VIII.—*The Thallus of the Diatomaceæ.*

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THE study of the living diatom has lately engaged the attention of many eminent foreign diatomists (M. P. Petit, Paris; M. J. Deby, Belgium; Count Castracane, M. Ardres, and others). The latest published observations are those of M. le Dr. Lanzi, of Rome, in his paper * on the "Thallus of the Diatomaceæ." By thallus is to be understood the stipes, cushion, tube, frond, or mucous pellicle. The latter is the material by which the film of diatoms is attached to wet walls, buttresses of bridges, &c. He communicates some interesting facts connected with the reproduction of these remarkable organisms. "In a gathering of *Epithemia ventricosa* made in the Villa Pamphilia, in Rome, I observed that some portions of the pellicle were composed of a great quantity of round granular corpuscles of a greenish-yellow colour. Most of these corpuscles were, to all appearance, the same as those contained in the interior of the frustules of the *Epithemia*, and imbedded in a hyaline plasma. Such was the resemblance, that no one could doubt that the granular bodies in the plasmatic thallus and those in the frustules were alike.

"At another time I made a gathering in a fountain in the interior of the Forum of Trajan, of a *Cymbella* in a state of reproduction, and I was again able to see the round corpuscles. They were very small, and of the same colour as the endochrome. They were contained in the thallus, and resembled those in the frustules. I followed these germs through their phases of development; and by repeated observations I ascertained that, whilst increasing in breadth, they preserved their circular form; that afterwards they commenced to elongate, in order to acquire the lunate and naviculoid outline of the mature frustule.

"Of these growing forms, some remained attached to the thallus, and some became free. The number of these corpuscles was considerable; and one was easily convinced that they were the result of a new kind of generation. The disparity in size was so considerable, that it would have been absurd to suppose that they had been produced by fissiparity.

"I am able to report other similar facts observed in *Navicula ambigua*, *Nitzschia minutissima*, *Amphora ovalis*; but of these I shall say nothing, in order to avoid useless repetitions, and shall confine myself to describing *Gomphonema olivaceum* only, in which I have followed the series of transformations from the time the frustule containing the germs had changed into a sporangial cell,

* See 'Annales de la Société Belge de Microscopie,' vol. iv.

until the thallus became charged with germs and frustules in various stages of development. In this same thallus was also seen the gradual transformation of the corpuscles into rudimentary frustules, their growth, and lastly the development of the dichotomous peduncle. When this cycle was completed, the thallus contained three different forms—the sessile sphenelloid form, the pedunculate (either simple or dichotomous), and the perfect or free form. From the preceding, it appears that there arrives a time when the plasma contained in the siliceous cells acquire a considerable volume, owing to the rapid development manifested at the time of reproduction, and which cannot be contained within the walls of the frustule by reason of the want of elasticity produced by the deposition of silice. The frustules being unable to follow the growth of the plasma, the valves separate from the pressure; but previous to arriving at this condition, the protoplasm had commenced to undergo the changes necessary to the formation of the new cellules, and we are able to see an aggregation of hyaline masses destitute of an external membrane. These are the Moneres of Haeckel. Amongst them are some that remain for a long time as plastid gymnocytodes—that is to say, without an external membrane, as named by Haeckel—and form in this manner the amorphous or indefinite thallus (*mucus matriculis* of authors); whilst those that take the form of stipes, peduncles, cushions, or some definite form, appear to belong to the plastid lepcytodes, that is to say, invested with an extremely thin external membrane. This membrane, although scarcely visible with the Microscope, nevertheless limits the outline of the thallus. . . . I have determined to place the above-mentioned facts before diatomists, in order to call their attention to the study of the thallus of diatoms. The study of the function of the thallus in this large family seems to me to be full of interest.”

The presence of this “thallus” is by no means uncommon. I have detected it in many diatomaceous gatherings, particularly those from fresh water, but I never saw the corpuscles Dr. Lanzi mentions; they may not have been present, or, what is equally probable, I overlooked them. However, the discovery is of great interest; and I hope, with Dr. Lanzi, that other diatomists will turn their attention to the study of the living forms. The reproduction of the Diatomaceæ has not received that amount of attention the subject deserved. Their increase by self-division was the method first observed, more careful observations led to the detection of conjugation and production of sporangial frustules, or the formation of a sporangium by a single frustule; and we now find that another method has been observed, viz. that just described by Dr. Lanzi.

The author's figure (1) represents a number of circular bodies immersed in the thallus of *E. ventricosa*, and also in the frustule;

(2) thallus of *Cocconema cistula*, representing the corpuscles in various stages of development. Unfortunately the amplification is not stated, a matter of some importance. It is also to be hoped that Dr. Lanzi will make some experiments to test the power possessed by them to resist desiccation without losing their vitality. In Herr Grunow's "New Diatoms from Honduras," 'M. M. J.,' vol. xviii. p. 184, Pl. 196, Fig. 4*b*, is described and figured a curious abnormality of *Cerataulus lævis*. Within the large frustule are two very small ones. Herr Grunow asks, "In what manner do these abnormal frustules multiply and reproduce a new series of normal forms? Certainly not by conjugation or self division." Professor Cleve* figures a frustule of *Biddulphia aurita* with a small frustule within. In a note (p. 184), I suggested "that the endochrome, under certain conditions, might possess the power of producing (? by means of microspores) perfect frustules without conjugation." Dr. Lanzi's discovery confirms my supposition, and explains the formation of the small frustules within the large one.

* 'Bihang till Vet. Akad. Hand.,' band i. tab. iv. fig. 3*a b*.