not all of the cases where Ehrenberg attributes apertures to the shells of Diatomaceae, no real perforations of the shell exist, I yet failed to perceive, until quite recently, that to the genus *Auliscus* are probably referable a number of beautiful forms, for which I had intended to propose a new genus with the name of *Mastodiscus*. I am, however,

now pretty certain that Ehrenberg's *Aulisci* have no apertures, and that, by correcting his description as follows, it will include the beautiful forms represented in our figures 3, 4, 5, 6, 7, 8, 9, and 13. The *Eupodiscus sculptus*, Smith, *British Diatomaceae*, p. 25, also belongs to this genus.

AULISCUS.—Ehrenberg.

Lorica cylindrical (often discoid); bases[1] circular, undulated, having two circular, flattened, mastoid, imperforate processes at some distance from the margin; umbilicus (generally present) smooth, circular, surrounded by a plumose arrangement of dots and lines; sides smooth. The projections on one base are usually on a line at right angles to that on which those of the opposite base are placed.

The following species appear to belong here, and are, I believe, entirely new.

1. Auliscus pruinosus, B.

(Plate, Figs. 5, 6, 7, and 8.)

Lorica large; edges bevelled; bases marked with four sets of curved and sparsely punctate lines, two sets of which diverge from the circumference of the large smooth umbilicus, while the other two sets converge around each of the two large mastoid processes. Sides smooth, or with distant lines parallel to the base. Diameter from $\frac{2}{1000}$th (= 2^m) to $\frac{6}{1000}$th (= 6^m) of an English inch.[2] This species occurs in estuaries, &c. from Massachusetts to the Gulf of Mexico. I found it particularly abundant at Ballast Point, Tampa Bay, Florida. It occurs in the Hudson River at West Point, and in the earth of rice fields in Georgia and South Carolina.

This species, when of largest diameter, is usually of a flattened or discoid form, as in Figs. 5 and 6; but when smaller, it presents considerable variety in the length of its sides, sometimes being discoid, as in Fig. 6, and not unfrequently showing long cylindrical sides marked by numerous distant lines, parallel to the base, as in Fig. 7. Specimens frequently occur in which the sides show two or more cylindrical portions differing considerably in diameter, as in Fig. 7. These varieties all occur together, and pass into each other by such gradations that I am satisfied they should all be referred to the same species.

2. Auliscus punctatus, B.

(Plate, Fig. 9.)

Lorica, as in the preceding species, but having the lines so crowded and so closely punctate that the plumose arrangement is scarcely visible.

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[1] In this paper, the term base is applied nearly in its geometrical sense to the circular or elliptical ends of cylindrical forms; to the triangular, quadrangular, or curved ends of *Triceratium*, *Amphitetras*, *Zygoceros*, &c.; and, in the Naviculaceae and allied forms, the term base will be applied to the striated, grooved, or punctate surfaces on which the thickened portions usually, but erroneously called, apertures exist. That the so-called apertures in *Navicula*, *Pinnularia*, *Stauroneis*, &c. are, in reality, the thickest parts of the shell, I proved, some time since, by the action of hydrofluoric acid in which these portions are the last to dissolve. (See *Silliman's Journal*, 2d series, XI. 349.)

[2] All dimensions in this paper will be given in thousandths of an English inch, so as to have the same unit of comparison for all the figures. The small m attached to a number will be used as a symbol for $\frac{1}{1000}$th of an inch, thus: 6^m = $\frac{6}{1000}$ths.

This may prove to be only a variety of the preceding, with which it often occurs at the above-mentioned localities, but, at present, I think it best to keep them separate. The sparsely punctate bases of the one, and the closely punctate surface of the other appear to offer a sufficient distinction between them.

3. Auliscus caelatus, B.

(Plate, Figs. 3, 4.)

Margin of the bases strongly grooved with unequal lines proceeding from the circumference towards the centre, but leaving a well-defined cruciform figure, containing on one bar the two processes with sets of converging curves, and on the other bar two sets of beautifully reticulated and anastomosing lines. Umbilicus distinct, smooth. Diameter of base $\frac{3}{1000}$th in. Found in sand washed from West India sponge, and in soundings from Mobile Bay.

