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1. The Cœlom and Nephridia of Flatworms

Reply to M. Van Beneden.

by E. Ray Lankester, Jodrell Professor of Zoology, University Coll., London.

Before offering what I hope may be a final reply to M. Van Beneden, I should wish to say that I regret having made use of expressions in my previous note on this subject, which appear to him discourteous. The vexation which I experienced on finding myself persistently misinterpreted, caused me to write unguardedly. I trust that both my apology and my excuse may be accepted.

M. Van Beneden has in so many words in his first communication to this Journal on this subject, attributed to me the theory that »the sanguino-lymphatic system of triploblastic animals, — whether it be formed of lacunae, of canals or of large cavities, and the urinary canals whatever their form are parts, more or less completely differentiated and separated of one and the same system of lacunar spaces.«

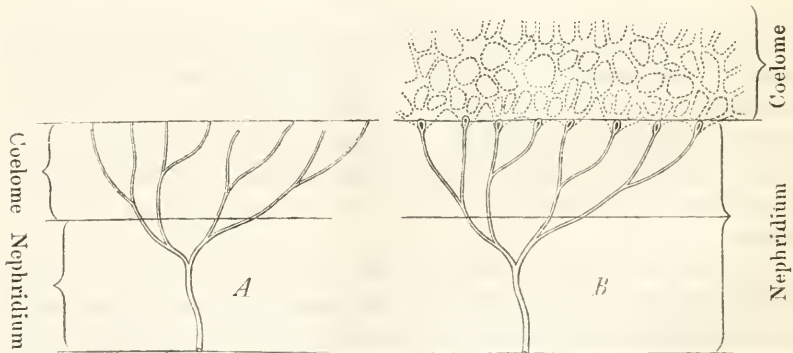
In his last communication to this Journal, M. Van Beneden admits in reply to my remarks on this statement, that he has been in error. He admits that I have not maintained that the urinary canals are parts of the same system of lacunar spaces as the sanguino-lymphatic system. He admits that I have on the contrary maintained that the urinary canals and the sanguino-lymphatic spaces are distinct in nature and origin and to be distinguished as separate morphological elements. So far I have succeeded in inducing M. Van Beneden to

abandon the position of attributing to me, views which I do not hold and have never held.

It remains to induce M. Van Beneden to proceed further in the rectification of his conceptions as to my views. At any rate I hope that I shall be able to place the matter clearly before the readers of this Journal, and may after this note, be allowed to abstain from further discussion of the subject.

M. Van Beneden having withdrawn one part of his erroneous statement as to what he conceives to have been my views, now states as follows, »Lankester professe l'opinion, partagée d'ailleurs par tous les helminthologistes de l'époque, que chez un Trématode il n'existe entre l'épithélium du tube digestif et l'épithélium tegumentaire d'autres cavités que les canaux du système aquifère. Il émet l'hypothèse qu'une partie de ce système de canaux représente le coelome, tandis que l'autre représente le néphridium et cela sans chercher à déterminer la limite entre les deux portions de l'appareil.«

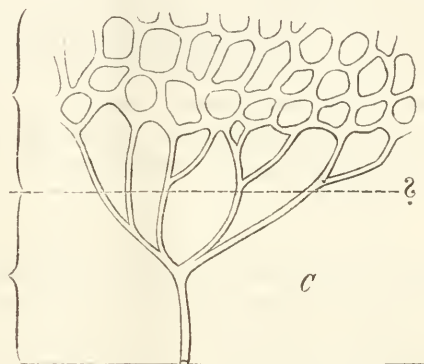
In reference to this I have to point out that I have never in relation to this subject spoken of the Trematodes alone but have considered the various groups of Flat-worms (viz. Planarians, Nemertines, Trematodes and Cestodes) as one illustrating the other. M. Van Beneden insists that I knew of no other spaces between the intestine and epidermis excepting those definitely recognised as the canals of the 'système aquifère', and he gives a woodcut here reproduced (A) to illustrate what he would say must have been my conception on the matter in order to contrast it with another (B) illustrating Fraipont's results.



In the woodcut A which Van Beneden declares to represent my view, he has drawn the nephridial canals as abruptly ending. He has no justification for thus abruptly cutting off these canals. It is true that zoologists had no definite knowledge ten years ago of the

mode of termination of these canals, but it was known to all who chose to trace them in transparent forms, that the canals become exceedingly fine and probably in some cases ended in a network of spaces between the tissue-elements of the parenchyma of the body. I certainly never believed in the abrupt termination which Van Beneden has drawn for me (and I do not know who did), — but I inferred the existence of an arrangement such as is shewn in the wood-cut I now submit (C).

Van Beneden wishes to limit my reference to »channellings in the mesoblast, sometimes spoken of as water-vascular system«, to the larger trunks of the nephridia which were certainly and definitely figured and described as the ,excretory canals' or ,water-vascular canals' by the helminthologists of thirty years since. He declares that I must have meant these canals and these only and so could not have conceived of such an arrangement as Fraipont has demonstrated, namely — the continuation of these ,water-vascular canals' into a system of fine intercellular spaces.



M. Van Beneden's contention would be defensible, had I not in my essay on the ,Primitive Cell-layers of the Embryo' carefully explained that I held (as the diagram C shews) that the ultimate branches of the so-called water-vascular system form a system of lacunae or network of spaces surrounding the tissue elements of the parenchymatous body.

