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ON AN EASY METHOD

OF

VIEWING CERTAIN OF THE DIATOMACEÆ.

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On an Easy Method *of viewing certain of the* Diatomaceæ.

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We shall most certainly add not a little to the chances of increasing our knowledge of the intimate structure of the infusorial tribes, if any means can be suggested by which the number of observers may be increased. Possessed of a good microscope by one of our principal makers, a student may imagine that he is in a condition at once to ascertain the exact form and nature of certain shells of Bacillaria, certainly amongst the most difficult of test objects; a very few trials will, however, convince him that even the best-constructed *eighth* will not fully display their peculiar markings without some accessory instrument. For this purpose the achromatic condenser of Mr. Gillet, as made by Mr. Ross, or the achromatic condenser of Powell and Lealand, or of Smith and Beck, is usually employed. The purse, unfortunately, of the most enthusiastic labourers is not always the heaviest; a microscope is bought and added to from time to time, and the condenser, so much coveted, must often be waited for some years.

We propose in the present paper to show how, for a few shillings, this apparatus may, for a time at least, be dispensed with; and how the *Pleurosigma Hippocampus*, *Pleurosigma formosum*, *Pleurosigma angulatum*, and other individuals of this genus, may be shown in the most satisfactory manner; and we almost envy the sensation of delight which must be experienced on using this simple means of illumination, and beholding for the first time the wonderful markings and brilliant colouring of many of these dust-like atoms, found alike in the clearest waters, in the strongly acidulated, and in the salt fluids of the various zones of the earth. "In springs, rivers, lakes, and seas, in the internal moisture of living plants and animal bodies, exists," says Pritchett, "a world, by the common senses of mankind unperceived; for, in the ordinary pursuits of life, this mysterious and infinite kingdom of living creatures is passed by without knowledge of, or interest in, its wonders." To facilitate the investigation of these wonderful organizations the present paper has been written.

The discovery of this method of exhibiting the *Pleurosigma angulatum* was perfectly accidental, and so far as I know it has not been published; at any rate, Messrs. Powell and Lealand were wholly unaware that such an effect could be produced, on my communicating it to them.

With many microscopes is furnished, for the purpose of a dark-ground illumination, what is called a "*spotted lens;*" by this means the object itself appears beautifully illuminated, while the entire field by which it is surrounded is perfectly dark; the effect is produced by preventing any rays of light, reflected from the mirror, passing through the object: this is accomplished by placing a dark stop beneath the latter. The arrangement, however, is such, that any oblique rays will impinge upon the object, and after they are refracted by it, they will pass into the object-glass; consequently, the result being, that the only rays transmitted through the instrument, are those thus refracted from the object, it appears beautifully bright whilst the surrounding field is black. The accompanying engraving explains the instrument used by myself, the cost of which was only 7*s.* 6*d.*: *a*, the brass tube, fitting either into the usual brasswork of the achromatic condenser of Smith and Beck, by which it can easily be moved up and down and correctly adjusted; or, as in the microscopes of Mr. Salmon, into a small piece of tube adapted to the diaphragm; *b b*, the lens removed from the tube. The drawings are the exact size of the different parts of the apparatus.

This instrument is usually employed with the lower powers (*the inch* and *two inches*), when the appearance is that already described. On using it with a quarter constructed for me by Mr. Ross, the angular aperture of which is 85°, with a 1-5th of Smith and Beck's (angular aperture of 100°), and with a very beautiful 1-8th (angular aperture 126°), made for me a few months ago by Powell and Lealand, I was astonished to find a field perfectly clear and white, and the illumination little, if at all inferior, to that produced by Gillet's condenser, or the one I generally use myself, which was made for me by Smith and Beck. The first object I tried it with was *Pleurosigma angulatum* (the *Navicula angulata* of Quekett), which after a little trouble I was enabled to exhibit most beautifully in dots; and two experienced friends, Dr. Branson and Mr. Gregory, in common with myself, were much struck, not only with the very beautiful manner in which the object was shown, but also with the rapidity with which the adjustment could be effected.

An experienced artist, Mr. C. J. Fleming, has carefully

Fig. 2.

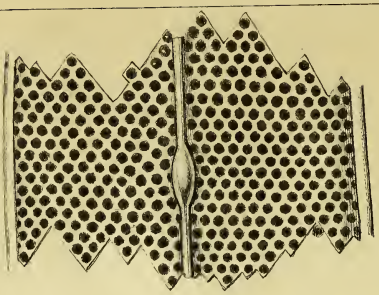


Fig. 3.

