REMARKS ON STEPHANODISCUS NIAGARÆ.

By C. M. Vorce, F. R. M. S., Cleveland, O.

The conclusions of Gov. Cox [see paper at page 33] are corroborated by some observations made by myself a few years since, I think in 1879, on a diatom very common in the water supply of all the cities on the great lakes, viz., the *Stephanodiscus Niagaræ*. This is a familiar diatom, and in its normal state the frustule has considerable depth, about $\frac{1}{3}$ the diameter of the valve. As gathered in its fresh living state the endochrome in this diatom is very distinct and is plainly seen to line the surface of the two valves with a thick layer, while a stout central cord connects these two valve layers into one mass. This condition, the normal mature state of the diatom, is shown in *fig. 1*.

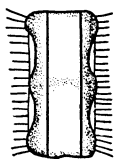

Fig. 1

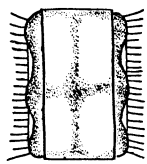

Fig. 2

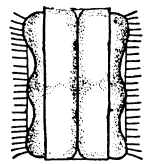

Fig. 3

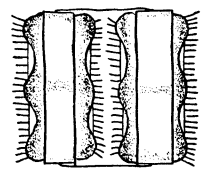

Fig. 4

By examining continuous series of gatherings, daily, or nearly so, the entire process of division can be seen in this diatom. The first change noticed is that the connecting zone or hoop is widening. Whether the growth of the hoop during this widening takes place along the edges only, or otherwise, I do not know, but certain it is that this hoop widens out and the box of the frustule becomes consequently deeper until it is often as deep as it is wide. Contemporaneously with this growth of the silicious wall of the frustule the endochrome increases in quantity, and as the time for division comes on forms a central mass, which finally extends to the outer wall, so that now in addition to the thin layer lining all the interior

of the frustule, there are three main masses of the endochrome, one spread over the inner surface of each valve and another occupying the center of the frustule. *Fig. 2* shows this condition of the diatom.

Up to this time there is nothing to be seen of the silicious walls except the outer walls of the original frustule; but at about this time there will suddenly be discovered an extremely fine line of division crossing the center of the frustule in the middle of the central mass of endochrome. This is almost invisible at first, but gradually becomes more distinct as it thickens and grows stronger. At first it is soft and flexible, and is undoubtedly a vegetable membrane devoid of silex, or nearly so: in frustules pinched by the cover as the water evaporates, this membrane is often seen bulged out by the pressure of the fluid contents of the frustule, especially if one valve be broken. Later on, as this membrane thickens, it shows double at the outside of the frustule. *Fig. 3* shows this condition, and finally it becomes double clear across the frustule, and begins to exhibit indications of the future spines of the new valves. The frustule has now become double, composed of two frustules, each of which has its outer valve thick and strong with long spines, and its inner new valve thin and fragile, with only rudimentary spines. The endochrome in each of the frustules is disposed as it was in the original frustule before division began.

As growth in the new valves goes on, they become, of course, thicker, and separate from each other further and further, being apparently pushed apart by the growth of the lengthening spines, until finally they are sometimes half as far apart as the width of the original frustule. The hoop of the parent frustule goes on widening to accommodate this growth until when the two new frustules are completely grown and "ripe," so to speak, they present the appearance shown in *fig. 4*, and are ready to separate and repeat the process each for itself. One or both of the new frustules now drops out of the hoop, and it is not uncommon to find the wide hoop with one frustule attached and one gone. The separate hoop is also sometimes found, but I have never seen a frustule beginning division with the old hoop attached, nor any approach to the formation of a chain as in Melosira. In fact, so far as my observations go, *fig. 1*

is the beginning and *fig. 4* the end of the cycle of growth and division. I do not know whether these observations are new or not; but I submitted them and my views concerning them to Prof. Smith, now our President, at the time they were made, and he agreed with me fully in the respects I have stated here, although he did not concur in my suggestion that *Actinocyclus Niagaræ* might perhaps be the sporangial frustule of *Stephanodiscus Niagaræ*. However that may be, the point to which I cite these observations is that in the division of the frustule in this diatom, S. *Niagaræ*, the new valve is formed by the deposition of silex from the fluid of the frustule contents or from the surrounding water in or upon a membrane previously formed, and not by growth along an edge; and if this is so in the case of the valve it may naturally be so in the case of the connecting zone or hoop.