This fact — which seems to be the chief fact now remaining among those originally overlooked by M. Van Beneden — is established by the following extracts from the ,Primitive Cell-layers'. *Ann. and Mag. Nat. Hist.* 1873. p. 331 et seq.

1st »In all Triploblastica it (the blood-lymph system) is represented by lacunae or channels or by mere wide-setting of the cellular elements of the mesoblast, between and around which the movement of a fluid, so-called lymph, is possible. A blood-lymph system appears in its simplest form in the Flat-worms where the main portion of those channellings in the mesoblast, sometimes spoken of as ,water-vascular system' must be regarded as the commencing differentiation of the blood-lymph vascular system.«

Thus the 'wide-setting' (i. e. set so as to leave intercellular spaces) of cellular elements' is pointed out as a simple form of blood-lymph system and immediately afterwards it is stated that the main part of the canal-system of Flat-worms is a commencing blood-lymph system. Surely this does not mean that the canal-system consists only of comparatively large trunks which terminate blindly! It means that the larger trunks are continued into an inter-cellular system of spaces.

2nd This is further shewn by the reference which follows to Mr. Moseley's researches on *Bipalium*, — researches which by a very natural coincidence M. Fraipont also cites in support of his views. Speaking of M. Moseley's sections of *Bipalium* I say »The channels of the water vascular system in these cases are seen in section to be intersected by long branching cells; they are, in fact, only partial excavations of the mesoblastic tissue. Such excavation, carried to a greater extent and widened out, ultimately forms the perivisceral space seen in many Nemerteans, and in all the Gephyrea, Chaetopoda, Echinodermata.«

3rd In the following paragraph, I draw a parallel between the flattened transparent Mollusc *Phyllirhoë* and the Flat-worms. It was generally admitted that the blood-lymph space in the Mollusca is in the condition of a series of inter-cellular lacunae assuming in some regions the form of canals, — I could hardly have more distinctly stated my view that the finer ramifications of the canal-system of the Flat-worms are intercellular and not parts of the nephridia than by comparing them to the blood-lymph system of a Mollusc. Yet M. Fraipont erroneously stated that I considered these ultimate ramifications of the canal-system of Flat-worms to be intra-cellular and part of the Nephridia, and M. Van Beneden has emphatically reiterated this erroneous statement. My words are (loc. cit. p. 333). »In *Phyllirhoë* we have, it seems to me, as in the Flat-worms, the imperfect channellings and spaces of a parenchymatous body placed in relation with the exterior by the segment-organ, the wall of which is not discontinuous with that of the channels.«

I may state once again, what I have previously admitted, namely that I was unable to draw the line in the Flat-worms between the ultimate ramifications of the canal-system which represent body cavity and are intercellular and the terminations of the branches of the nephridia or segment-organs. That was done when Bütschli described the ciliated lappets on the canals of *Cercaria*, and I have already admitted that his observations and those of Fraipont have shewn that the nephridial portion of the canal system extended somewhat

further in the direction of the ultimate network of spaces than I had supposed to be probable.

In conclusion I must repeat that I should not have written at the present time on this matter in reference to M. Fraipont's researches and conclusions, had not that naturalist taken the trouble to give an account of the views which he supposed me to have held, which account was erroneous.

I entirely repel the suggestion made by M. Van Beneden to the effect that I desire to diminish the credit due to his pupil for his interesting observations and I sincerely deplore the tone which M. Van Beneden has thought proper to adopt in dealing with what was in the first instance a friendly correction of a misconception.

Febr. 20th 1882.

2. Beiträge zur Kenntnis des Nervensystems der Dipterenlarven.

(Vorläufige Mittheilung.)

Von Prof. Dr. Ed. Brandt.

Das Nervensystem der Dipterenlarven ist noch sehr wenig untersucht. Wir besitzen nur einige Kenntnisse über den Bau des Nervensystems der Larven aus den Familien: *Muscae calyptratae* und *acalypterae*, *Oestridae*, *Syrphidae*, *Stratiomyidae*, *Asilidae*, *Culiciformia*, *Tipulidae*, *Fungiformia*, *Pupipara*¹ und neuerdings von Tabaniden². In vielen Familien der Dipterenordnung sind aber die Larven in Hinsicht auf das Nervensystem noch gar nicht untersucht worden.

Durch die freundliche Güte des bekannten Kenners der Dipterenlarven, des Herrn Forstmeisters Th. Belling, dem ich hier öffentlich meinen Dank ausspreche, erhielt ich Larven solcher, zwischen Brachyceren und Nemoceren stehenden Familien, die noch gar nicht auf das Nervensystem geprüft waren und will ich hier kurz die Resultate meiner Untersuchungen über den Bau des Nervensystems dieser Larven geben.

Ich hatte folgendes Material zur Verfügung:

Leptidae: *Leptis* spec.

Bibionidae: *Bibio Marci* L.,

— *Pomoniae* Fabr.,

— *ferruginatus* L.,

— *varipes* Meig.,

¹) Siehe die betreffende Litteratur bei: Fr. Leydig, Vom Bau des thier. Körpers. Tübingen 1864 und Ed. Brandt, Vergleichend-anatomische Untersuchungen über das Nervensystem der Dipteren (Horae Soc. Ent. Ross. Bd. XVI. 1879).

²) J. Künckel, Recherches morpholog. et zoolog. sur le syst. nerv. d. ins. dipt. (Compt. rend. acad. sc. Paris. 1879. Tom. LXXXIX. pag. 493.)

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