4. Auliscus radiatus, B.

(Plate, Fig. 13.)

Lorica small; bases with radiant punctate lines; umbilicus wanting. Diameter $\frac{2}{1000}$th to $\frac{3}{1000}$th. A minute species, presenting the characteristic mastoid processes of the genus *Auliscus*, but having no distinct umbilicus, and only slight indications of the peculiar curved lines of the preceding species. Found in mud from New York Harbor, and in the mud of the Hudson River at West Point; also at Rockaway, Long Island, New York.

IV.

American Locality of Amphitetras antediluviana, Ehr.

I have published, in the *American Journal of Science*, notices of American localities of the beautiful species of *Isthmia* and *Biddulphia*, but I had long sought in vain for the allied but much rarer form of *Amphitetras antediluviana*, which has never hitherto been noticed as an American species. I have at last, however, detected a few frustules of this species (See Plate, Fig. 21) in soundings from Edgartown Harbor, Massachusetts, for which I am indebted to A. D. Bache, Esq., Superintendent of the Coast Survey. I presume that a careful search among the parasites upon the Algae in the vicinity of Edgartown would be rewarded by the discovery of an abundance of specimens of this interesting species.

In company with the above, at Edgartown Harbor, and at the outer buoy near Cape Pogue, were found the following Diatomaceae:—

Viz: Actinoptychus senarius, Ehr.
Biddulphia pulchella, Gray.
Amphora libyca, Ehr.
Gallionella sulcata, Ehr.
Eupodisci with from three to seven feet, and always opaque and white; perhaps new.
Auliscus pruinosus, B.
Auliscus punctatus, B.
Navicula? lyra, Ehr., abundant.
Triceratium favus, Ehr., very abundant.

This locality is also remarkable for the abundance of Polythalamian forms, among which (besides various species of *Textilaria* and the common nautiloid forms) were noticed beautiful species of a *Lagena*, resembling the *L. laevis* of Wil-

liamson,[1] and numerous specimens of an *Entosolenia*, resembling the *E. globosa* of Williamson, which is abundant in a fossil state in the Miocene tertiary of Virginia, and which appears to be a cosmopolite in the present seas, as I have found it not only in American soundings, from Massachusetts to the Gulf of Mexico, but also in muds from the Island of St. Helena, and from Bombay.

No locality on our northern coast has furnished such an abundance of Polythalamian forms as the one at Edgartown; and it is worthy of inquiry whether oceanic currents, or some peculiarity of the neighboring rocks, can have affected the fauna of this place.

V.

American Localities of Tetragramma.

In the *Berlin Monatsbericht* for May, 1843, Ehrenberg gives the following characters for the genus *Tetragramma* :—

"Genus e familia Bacillariorum, sectione Naviculaceorum. Lorica, simplex bivalvis silicea, compressa quadrata libera latior quam longa unilocularis, septis in medio loculo binis medio interruptis ibique dilatis in forman 4 signorum musicorum."

He states also that the only species known to him is nearest allied to the *Terpsinoe musica*.

The specific characters of the Asiatic species, *T. Asiatica*, Ehr., are not given, nor have I seen any drawing or specimens of it. The generic characters, however, as above given, agree so well with an American form, that I have no doubt that we have a species of the genus occurring in considerable abundance upon the North American coast of the Atlantic.

As the Asiatic species is unknown to me, I shall, for the present, keep our species distinct from it, and propose for it the name *Tetragramma americana*, and the following specific characters :—

Tetragramma americana, B.

Lorica quadrangular, resembling that of *Terpsinoe musica*, Ehr., but smaller, more minutely punctate, and showing on each side only two of the internal bodies, resembling notes of music. The end view shows an undulating outline (see Fig. 1, A B), with two cross-bars, which separate the inflated central portion from the narrower three-lobed ends. By comparing the outline (Fig. 1, A, B) of *T. americana* with the accompanying ones (Fig. 2, C D), of *Terpsinoe musica*, their chief points of resemblance and disagreement will be seen.

Fig. 1.

