

NOTE on Dr. HINRICH NITSCHÉ'S PAPER on "SOME INTERESTING POINTS concerning the MODE of REPRODUCTION of the BRYOZOA." By the Rev. THOMAS HINCKS, B.A.

IN the following brief communication I propose to offer one or two remarks on the important paper by Nitsche published in the last number of this Journal, in which he criticises some of the views of the eminent Swedish naturalist Smitt respecting the reproduction of the *Polyzoa*. I shall confine myself at present to a single point, the theory of the "germ-capsule" ("*groddkapsel*") of Smitt. This term has been employed to designate the dark-coloured, more or less circular bodies, which are commonly present in the older cells of the Polyzoan colony, and were long regarded as ova. Smitt claims to have established the very interesting fact that they are in reality produced by the decomposition of the polypides previously in possession of the cells, and that they originate fresh zooids to fill the places of those which have thus disappeared. He describes the "germ-capsule," as it occurs in several species, and also the evolution from it by budding of a new polypide.

Nitsche, while admitting the correctness of Smitt's views respecting the *origin* of the "*groddkapsel*," denies that it is "in any way concerned in the reproduction of a new polypide in the deserted cells." The *buds* which the Swedish naturalist describes and figures as proceeding from the germ-capsule, he has satisfied himself, take their origin from the endocyst. From their position they are often in close contact with the "brown bodies," and this circumstance has led to an error of observation and, consequently, of interpretation.

Upon this I remark that the mere *ipse dixit* even of so able and accomplished an investigator as Dr. Nitsche cannot be accepted as against the careful and patient observations of Smitt, accompanied as they are by illustrative drawings, which tell their own tale. The supposition that in so simple a matter and in such numerous cases there has been a blunder of observation is almost incredible on the face of it, and is hardly just to a most competent microscopist. It must be remembered that it is not a difficult problem in histology, demanding for its solution great resource and very delicate manipulation, that is at issue; but that the question simply is, whether certain buds originate from the inner wall of a cell, or from a body lying in the centre of the cell, a point which it certainly requires no special gifts to determine.

Smitt states that he has seen a polypide sprouting from the "germ-capsule," and he has figured the nascent bud;¹ and the weight of this positive evidence will hardly be affected by the bare statement that Dr. Nitsche "has satisfied himself" that it is otherwise.

Our author would seem not to have appreciated the kind of evidence on which Smitt grounds his opinion, for he writes, "the fact that they (the 'groddkapslar') are often found associated together with a new bud of a polypide forces upon him the conviction that this new bud is the descendant of the brown body." As I understand him, this is by no means the case; he does not rely on an inference, but on direct observation. The conviction has resulted from his having seen the bud forming on the germ-capsule.

Dr. Nitsche supplies us with little evidence in support of his own view, but he finds a proof that the appearance of a new polypide in a lodge is in no way connected with the presence of a "groddkapsel," in the fact that he has observed (in the case of *Alcyonidium hispidum*), a new polypide budding from the endocyst "in the centre of the upper wall of the cell," while the original occupant still retained its position and shape, and therefore before the formation of a "groddkapsel." I do not for a moment question the accuracy of this observation; I have a great deal too much respect for Dr. Nitsche's powers as a microscopist to do so. But I submit that it is no proof whatever that new polypides do not *also* originate from the "germ-capsule," as Smitt reports. The base is much too narrow for the superstructure that is reared upon it. It would be too much to require us to believe that, because Nitsche has seen a new bud originating from the endocyst, Smitt must be in error when he tells that he has seen one originating elsewhere.

We have, perhaps, hardly a right to expect any detailed evidence in a mere "preliminary sketch of his views," which is all that Nitsche's paper professes to be, though some slight account of the process by which he has reached his conclusions would have been satisfactory. But in the absence of it we may reasonably regret that the explicit testimony and laborious research of Smitt should have been summarily disposed of by the dictum, "I have satisfied myself that the 'brown bodies' ('groddskapslar'), being in no way endowed with any reproductive function, are mere remains of decaying polypides."

