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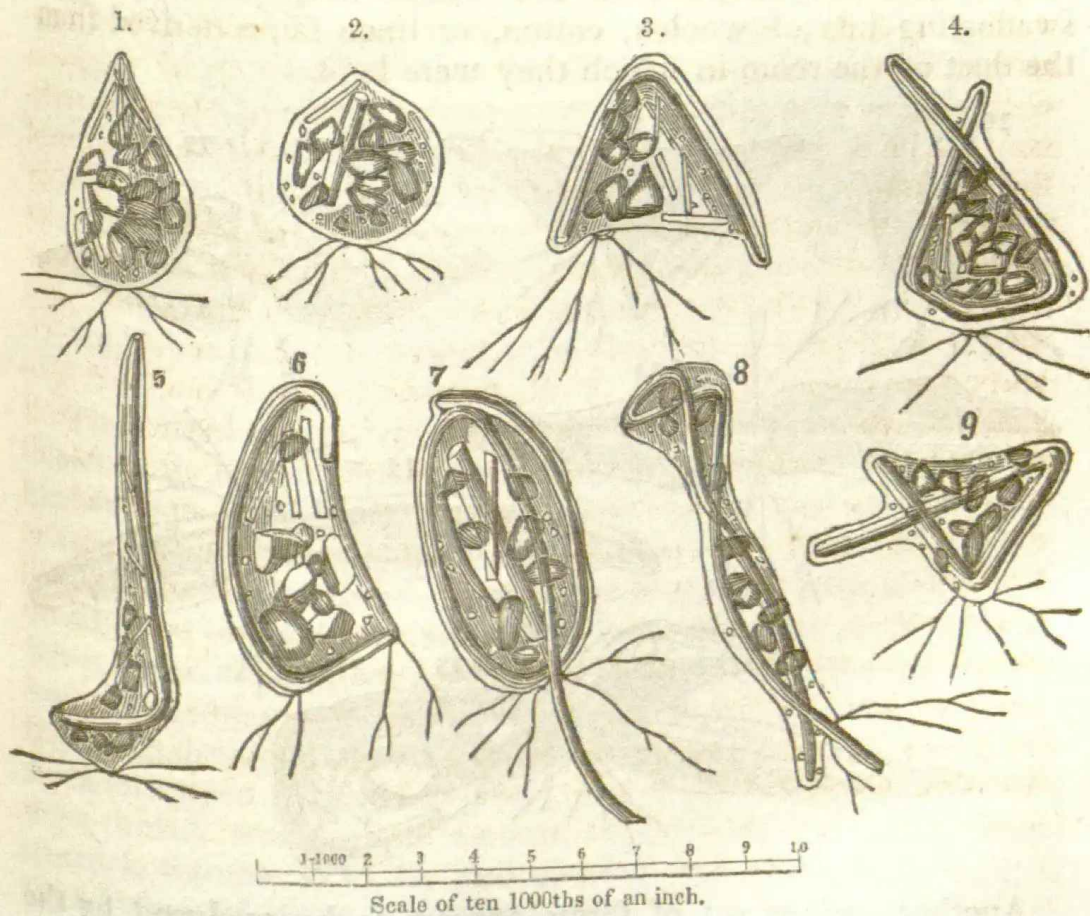
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ART. XXXVIII.—*Observations on a newly discovered Animalcule*; by J. W. BAILEY.

THE animalcules described in the following pages were found in great numbers in the bottom of a small vessel or "aquarium," in which colonies of *Plumatella*, *Melicerta*, and *Limnias* had been kept. Of all the forms which can with certainty be referred to the animal kingdom, there are few which at first sight are so little likely to be recognized as animals as those about to be described.

If the reader will imagine a bag made of some soft extensible material so thin as to be transparent like glass, so soft as to yield readily by extension when subjected to internal pressure, and so small as to be microscopic; this bag, filled with particles of sand, shells of *Diatomaceæ*, portions of *Algæ* or *Desmidiæ*, and with fragments of variously colored cotton, woolen, and linen fibres, will give a picture of the animal; to complete which it is only necessary to add a few loose strings to the bag, (figs. 1 and 2,) to represent the variable radiant processes which it possesses around the mouth.

