

richtetes Läppchen (Fig. 2, *l*). Der Vorderrand dieses Läppchens ist mit vier Zähnen besetzt.

Der Außenrand des genannten Stielgliedes ist mit einem kräftigen Dorn versehen. Vom Läppchen bis zu diesem Dorn hin zieht sich ein Borstenrand; ebenso ist das Antennenglied auch oberhalb des vierzähligen Läppchens mit Borsten besetzt.

2. The relation of the flagellum to the nucleus in the collar-cells of calcareous sponges.

By E. A. Minchin, London.

(With 6 figs.)

eingeg. 18. Oktober 1909.

In former memoirs¹ I have divided the *Calcarea Homocoela* or *Ascons* into two families, *Clathrinidae* and *Leucosoleniidae*, and amongst other characters which distinguish these two groups, I pointed out that in the *Clathrinidae* the collar-cells have the nucleus basal, while in the collar-cells of *Leucosolenidae* the nucleus is apical in position. I expressed the further opinion that the ordinary *Heterocoela*, such as *Sycon*, are more nearly related, systematically and phylogenetically, to the *Leucosoleniidae* than to the *Clathrinidae*, and that they also exhibit the apical position of the nucleus in the collar-cells.

In the investigations on the histology and developement of *Sycon raphanus* recently published by Dr. E. Hammer², the author points out that in the collar-cells of this sponge the position of the nucleus is so variable that it cannot have any systematic or phyletic value »Die Lage des Kernes ist jedoch, wie ich glaube, trotz einer gewissen Regelmäßigkeit eine so variierende, daß man ihr systematische bzw. phyletische Bedeutung im Sinne Minchins nicht beimessen kann« (p. 323). The same criticism of my views has been expressed by my friend Prof. A. Dendy, both in conversation and in discussions at the scientific meetings of the Zoological Society of London. I am prepared to acknowledge the validity of the criticism so far as it goes; the fact of the matter is that the distinctive feature of the two types of collar-cells in question should have been stated by me in a different manner. The important point is not the exact position, apical or basal, of the nucleus in the collar-cell, but the relation of the nucleus to the flagellum, a relation of which the position of the nucleus is but a secondary consequence.

¹ See especially Lankester's *Treatise on Zoology*. Part II. 1900. Chapter 3. p. 56 and 109, 110.

² Neue Beiträge zur Kenntnis der Histologie und Entwicklung von *Sycon raphanus*. *Arch. f. Biontologie* II. p. 291—334. Tab. XXIII—XXVIII.

The essential structural feature that differentiates the two types of collar-cells is as follows. In all *Leucosoleniidae*, and also in all *Sycons*, that I have had an opportunity of examining, or that have been accurately described, the flagellum arises from a basal granule which is in direct contact with the nuclear membrane. The nucleus itself is more or less pear-shaped and the flagellum appears to arise as a direct continuation of its pointed end; as a consequence of this arrangement, the nucleus is at or near the upper end of the collar-cell, generally quite close to the origin of the flagellum (fig. 3). If, however, the basal portion of the flagellum, that is to say, the portion within the cell, is drawn out, the nucleus may come to lie deeper down in the cell, as shown in Dr. Hammer's figures (Taf. XXVI, figg. 64—67), in which the connection of the flagellum and the nucleus is clearly depicted. In some cases also the collar-cells of this type are very shallow, scarcely exceeding in vertical height the length of the pear-shaped nucleus itself; in such cases the nucleus is necessarily at or near the base of the cell, without losing its characteristic relation to the flagellum.

On the other hand, in all *Clathrinidae* that I have studied, I have found that the flagellum arises from a basal granule situated at the surface of the cell, in the centre of the area enclosed by the base of the collar, and in no connection with the spherical nucleus, which occupies a position at the base of the collar-cell, as far removed as possible from the base of the flagellum (fig. 1). This arrangement occurs with, so to speak, military regularity, and is very striking in sections of a partially contracted sponge, in which the collar-cells are beginning to be pressed one against the other, and are consequently more columnar in form (fig. 2). There is only one exception to this rule, and that is a very remarkable one, to which I have already drawn attention in former works; namely, that when a collar-cell of a *Clathrinid* is about to multiply by division, the nucleus first travels up to the apex of the cell, immediately below the base of the flagellum, and there undergoes division. I have not worked out the division of the nucleus in detail, and therefore cannot state whether the dividing nucleus comes into relation with the flagellum; but I am inclined to think that the basal granule or blepharoplast of the flagellum plays the part of a centrosome in the division of the nucleus. However that may be, the apical position of the dividing nuclei is easily seen, and, by its sharp contrast with the resting nuclei, renders it an easy matter for the eye to pick out the dividing collar-cells in a section. The young collar-cells resulting from a recent division also have their nuclei at first in an apical, *Leucosolenia*-like position, but as they increase in size the nucleus assumes its characteristic basal position.