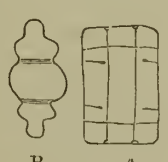
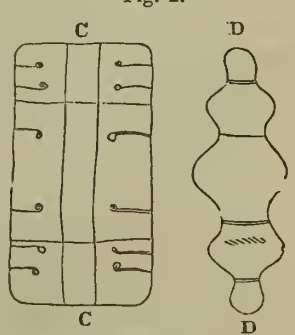


Fig. 2.



[1] See Annals and Magazine of Natural History, 2d series (Plate I. Fig. 1), for January, 1848.

Single frustules of *Tetragramma americana* were found by me several years ago in the mud of the Hudson River, in mud from Rockaway, New York, and Charleston, South Carolina; but I have nowhere found it in such abundance as in the mud of the St. Sebastian River near St. Augustine, Florida, and at Tampa Bay, Florida.

VI.

New Species of Diatomaceae.

In this article I present brief descriptions, with figures of a number of American Diatomaceae, which I suppose to be hitherto undescribed.

1. Amphora stauroptera, B.

(Plate, Figs. 14, 15.)

Elliptical, elongated; margins striated; central portion crossed, as in *Stauroptera*, by a broad band. Length, $\frac{4}{1000}$th; width at the middle, a little more than $\frac{1}{1000}$th of an inch. Found in Algae from Halifax, Nova Scotia.

2. Climacosphaenia elongata, B.

(Plate, Figs. 10, 11.)

Frustules elongated clavate, rounded at the ends, and having numerous cross-bars on the minutely striated bases. Striae most distinct near the edges, and exceedingly delicate in the middle portions of the bases. Pedicels long, branching, supporting many fan-shaped groups of frustules, as shown in the following wood-cut. It occurs in great numbers, parasitic upon Algae; from Garden Key (Tortugas), Florida. Length of frustules, $\frac{13}{1000}$th of an inch.

I have distributed some specimens of this form under the manuscript name of *C. ramosa*, B.; but, as I now believe that branched pedicels may also belong to other species, I have changed the name, and now rely on the elongated clavate form of the frustules, and their excessively minute striations, to distinguish this species from those described by Ehrenberg and Kützing. The striae on the *C. elongata* can be made out without much difficulty, near the edges of the shell, but to trace them completely across the middle regions of the bases requires excellent lenses and careful management of the light. In fact, these lines are even finer than those upon the Providence *Grammatophora*. In our figure 10, these cross-lines are well represented, although the figure itself almost requires to be looked at with a magnifying glass, in order to distinguish these lines.

Fig. 3.

Chaetoceros borcale, B.

(Plate, Figs. 22, 23.)

Body oblong in side view, elliptical when seen endwise. Horns excessively long (30 to 50 times as long as the body), and armed with numerous minute spines. Longest diameter of the body $1\frac{1}{4}^{m}$. Shortest diameter $\frac{3}{4}^{m}$. Length of the horns 16^{m}. Length of the spines 1^{m}. Habitat, St. George's Bank, Atlantic Ocean.

Ehrenberg describes several recent species of *Chaetoceros*, as occurring in the

Southern and Antarctic Oceans. Other species are common in Guano, and others occur as fossils in the "Bermuda Tripoli," and in the infusorial strata at Richmond, Virginia. The species here described was found in considerable numbers with other Diatomaceae in the contents of the stomach of the *Botryodactyla grandis*, Ayres, a large Holothuridian animal from St. George's Bank, for specimens of which I am indebted to William O. Ayres, Esq., of Boston.

It is the first of the genus which has been found as a living species in the northern hemisphere. Its southern congeners abound in a frozen ocean.

Chaetoceros incurvum, B.

(Plate, Figs. 30?, 31, 32.)

Bases elliptical; horns recurved, longer than the body. Frustules usually found united in pairs, with a void space between them. Sometimes a fillet with the curved horns is found unconnected with the other portions (see Fig. 31).

I have only noticed this curious form in the infusorial strata at Richmond, Virginia, where it is not rare.

Denticula? lauta, B.

(Plate, Figs. 1, 2.)

Bases elongated, oblong or elliptical, with three to sixteen distant transverse striae, or bars, which pass on to the sides, where they terminate in an ocellate form. Sides rectangular, showing near each margin a row of the ocellate ends of the basal striae or bars. Length, 2^m; width, $\frac{1}{4}^m$.