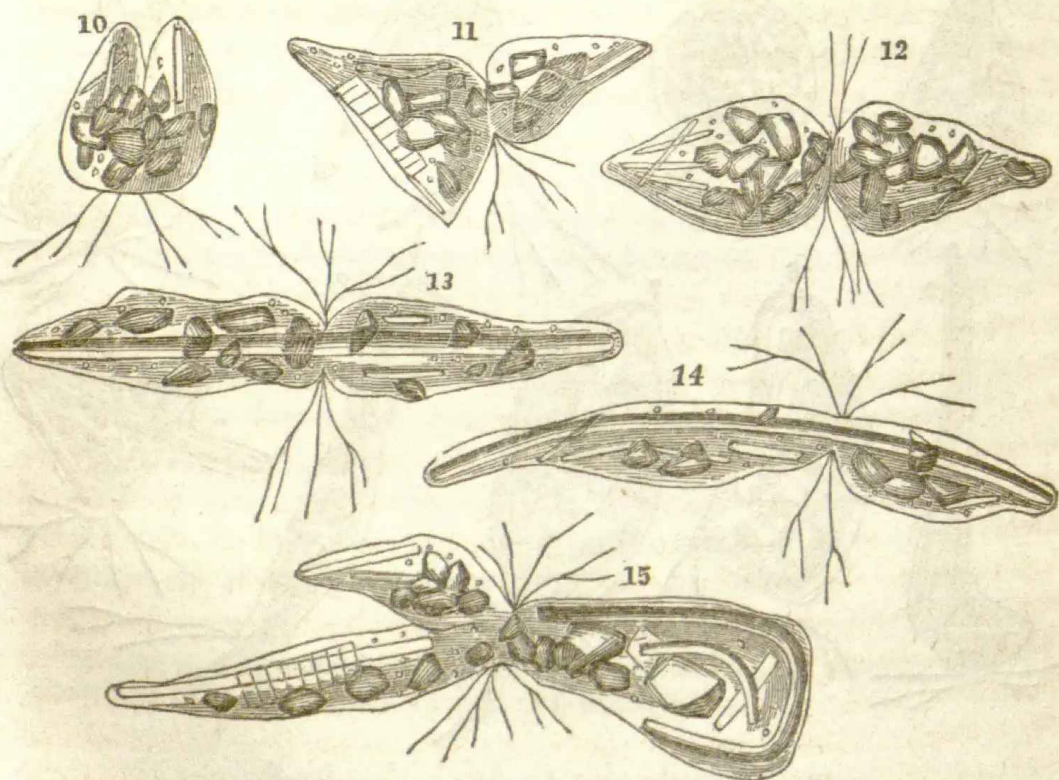


When I first saw these curious creatures they attracted but little attention, as I supposed they were merely excrementitious masses due to some of the aquatic animals living in the vessel

where they occurred. A more careful examination showed that they moved spontaneously and even with some degree of rapidity; and that this motion was due to radiant, branching, and variable feelers, or "rhizopods," which were thrown out near one extremity. By attaching these feelers to various objects the animal was enabled by means of them, to pull itself along, or to change its position at will.