The Swedish naturalist, however, will no doubt speak for himself and make good his position. It is my principal

¹ Vide Smitt's paper, plate v, fig. 5, s.

object in writing to put on record the results of my own independent observations, which, so far as they go, are entirely in agreement with those obtained by Smitt.

I have studied the history of the "germ-capsule" more or less in many species, but more especially and most thoroughly in *Bicellaria ciliata* (Linn.). In general structure it is a granular mass, of somewhat variable form, enveloped in a membrane, which is thickly covered with pigment spots. It is found attached to the cord that connected the polypide with the base of its cell, occupying, indeed, much the same position as it did when an integral portion of the digestive sac. The first sign of its having entered upon a course of development is the appearance of a clear space, and then of a small swelling or protuberance on its upper surface. This bud is of a light greyish colour, and shows distinctly in contrast with the dark reddish-brown of the capsule itself. It increases in size, and is gradually moulded into a tentacular crown and rudimentary intestinal canal, and at last a perfect polypide replaces the original tenant of the cell. The budding tentacles are of a light colour, while the lower portion of the "groddkapsel" retains its dark-reddish tint, so that the course of development is easily followed. It seems to correspond very closely with that which has been described by Nitsche in his account of the development of the primary cell from the larva in *Bugula flabellata*.¹ I have sketches of various stages of growth, made at the moment of observation, which would have accompanied this paper had there been time for the preparation of the engravings.

I may remark, further, that Nitsche's opinion, that the so-called "germ-capsules," or "brown bodies," in the cells of the Polyzoa, are "mere remains of decaying polypides," is quite inconsistent with the history of their formation, which has not received sufficient attention. The "groddkapsel" is in no true sense "the remains of a decaying polypide." It is a special body, elaborated out of the substance of the polypide, passing through a fixed and constant course of development, which commences at a comparatively early period in the life of the polypide, and exhibiting at last a definite form and structure.

I have repeatedly studied its origin and formation in various species, and always with the same result. At a certain point in the life of the polypide a very marked change is seen to be taking place towards the base of the body. It consists in the gradual separation of the lowest portion of

¹ *Vide* his admirable paper, "Zur Kenntniss der Bryozoen," 1869.

the stomach from the rest of that organ.¹ A constriction of the walls of the stomach takes place at a definite point, and this increases until the lowest section, which assumes a somewhat globular form, is connected with it by a narrow channel only, and hangs suspended beneath it like a distinct organ. This semi-detached portion continues to share in the contractile movements of the stomach, and the food is driven down into it through the channel that I have just mentioned. In this state it was noticed by J. V. Thompson in the following passage, which is quoted by Smitt:—"From the stomach the viscus appears to descend considerably lower, and from its acquiring a spherical shape, opaque yellowish colour, and its persisting after the death of the animals in many of these zoophytes, is most probably an ovum or ovarium." The stomach now appears to consist of two connected chambers, of which the lower and smaller is globular in form. I have never witnessed the actual separation of this portion from the rest; but at length, whether before or after the death of the polypide I cannot say, it is cast off, and lies within the cells as a separate structure, the "germ-capsule" of Smitt, "the dark body" of earlier observers. This course of development seems to be constant, and the history, as I have now given it, would certainly lead us to suppose that the "groddkapsel" has some further and probably important function to discharge for the Polyzoan colony. Thus definitely formed, and holding so constant a place in the life history, it certainly cannot be correctly viewed "as the mere remains of a decaying polypide."

It may be remarked in passing, that these observations completely exclude Claparède's conjecture, that the "dark bodies" are a product of the endocyst. Relying on the evidence now adduced, I hold that Smitt's view of the "groddkapsel" is substantially correct, and that it is rightly regarded as one of the reproductive bodies of the Polyzoan colony.

¹ *Vide* a paper by the author in the 'Popular Science Review' for January, 1870, entitled "On some Interesting Points in the History of the Polyzoa."