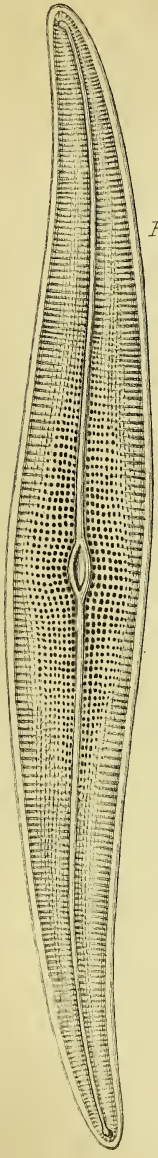


Fig. 1.

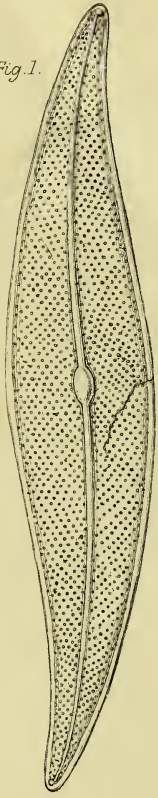


Fig. 5.

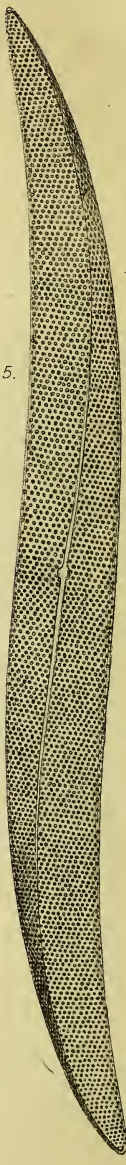
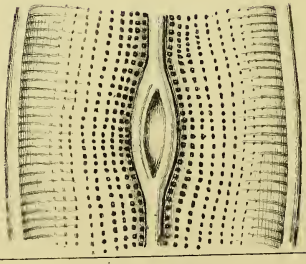


Fig. 4.



C. J. Fleming del. Tuffen West sculp.

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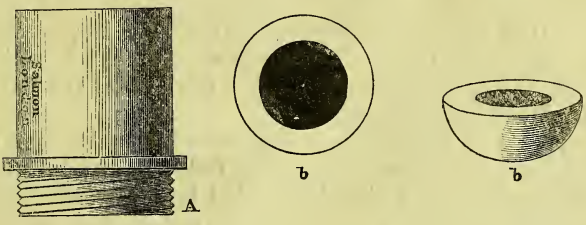
sketched, from my microscope, the actual appearance of the objects shown with this peculiar illumination, which at once places in the hands of every student a ready and very cheap method of exploring a field abounding with objects of the most wonderful forms, and the internal structures of which, as organized living beings, cannot fail amply to repay the most diligent research.



These drawings, most beautifully engraved by Mr. Tuffen West (Pl. XIII.), will show the student what he has to look for, and so far as I know they give a better representation of these beautiful objects than any yet published; for however well calculated the plates in the works of Quekett, Pritchett, or Smith, are to show the forms of the different *Diatomaceæ*, they fail, to my eye, to do justice to the wonderful appearances actually exhibited by these shells. Perhaps it should be added that the glass I generally use is an eighth, constructed by Powell and Lealand; with a 1-5th of Smith and Beck, or a 1-4th of Ross, the markings may also be very well seen. The light was obtained from the very complete gas lamp of Mr. Highley.

In order to show these objects in a satisfactory manner, the most careful manipulation is required; they must be covered with the thinnest possible glass, and the slide should be perfectly clean and free from damp, otherwise the field will have a milky appearance. In using the spotted lens, every part of the microscope must also be perfectly clean and free from dust; the *concave mirror* should always be used with it. When due precautions are taken, points of structure can with its aid be easily made out not seen by the ordinary methods of illumination.

What may be the exact nature of the striæ is not easy to determine. "Whenever," says Mr. Quekett, "these infusoria are viewed under the most favourable illumination, either from a white cloud or a lamp with direct light, and a magnifying power of at least 1,200 diameters, the lines are

all shown to be dots or elevations from the surface." * The Rev. W. Smith † considers the true character of these markings to have been mistaken: "some observers having considered those appearances to arise from a series of perforations, others from rows of beads or minute elevations." From the close manner in which the striæ are arranged, their resolution is amongst the most difficult tasks in microscopy. After having given to the subject no little care and attention, with an eighth object-glass made by Messrs. Powell and Lealand (the beautiful defining powers of which it is impossible to estimate too highly), and a very deep eye-piece, I have little hesitation in now concluding with Mr. Smith that the form of these markings is hexagonal.

In speaking of these curious structures it will be seen that the division of Mr. Smith has been followed; and that the genus *Navicula* of Kützing is divided into *Navicula*, distinguished by the delicacy of the striæ, and their moniliform character; *Pinnularia*, from the striæ, owing to the confluent nature of the cellular structure of its epiderm, having the appearance of distinct costæ; and *Pleurosigma* from the characteristic curve of its beautiful frustules.

* Quekett on the Microscope, 2nd Edit., p. 475.
† Smith, vol. i., pp. 61, 62.

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