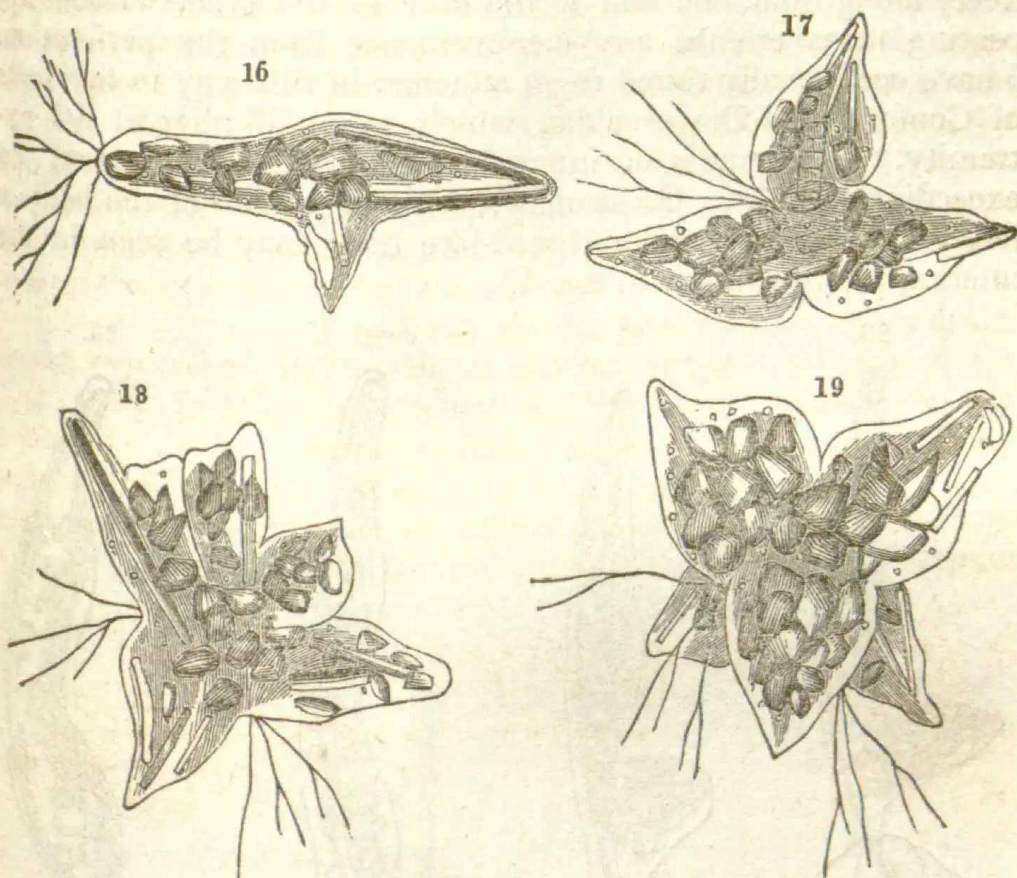
The most common form in which these creatures occur is that of a pear-shaped mass (fig. 1) having the feelers attached to the larger end, while the other end appears almost always to be pushed out and rendered acute by the presence of several long diatomaceous shells which the animals have swallowed. A globular or pyriform state (figs. 1 and 2) may be considered as the normal condition of these creatures; but the imagination can scarcely conceive of forms more varied and extraordinary than they assume in order to accommodate themselves to the shape of substances which they may have swallowed.

A better idea than words can convey of these bizarre shapes will be obtained by a glance at some of the figures, (figs. 3, 4, 5, 6, 7, 8, and 9, on the preceding page,) in which are represented various individuals in the shapes they presented after swallowing bits of woollen, cotton, or linen fibres derived from the dust of the room in which they were kept.



Another curious set of forms appears to be produced by the process of spontaneous fission or self-division, for I know not in what other way to explain such forms as those represented in figs. 10, 11, 12. It will be seen that these figures show what