This species forms a large portion of the mass of fossil Diatomaceae at Suisun Bay, California.

Gallionella crotonensis, B.

(Not figured.)

Frustules minute, about twice longer than broad, united by pairs into long filaments, and showing two sulci or lines of division between the ends of each pair. Internal portions not constricted. Surface with decussating rows of very minute granules. Bases of the frustules slightly crenulate. Average length of joints, $\frac{1}{2}^m$. Diameter, $\frac{1}{5}^m$. to $\frac{1}{3}^m$.

I should be very reluctant to add another species to this already confused and imperfectly known genus, if I could satisfactorily refer our species to any of the described forms. But it is only by overlooking characters which are obvious enough under good glasses, that I can make it appear to agree with any of the published descriptions.

It might at first be confounded with either *G. decussata*, *G. crenulata*, or with the young of *G. aurichalcea*, Ehr.; but, although decussately punctate, it differs from *G. decussata* in the extreme delicacy of its granulations; although crenulate, it is far less distinctly so than *G. crenulata*, and from *G. aurichalcea*, for the young of which it is usually mistaken; it differs in the small and nearly uniform size, its want of internal constrictions, and in its surface appearing distinctly decussately-punctate under a power which shows scarcely a trace of granulations on the surface of *G. aurichalcea*.

The *Gallionella crotonensis* constitutes the largest portion of the matter collected by filters from the Croton water in the city of New York, and thousands of its frustules must be daily swallowed by those who use the unfiltered water. It is so abundant in the Croton water that it may yet possibly prove of importance as a means of detecting the fraudulent dilution of various substances. A portion of the sediment from a suspected liquid could be taken up with a sucking tube, and then examined with the microscope, when the *G. crotonensis*, and other characteristic forms, would easily be recognized. (See Article VII.)

Hyalodiscus subtilis, B.

(Plate, Fig. 12.)

Discoid, bases with a broad margin, marked like the engine-turned back of a watch, with lines of exceeding delicacy, only visible by the highest magnifiers and careful illumination. Umbilical portion more coarsely granulated, and in size little less than one-third of the diameter of the base. Diameter from 1^m. to 3^m.

Occurs at Halifax, Nova Scotia.

Ehrenberg's species, *H. laevis*, resembles the *H. subtilis* in many respects, but differs in having a wider margin, covered with much coarser markings. The Halifax specimens, even of the largest size, are so delicately marked as to form admirable test objects for the best microscopic objectives. (See page 14.)

Hyalodiscus stelliger, B.

(Not figured.)

Discoid, bases with a broad margin, covered with distinct rectilinear rows of dots, arranged in sectoral groups, so as to produce a stellate appearance.

Abundant at St. Augustine, Florida.

The markings in this species are quite distinct, and the stellate appearance, resembling that shown by *Coscinodiscus subtilis*, will at once distinguish it from all other species.

Naviculata granulata, B.

(Plate, Fig. 16.)

Bases elliptical, with a smooth longitudinal space reaching from end to end, exterior to which is a coarsely and irregularly granulated portion, bounded by marginal rows of dots or granules. Length, 3^m. Width, $1\frac{1}{2}^m$.

Habitat, Halifax, Nova Scotia.

Stauroptera oblonga, B.

(Plate, Fig. 17.)

Lorica, having the size and markings of *Stauroptera aspera*, Ehr., but having its bases oblong, with parallel sides and acute angular ends.

Found with *S. aspera* at Halifax, Nova Scotia. For the purpose of comparison, a figure of *S. aspera*, Ehr., is given. (See Plate, Fig. 18.)

Podocystis americana, B.

(Plate, Fig. 38.)

Lorica nearly sessile; bases obovate, with a longitudinal line through the middle, and numerous granules arranged in double rows, producing more or less regular transverse bars. The side view is wedge-shaped. Length, $\frac{4}{1000}$th of an inch, $= 4^{m}$.

This very pretty species is not uncommon as a parasite upon filamentous Algae in Long Island Sound, and at Greenport, New York.

Tetragramma americana, B. (See page 7.)

