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TRANSACTIONS OF THE SOCIETY.

VII.—*On the Structure of certain Diatom-valves as shown by sections of charged specimens.*

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(Read 15th April, 1891.)

PLATE VIII.

IN a paper which I had the honour to read before this Society on the 19th of March, 1890, it was demonstrated that the "striae, dots," &c., of very various forms of diatoms were cavities of some kind, inasmuch as they could be filled with opaque foreign matter, e. g. platinum or the sulphides of mercury or silver. I added, "Whether these lacunæ are complete perforations through the silicious test or mere pits or depressions on the inner or outer surface of the valve, or more or less flask-formed cavities communicating by one or more canals with the inner or outer surface, or with both, cannot at present be resolved with any degree of certainty in the case of those diatoms which have the finer markings."

Since writing the above I have found among my slides a few fragments of charged diatoms so tilted as to give a clear edge view of the fractured shell. Some of these I have photographed, and they seem to me to show clearly that the lacunæ in these cases at any rate extend from face to face and are not mere surface depressions.

Photograph No. 1, taken from a specimen of *Cocconema lanceolatum*, gives, at the points inclosed by the bracket, a picture of a broken edge which is not quite straight, and therefore not in sharp focus everywhere at once. It shows the mercurous sulphide filling the pores or lacunæ and extending, apparently, from face to face of the shell. The same thing is seen in optical section only and confused by interference lines in the other margin of the valve as photographed.

When examining the original slide (and others which I have not photographed) by help of a good 3 mm. apochromatic objective N.A. 1.4, and careful adjustment of the light, I think that I can detect the presence of a limiting film of silica, on the outer face at least, corresponding to the cell-cappings of the coscinodiscs.

Photo No. 2 shows the same things in the case of the more finely dotted *Stauroneis phœnicenteron*.

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Photo No. 3 is taken from a valve of *Pleurosigma Balticum*. In this case, as the structure is so very minute, and as I have not been able to find even a second specimen presenting the same aspect to view, I bring forward an isolated example for what it is worth. As however the picture it gives is entirely in accordance with what we should expect to see, judging from analogy with the coarser forms cited and illustrated above, and about which no doubt can exist, I consider it is a substantially true representation, and that in this *Pleurosigma* at any rate the dots represent cavities which extend from face to face of the shell.

The question as to whether these pores are absolutely complete perforations through and through the walls of the valve or have any sort of operculum or capping on either or on both faces, as is the case with the large discoid diatoms, is one which can hardly be decided by optical means. But the way in which various precipitates are retained in the pores in resistance to violent agitation with water, leads me to incline strongly to the opinion that such "cappings" exist. Moreover, in the case of one large and coarsely marked form of *Epithemia* the "secondary markings," i. e. the perforations of the cappings, are plainly visible in an imperfectly charged specimen of which I now exhibit a photograph (No. 4).

I must apologize for again trespassing on your attention with such a threadbare subject as diatom markings, but plead that it is done in the hope of finally laying to rest a subject of controversy which has engaged a most disproportionate amount of attention.

There is indeed still one aspect in which the subject may even yet be regarded as of serious interest. So long as the structure of these much studied organisms remains in doubt, so long must a great feeling of uncertainty prevail as to the value to be attached to the interpretation of appearances presented by other minute structures under the Microscope.

Now, if by any means we attain to a feeling of comparative certainty as to the truthfulness of the visual impressions received from the Microscope in any one case of minute structure, we *pro tanto* increase our confidence in the reality of the things pictured to us in those cases where none but purely optical means are available in making out the subject under examination. This method of filling the pores of diatoms has rendered it certain that the conclusion previously arrived at by observers like Messrs. Flögel, Weiss, Van Heurck, H. L. Smith, Cox, Nelson, Morland, and others, viz. that the dots, &c., on diatoms were perforations or depressions, and not beads, was substantially correct, and that therefore the microscopic images on which they founded their opinions were at any rate approximately true images. Hence we derive the comforting assurance that we need not receive with utter distrust the conclusions arrived at by the study of microscopic images, even in those cases where the close approximation of minute structures must lead to the production of endless diffraction spectra.