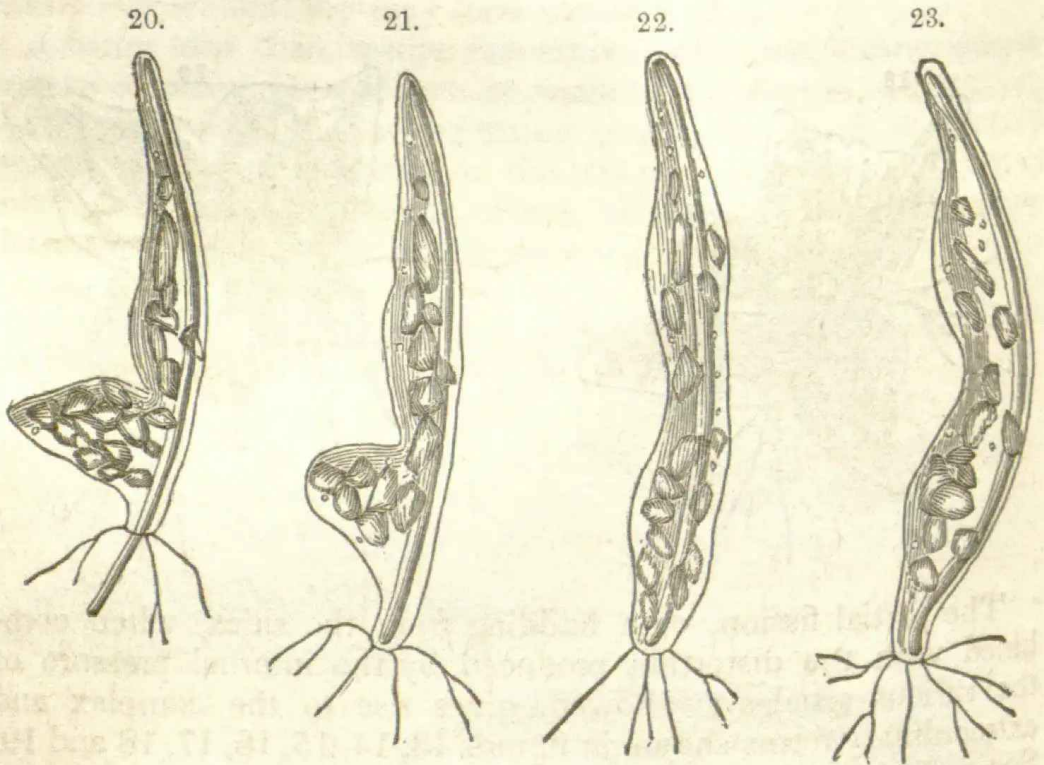
appear to be all the stages of fission from a slight depression in the posterior portion as in fig. 10, to an almost complete separation into two individuals, as in fig. 12, where a narrow isthmus alone connects the two portions. Although these successive states have not as yet been seen to occur in the same individual, I think the figures just referred to leave little doubt that the process of spontaneous division so common among animalcules is possessed by the creatures now under consideration.



The partial fission, or a budding from the sides, when combined with the distortion produced by the internal pressure of the various articles swallowed, gives rise to the complex and extraordinary forms shown in figures 13, 14, 15, 16, 17, 18 and 19. Some of these appear as if several pear-shaped individuals were about to be produced by a budding from the sides of the parent, but it is also certain that some at least of these sac-like projections are only temporary extensions produced by internal pressure. This was decided beyond a doubt by a series of continued observations upon single individuals, one of which, while swallowing a thread, was seen to assume successively the forms represented in figures 20 to 23, and another one while disgorging a thread changed shape as shown in figs. 24 to 31.