The changes in the position of the nucleus in Clathrinidae acquire a still greater interest when compared with the state of things found in the embryonic development. In the larvae of both Clathrinidae and Leucosoleniidae, possibly in the larvae of all calcareous sponges, the flagella of the superficially placed flagellated cells, that is to say of those cells which later becomes the collar-cells, are in all cases in direct continuity with the pear-shaped nuclei (figg. 4 and 5; see also Hammer, Taf. XXV). In other words, the condition found in *Leucosolenia* and *Sycon* is the larval condition, which these forms retain unaltered in the adult, but which in Clathrinidae is lost com-

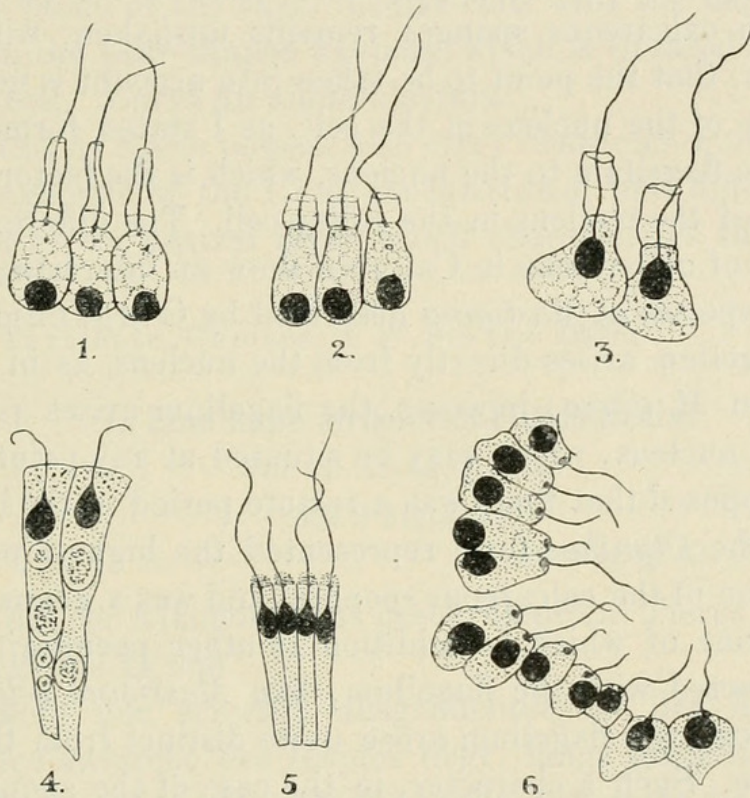


Fig. 1. Collar-cells of *Clathrina coriacea* in the fully-expanded condition of the sponge, showing the cells with relatively broad bodies and very long collars.

Fig. 2. Collar-cells of the same species in the partially contracted condition, with longer bodies and shortened collars.

Fig. 3. Collar-cells of *Leucosolenia complicata*.

Fig. 4. Flagellated cells (future collar-cells) of the larva of *Leucosolenia variabilis*.

Fig. 5. Flagellated cells of the larva of *Clathrina blanca*.

Fig. 6. Collar-cells lining the gastral cavity of the pupa of *Clathrina blanca* on the 7th day of fixation, shortly before the formation of the osculum, showing various positions of the nucleus in the cell; the collars are not yet formed. All figures magnified 1000 diameters, the outlines drawn with the camera lucida.

pletely during the development. I have been able to find all stages of the change in my sections of *Clathrina blanca* in its postlarval stages. In sections of pupae shortly before the formation of the osculum, and before the collars grow out from the collar-cells, it is seen that the relation of the nucleus to the flagellum, and its position in the cell, varies

greatly (fig. 6). In some cells the nucleus is still in its primitive position, in contact with the blepharoplast; it is no longer pear-shaped, however, but has a spherical form. In other cells the nucleus is halfway between the apex and the base of the cell, and in others again it has taken up its final position at the base of the cell. Hence in Clathrinidae the assumption by the nucleus of an apical position as a preliminary to division, is simply a return to the position which it occupied in the larva, and which may be reasonably regarded, I venture to think, as the phylogenetically primitive position.