Toxarium undulatum, B. (See page 15.)

Triceratium setigerum, B.

(Plate, Fig. 24.)

Bases triangular, slightly convex with rounded edges, and bearing three large obtuse projections, or horns, at the base of each of which is placed a setiform process. Sides rectangular or square, separated from the ends by deep constrictions. The whole surface covered with granules arranged in a decussate manner. Length from base to base, 6^{m}. Width of sides, 3^{m}. to 4^{m}.

This very beautiful species occurs at Ballast Point, Tampa Bay, Florida, where it is not rare. It appears to be allied to the *Triceratium spinosum*, B., which I found fossil at Petersburg, Virginia. (See *London Physiological Journal*, I. 143.

Zygoceros circinus, B.

(Plate, Figs. 19, 20.)

Bases elliptical, terminating in truncated cones without horns, but having two long, setiform, bent spines. Sides, minutely and decussately punctate. The decussating rows of granules are omitted in the figure.

Fossil at Richmond, Virginia.

Zygoceros? radiatus, B.

(Plate, Fig. 29.)

Base with an elliptical outline; horns slightly elevated, minutely punctate; basal surface covered with radiating and dichotomous rows of granules; sides not yet seen. Length of base about 7^{m}. of an inch. Width about 4^{m}.

Although I have only seen a few of the bases of this elegant species, I have little doubt that it is a congener of *Zygoceros rhombus*, Ehr. Its large size and beautiful markings make it a very interesting species. I found it among Algae from Halifax, Nova Scotia.

VII.

On the Microscopic Forms Found in the Croton Water in New York City.

It has long been known to the New York microscopists, but not to the public generally, that the Croton water abounds in beautiful microscopic organisms, and particularly in Diatomaceae and Desmidieae. The following list gives the names

of the species noticed by myself in sediment collected from the Croton water by means of a filter at the Astor House, in New York city:—

DIATOMACEAE.

Amphiprora alata, Ehr.
Amphora ovalis, Ehr.
Cocconema cymbiforme, Ehr.
" gibbum, Ehr.
Eunotia amphioxys, Ehr.
" gibba, Ehr.
Gallionella crotonensis, B.
" aurichalcea, Ehr.
Gomphonema acuminatum, Ehr.
" constrictum, Ehr.
Navicula affinis, Ehr.
" cuspidata, Ehr.
" inaequalis, Ehr.
" mesolepta, Ehr.
" (Gyrosigma) hippocampus, Hass.
" (Gyrosigma) Spencerii, B.
" (Pinnularia) dicephala, Ehr.
" (Pinnularia) elliptica, Ehr.
" (Pinnularia) peregrina.
Stauroneis gracilis, Ehr.
Stephanodiscus Niagarae, Ehr.
Surirella solea, Ehr.
Synedra acus, Ehr.
" capitata, Ehr.
" ulna, Ehr.
" valens, Ehr.
" vitrea, Kg.
Tabellaria flocculosa, Ehr.
" fenestralis, Ehr.

DESMIDIEAE.

Ankistrodesmus falcatus.
Closterium lunula.
Monactinus octonarius, B.
" duodenarius, B.
Pediastrum ellipticum.
" heptactis.
Pediastrum Napoleonis.
" pertusum.
" simplex.
" tetras.
Scenedesmus obliquus.
Scenedesmus obtusus.
" quadricaudatus.
Staurastrum dejectum.
" enorme.
" gracile.

INFUSORIA AND CRUSTACEA.

Cyclops, several species.
Lynceus, several species.
Cypris, several species.
Spicules of spongilla.
Anguillulae, &c.

VIII.

TWO NEW SPECIES OF THE GENUS PERIDINIUM.

1. Peridinium longipes, B.

(PLATE, Fig. 35.)

Body triangular, rough; angles produced into very long ciliated processes, of which the two frontal ones are longest. Body crossed obliquely by a ciliated groove. Habitat, St. George's Bank.

This species is distinguished from *P. tripos*, of Ehrenberg, by its roughly granulated surface, its ciliated processes, and its triangular, not urceolate body.

Many specimens of this fine species were found in the stomach of the *Botryodactylis grandis*, Ayres, from St. George's Bank.