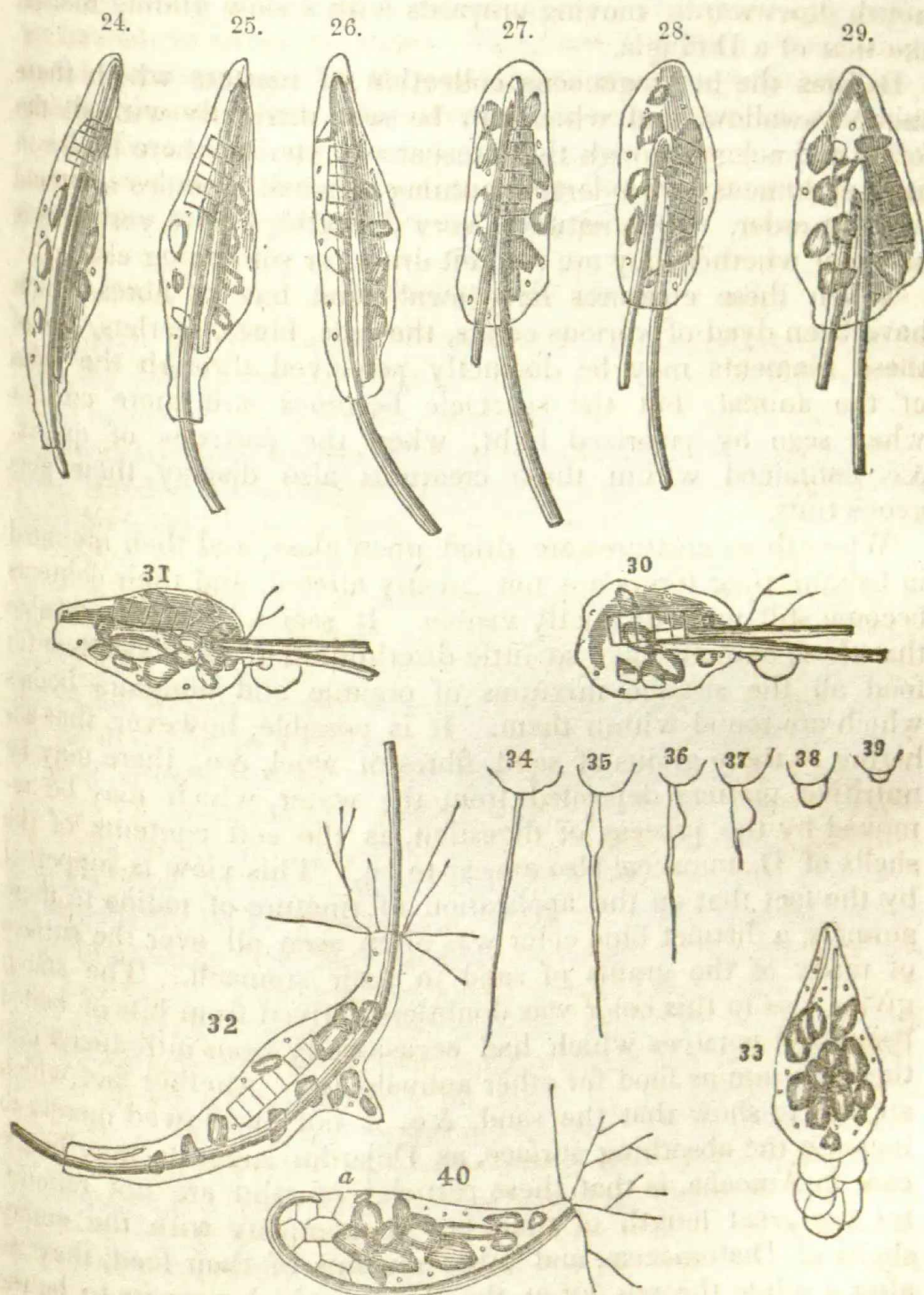
The substance of which these animals are composed is much like that composing the bodies of the various species of *Amoeba*, being soft, colorless, elastic and extensible. It is probably with-

out any true integument, and is colored yellow by tincture of iodine. It appears to resist internal pressure with considerable force, and it is but rarely that it appears to be completely broken through by any of the matters, however hard, which are contained within it. I have however found some individuals, as represented in fig. 32, which had voluntarily impaled themselves upon long fibres which were distinctly seen projecting through the animalcules at each end, and these animals were seen moving freely along from one end of the fibre to the other without appearing to experience any inconvenience from the perforation. I have occasionally found them attached in this way to filaments of *Conferva* and *Draparnaldia*, which were still alive at one extremity. The traces of internal structure or organization are exceedingly slight. Occasionally, when a portion of the body is left vacant, some slender thread-like lines may be seen in the interior, as shown at *a* in fig. 40.



In many individuals, (see fig. 33,) I have seen the protrusion from the mouth of transparent rounded masses, which rapidly succeeded each other until they were heaped up about the mouth like a set of soap bubbles and were then as rapidly drawn in again. The more common appearance however is that shown in most of the figures in these pages, where the mouth is surrounded by a considerable number of slender, colorless, radiant, branching, and retractile feelers, precisely like the rhizopods belonging to the marine *Foraminifera* or *Polythalamia*. When fully extended, these often exceed in length that of the body of the animal. They change rapidly from simple to branched, or

vice versa, and are at one moment seen in a state of tension, fig. 34, and then wrinkled and collapsed, as in figs. 35 and 36, or changed into various rounded processes (as in figs. 37 to 39) which can be wholly retracted. In figs. 34 to 39 are shown



some of these changes which were seen to take place in succession upon a single tentacle. These feelers, tentacles, variable processes or rhizopods are not like the pseudopods of *Amoeba*, mere protrusions of the surface, nor are they thrown out as in that genus from all parts of the animal. They on the contrary resemble those of a *Diffugia* in being confined to the vicinity of

the mouth; but they are much more slender and more repeatedly branched than in any *Diffugia* which I have seen. By means of these organs the animals pull themselves along, when lying upon their side, and they also creep by means of them, with the mouth downwards, moving onwards with a slow gliding motion like that of a *Diffugia*.

