

Diatoms vary greatly. These are generally more or less convex on the outside and concave on the inside, increasing in this manner the capacity of the cell and at the same time enabling it more readily to resist the external pressure which would otherwise tend to crush it. Not only are the forms of the two valves in most cases symmetrical with each other, but each valve is divided in many species into two similar portions by a central rib, called a "raphe," which serves to strengthen the valve.

In the centre of this raphe, and sometimes at its two extremities, swellings called "noduli" often occur. The central nodulus, instead of being round, is sometimes extended so as to form a kind of cross which is named a "stauros."

Although in a great number of species a central raphe occurs, in many others no such structure is to be found. Hence, upon the presence or absence of this raphe, Professor H. L. Smith has proposed a new classification of Diatoms, distinguishing them into *Raphidieæ*, *Pseudoraphidieæ*, and *Cryptoraphidieæ*. It is to be remarked that this classification has the defect of not being natural, and, moreover, it would seem that the *Cryptoraphidieæ* should be called *Araphidieæ* or *Anaraphidieæ*, inasmuch as none of the types included exhibit traces of the existence of a raphe or of any other analogous arrangement. Nevertheless, since this system has the merit of simplicity, and has already been adopted by the Austrian naturalist Albert Grunow, and by Dr Henri van Heurck in his *Synopsis des Diatomées de Belgique*, it will be followed in the present Report.

Diatoms, like all other living organisms, multiply and reproduce themselves. Multiplication, however, is not to be confounded with reproduction, but is to be understood as an extension of individual life. Multiplication by duplication or division occurs in many members of the vegetable kingdom; on the other hand the process of reproduction is common to every living thing. That multiplication by duplication is of frequent occurrence in Diatoms is proved by the fact that it has been already observed in forty or more different species, yet it would appear that it ought to be regarded not as normal but as exceptional. This process, which is also called fissiparous division or temno-genesis, takes place as follows: (1.) the nucleus or cytoblast becomes bisected; (2.) a central contraction of the internal protoplasmic mass takes place, and proceeds so far that the latter becomes completely divided; and (3.) a double wall or diaphragm, which contemporaneously extends to the circumference in a direction normal to the ring or cingulum, is formed. In this manner the primitive mother frustule gives origin to two perfect daughter frustules, each of which is provided with an old and a new valve, the latter being somewhat smaller in diameter than the former as its hoop is embraced by that of the old valve. The process of duplication, as it progresses, must in this way lead to a marked diminution of the diameter of the new frustules, and in a short time these would become so small that they would be no longer characteristic of the species. In order, however, to counteract this progressive diminution it is to be noted that the siliceous walls