2. Peridinium depressum, B.

(PLATE, Figs. 33, 34.)

Lorica obliquely depressed, with one large conical posterior process, and two smaller conical frontal processes; the latter separated by a deep notch. Surface granular and reticulated.

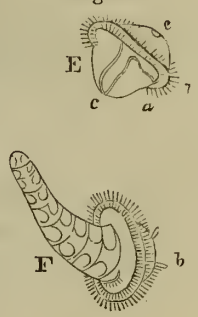
Habitat with the preceding.

Both of these species of *Peridinium* were doubtless furnished with a proboscis when living, and, like the other marine species of this genus, were probably phosphorescent.

The form of our species *P. depressum* (see Figs. 33, 34) is so analogous to the embryo of a *Nereis*, whose curious changes were studied by Loven, that I am induced to copy the figure and description of the latter, as given in Owen's *Lectures*, page 147.

He says: "Dr. Loven obtained, in August, from the Baltic Sea, a discoid animalcule (as in Fig. 4, E), which rapidly moved by means of two rows of vibratile ciliæ; the principal row being situated upon a projecting ring (*b*) at the margin of the disk. It had a mouth (*a*) and an anus (*c*) at the apex of the cone. The course of the alimentary canal was detected by feeding with indigo. In a short time, the cone began to elongate and to be divided into segments which were developed in four parts, the two principal pieces forming half rings, one on the upper, the other on the lower surface, which were united by two shorter lateral pieces. Coincident with this change was the development of a head from the discoid surface (*e*), upon which the black ocelli and then two pointed filaments or antennae (*f*) (Fig. 4, F) made their appearance. The length of the body and number of segments increased, the disk and cilia still existing. The disk is afterwards reduced to an appendage on each side of the head, and finally disappears. The new rings are added to the front of, and not behind the old ones. The tubular and setigerous feet are afterwards added."

Fig. 4.



This account, and particularly the comparison of the above figure with the form represented in the Plate, Figs. 33, 34, leads me to suspect that at least a portion of the forms which are now included in the genus *Peridinium*, may be imperfectly developed, or embryonic Annelids.

IX.

New Species of the Genus Cothurnia?

Cothurnia? perlepida, B.

(Plate, Fig. 27.)

Apex of the case attenuate, slightly curved; surface entirely covered with spiral decussating rows of hexagonal cells; orifice crenulate. Animal unknown.

Habitat, St. George's Bank and New Haven Harbor.

In order to give a name to the beautiful bodies above described, I have referred them, although with much hesitation, to the genus *Cothurnia*, to the cases of which they have much resemblance in shape. I have never found them in materials which have been acted upon by acids, although noticed prior to the action of the acid; which fact, added to the great transparency given to them by Canada Balsam, in which they become almost invisible, leads me to believe that they are membranaceous. Should they prove to be silicious, they might be referred to the genus *Rhizosolenia*. I have seen several specimens from St. George's Bank, and also one from the mud of the harbor of New Haven, Connecticut.

X.

American Species of the Genus Monactinus.

The genus Monactinus differs from *Pediastrum* of Meyen (*Micrasterias* of Ehrenberg), by having but one point or horn, instead of two, to each of the cells composing the circumference. Several forms belonging to this genus occur in the sediment filtered from the Croton water in New York, and those here described appear sufficiently constant in character to rank as species. As I cannot satisfactorily identify them with foreign species, I have ventured to give them names.

1. Monactinus octonarius, B.

(Plate, Fig. 36.)

Circumference composed of eight cells. Centre void.

Habitat: Croton water, New York city.

2. Monactinus duodenarius, B.

(Plate, Fig. 37.)

Circumference with twelve cells. Centre with three cells.

Habitat: Croton water, New York.

XI.

On some New Test Objects.