In spite, therefore, of the criticisms of Hammer and Dendy, my belief in the systematic and phylogenetic value of the structure of the collar-cells in calcareous sponges remains unshaken; with, however, the correction, that the point to be taken into account is not merely the exact position of the nucleus in the cell, as I stated formerly, but the relation of the flagellum to the nucleus, which is the factor determining the situation of the nucleus in the collar-cell. The differences between the two types of collar-cells in *Calcarea* show an interesting parallelism with the two species of *Mastigina* described by Goldschmidt³. In *M. setosa* the flagellum arises directly from the nucleus, as in *Leucosolenia* and *Sycon*; in *M. vitrea*, however, the flagellum arises quite independently of the nucleus, which may be situated at any point of the cell. It may be supposed that there was a remote period in the history of the world when the *Olynthus*-form represented the highest point reached in the evolution of the calcareous sponges, and was a genus with at least two species, one of which, in addition to other peculiarities, had the nucleus connected with the flagellum, like *Mastigina setosa*, while in the other species the flagellum arose quite distinct from the flagellum, as in *M. vitrea*. Such a character, in the case of the sponge, can have but little importance in relation to the conditions of life or the struggle for existence, and hence has persisted unchanged to the present day, and is one of the characters which, in my opinion indicates the deepest phylogenetic divergence in the pedigree of the calcareous sponges.

In conclusion I will give a brief diagnosis of the two families of the Homocoela, in correction of that given by me in 1900.

Class *Calcarea*. Sponges with the skeleton composed of calcite, in the form of spicules either monaxon, triradiate, or quadriradiate in form.

Grade 1. Homocoela. *Calcarea* with the gastral layer of collar-cells continuous, not forming separate flagellated chambers.

Family 1. Clathrinidae. Oscular tubes generally short, arising

³ Lebensgeschichte der Mastigamöben. Arch. Protistenkunde. Suppl. I. 1907. p. 83—168. Taf. V—IX. 20 Text-figg.

as shallow vents from the network of tubes; form of the body typically reticulate. Triradiate spicules always present, equiangular, and with the crystalline optic axis vertical to the facial plane of the rays; monaxon spicules present or absent. Collar-cells with the flagellum arising quite independently of the nucleus, which is spherical in form and situated at the base of the cell. Larva a parenchymula.

Family 2. Leucosoleniidae. Oscular tubes long, arising as distinct individuals from the stolon-like system of basal tubes; form of the body erect. Monaxon spicules always present; triradiates, if present, typically bilateral in form, with two paired and one unpaired angles, and with the crystalline optic axis never vertical, but always inclined, to the facial plane of the rays. Collar-cells with the flagellum arising directly from the pear-shaped nucleus, which is situated at or near the apex of the cell. Larva an amphiblastula.

Such forms as *Sycon* possess also every character which is put down above as diagnostic of the Leucosoleniidae, and differ only in the arrangement of the gastral layer which characterizes the grade Heterocoela.

Lister Institute, Chelsea, S. W. 9th Oct. 1909.

3. Eine neue afrikanische Dichthadia.

Von H. Stitz, Berlin.

(Mit 3 Figuren.)

eingeg. 21. Oktober 1909.

Länge des (in Alkohol etwas geschrumpften) Tieres bis zum Ende des Hypopygiums 45 mm.

Hinterkopf nur schwach ausgebuchtet; in der flachen, ausgerundeten Medianfurche des Kopfes liegt, längs gestellt, die mittlere, ovale, verhältnismäßig große Ocellargrube, neben ihr die beiden andern von derselben Form, aber kleiner. Die Stellung derselben entspricht also nicht den Spitzen eines Dreiecks, sondern sie würden mit ihren Hinterrändern dieselbe gerade Linie berühren (Fig. 1 o). — Stirnleisten abgerundet, wulstförmig, nach hinten zusammenlaufend, nach den Einlenkungsstellen der Fühler hin divergierend, nach außen gebogen und dabei schmaler werdend (Fig. 1 f). — Mandibeln pfriemenförmig, mit schwach umgebogener Spitze. Fühlergeißel 10gliedrig, das Endglied derselben doppelt so lang als das vorhergehende.

Thorax cylindrisch, schmal, von ungefähr $\frac{1}{3}$ der Breite der mittleren Abdominalsegmente. Tergite aller drei Thoracalsegmente in derselben Ebene, ohne mediane Furche oder Rinne. Naht zwischen Pronotum und Mesonotum etwas schärfer ausgeprägt als die Mesometanotalnaht.



Minchin, E. A. 1909. "The relation of the flagellum to the nucleus in the collar-cells of calcareous sponges." *Zoologischer Anzeiger* 35, 227-231.

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