Besides the heterogeneous collection of matters which these animals swallow, and which can be seen distinctly with all the forms and colors through the transparent exterior, there is also in most specimens a considerable number of small globules scattered without order, whose nature is very doubtful, for as yet there is no proof whether they are ova, oil drops, or something else.

When these creatures have swallowed bits of fibres which have been dyed of various colors, the reds, blues, scarlets, &c. of these filaments may be distinctly perceived through the sides of the animal, but the spectacle becomes still more curious when seen by polarized light, when the particles of quartz, &c. contained within these creatures also display their gorgeous tints.

When these creatures are dried upon glass, and then mounted in balsam, their forms are not greatly altered, and their contents become still more distinctly visible. It seems scarcely probable that these animals have so little discrimination as to swallow for food all the strange mixtures of organic and inorganic bodies which are found within them. It is possible, however, that adhering to these grains of sand, fibres of wool, &c., there may be nutritive matters deposited from the water, which may be removed by the process of digestion, as the soft contents of the shells of *Diatomaceæ* also appear to be. This view is supported by the fact that on the application of tincture of iodine to these animals, a distinct blue color was often seen all over the surface of many of the grains of sand in their stomach. The starch giving rise to this color was doubtless derived from bits of boiled beans and potatoes which had occasionally been introduced into the aquarium as food for other animalcules. Another fact which appears to show that the sand, &c. is not swallowed merely to increase the absorbing surface, as Dujardin suggests may be the case in *Amoeba*, is that these particles of sand are not retained for any great length of time, but in company with the empty shells of *Diatomaceæ*, and other remains of their food, they are after a while thrown out at the mouth, which appears to be the only aperture for their reception and discharge. There appears to be no reason to doubt that the cavity into which all these bodies are received, is a true stomach, and they therefore manifestly cannot be considered as polygastric animals. As to the position of these creatures in the system of Zoology, it is evident that they belong to the Infusorial *Rhizopoda* of Dujardin, and

connect the genus *Amoeba* with *Diffugia*, agreeing with the first in the soft body without shell, but differing in having true feelers or rhizopods confined to the anterior portion of their body, and by not throwing pseudopods from other parts. From *Diffugia* and the whole family of *Arcellina*, these forms are distinguished by having no lorica or shell. They are, however, closely allied to the *Arcellina*, and are very nearly what some of the species of this group would be, if deprived of their rigid external coverings.

In order to give to these curious beings at least a temporary name and place, I propose to found for their reception a new genus named and characterized as follows, viz :

PAMPHAGUS, nov. gen.

Animals of the class of *Rhizopoda* (intermediate between *Amoeba* and *Arcellina*) without shell or lorica, and composed of a soft colorless matter easily extended by internal pressure, but not spontaneously protruded into pseudopods. Feelers or rhizopods, slender, numerous, radiant, branching and confined to the neighborhood of the mouth.

Species 1. *Pamphagus mutabilis*.—This species, which is the only one now known, is sufficiently described above. Its habitat is probably the bottom of small pools and streams of fresh water, as it was found in vast numbers in an aquarium supplied from such places in the vicinity of West Point. It will probably be found to be a common form, and as it presents the conditions of animal life in almost the lowest degree of simplicity, and can be preserved and studied with great ease, it will well reward the attention of microscopists. I have thousands of these animals now living in mid-winter, and with a little care they may probably be kept until the return of warm weather, when other interesting facts may possibly be added to the observations here recorded. The sketches above given, except figs. 34 to 39 inclusive, are all drawn to the scale on page 341, which shows ten one-thousandths of an inch equally magnified with the drawings. These sketches were all made by means of a camera lucida eye-piece attached to the microscope. The objective employed in making these drawings was a new one of surpassing excellence, of $\frac{1}{2}$ inch focal distance, made by Spencer.

West Point, N. Y., Jan. 14, 1853.