1. Much of the trouble experienced in resolving finely lined objects by oblique light, arises from the necessity for the lines to occupy certain favorable positions with regard to the light, which an unpractised observer may find it difficult to obtain. A test which shall remove this difficulty must be circular, with lines radiating in all directions, so as to require no displacement in order to get the most favorable illumination; for it is obvious that, on such a body, some portion will always be in the best possible position with regard to the light. A diatomaceous shell, which has lines thus arranged, and which at the same time presents dots and lines of sufficient delicacy, is the *Hyalodiscus subtilis*, B. (Plate, Fig. 12) from Halifax, Nova Scotia. The largest disks are as finely marked as the Greenport *Grammatophora*, while the smallest specimens are not easier to resolve than the *Grammatophora subtilissima*, B. from Providence, Rhode Island. It is probable that these Hyalodisci may be found in considerable numbers on our northern coasts, and if so, they will prove admirable test objects.

2. A test object, which is even more difficult to resolve than either Amici's test or the Providence *Grammatophora*, is presented by what appears to be a variety of Ehrenberg's *Grammatophora stricta* from Halifax. Lenses which easily resolved the two tests above mentioned, entirely failed to resolve the Halifax specimens, which only yielded to some new objectives ($\frac{1}{12}$ths) made by Spencer.

I should here state that, in the spring of 1853, I resolved the Greenport *Grammatophora* unmistakably by a $\frac{1}{4}$th of an inch objective made by Spencer, and subsequently by a $\frac{1}{4}$th recently made by Powell, of London, for Dr. Vanarsdale of New York. Mr. Spencer informs me that, since the above observations were made, he has greatly improved his objectives, so that his $\frac{1}{4}$ths will readily resolve the Greenport *Grammatophora*.

XII.

Marine Diatomaceae of Halifax, Nova Scotia.

As no observations have been recorded upon the marine Diatomaceae of Nova Scotia, I take pleasure in presenting the following list of species found in mud washed from Algae from the harbor of Halifax, N. S., viz :—

Actinoptychus senarius, Ehr.
Amphiprora constricta, Ehr.
Amphora stauroptera, B. Plate, Figs. 14, 15.
Bacillaria paradoxa, Ehr. (abundant).
Cocconeis scutellum, Ehr.
Coscinodiscus (several species).
Dictyocha fibula, Ehr.
Dictyocha speculum, Ehr.
Diploneis entomon, Ehr.
Diploneis didyma, Ehr.
Gomphonema minutissima, Ehr.
Grammatophora serpentina, Ehr.
" stricta, Ehr.
Hyalodiscus subtilis, B. Plate, Fig. 12.
Navicula (Gyrosigma) sigma, Ehr.
" " elongata, Ehr.
" " formosa.
" granulata, B. Plate, Fig. 16.
" (Pinnularia) elliptica, Ehr.
" " lyra, Ehr.
" " peregrina, Ehr.
" " (several undetermined species).
Rhabdonema arcuatum, Kg.
Stauroptera aspera, Ehr.
" oblonga, B. Plate, Fig. 17.
Synedra sigma, Ehr.

XIII.

New Genus of Diatomaceae.

Toxarium, Bailey.

Lorica very long and slender; bases with an undulating outline, swollen in the middle, and then contracted into two excessively elongated processes with enlarged and rounded ends. Sides with nearly straight parallel edges. Bases transversely striate. The sides show the ends of the basal striae.

Toxarium undulatum, B.

Plate, Figs. 24, 25.

Syn. *Synedra undulata,* B. ms. and specimens.

This interesting species, the only one of its genus now known, was found by me several years ago, attached in considerable numbers to *Sargassum vulgare,* in Narragansett Bay. I distributed specimens under the name of *Synedra undulata,* B., but I now think it should form the type of a new genus, characterized as above.

The length of *T. undulata* is about 35m., its width at the middle of the base is about $\frac{1}{3}$m., and the width of the narrow parts of the base is about $\frac{1}{8}$m.

Habitat: Narragansett Bay, R. I., and Peconic Bay, near Greenport, New York. At both localities it was found parasitic, like a *Synedra* upon *Sargassum vulgare.*

XIV.

I cannot close this paper without expressing my thanks to Mr. J. E. Gavit, of Albany, the engraver of the Plate. Whatever faults the figures may present are due to me; for Mr. Gavit has, with untiring patience, industry, and zeal, endeavored to make the Plate as perfect as possible. The figures 5, 12, 26, and 27, are particularly beautiful. Figures 10 and 12 really need a magnifier to see their details.

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