

**The Segmentation of Annulosa**

IN the extract from his Address to the Entomological Society, given in NATURE, February 29, Mr. Wallace remarks that Mr. Spencer's views have not been so much as once alluded to in the

discussion of the Origin of Insects. The general question of the Annulosa obviously includes that of Insects, and I therefore desire to correct this statement, and to refer your readers to a paper by me on *Chœtogaster* and *Æolosoma*, published in the "Linnean Transactions," vol. xxvi. (read Dec. 1867), in which I have more than alluded to Mr. Spencer's views, and have offered some suggestions on the morphology of the head, and as to the unisegmental Annulose ancestor. Mr. Wallace quotes from this paper in reference to *Chœtogaster*, though from the context it would appear that he is quoting from Professor Owen.

Since the researches which have rendered Mr. Wallace's name one of the first among living zoologists have not led him into practical anatomical and embryological studies, I may venture to add one or two strictures upon his statements relating to such matters. In the first place, those who are engaged in the study of insect embryology are not ignorant of Mr. Spencer's or similar views; the wide-spread study of his works in England and America, and of Haeckel's general morphology in Germany, is sufficient guarantee of this. But even if it were as Mr. Wallace supposes, he has not, in the extract given in *NATURE*, shown at all how Mr. Spencer's views on aggregation are to influence the study of the embryology of insects. Of course, the general theory of somites has immense importance in all studies relating to the Annulosa, but in what way the particular form of it, due to Mr. Spencer, can influence conclusions drawn from the observation of the manner in which insects develop from the egg, Mr. Wallace does not explain. Whether, admitting or denying the truth of Mr. Spencer's or Prof. Haeckel's views, it would be equally conceivable, did the observed facts point in either direction—that the ancestry of insects is to be traced to a simple nauplius-form or to a multi-segmental Annelid-like progenitor, the question of segmentation is not finally settled, though it is largely elucidated by the doctrine of Mr. Spencer. It is no doubt an instructive point of view to take—that segmentation is an arrested production of zooids, but it is equally true that the production of zooids is an exaggerated segmentation. We have no grounds for assuming the one more than the other as the essential process; they are both phases of the same process. The fact appears to be that in certain masses of organised matter, on their reaching a certain limit of growth, "polarities," which were hitherto held in one system, break up into two and so on. The simplest case of this is cell-division, but whether the systems separate entirely, as in simple fission, or remain associated, as in the cleavage of the egg and in the segmentation of the Annulosa, depends on another factor, a cohesive or integrating force proper to the growing mass.

In the present state of knowledge upon the subject, the assumption adopted and held of so much importance by Mr. Wallace—that the Vertebrata do not exhibit a segmentation of the same kind as that of the Annulosa, is by no means justified. Though much of their jointed iterative structure may probably be due to that kind of adaptation which Mr. Spencer so justly distinguishes as "superinduced segmentation," yet that there is a fundamental bud-segmentation, or segmentation of growth identical with that of Annulosa, is in the very highest degree probable. And even as to the Chiton, which Mr. Wallace quotes from Mr. Spencer as quite certainly an example of superinduced segmentation, I think that had he examined the grounds for making such a statement, he would have hesitated. The larva of Chiton is identical with that of an Annelid, and its segmentation makes its appearance in the same way. Why should there not be segmented molluscs? It is necessary most constantly to bear in mind, when considering this matter of segmentation, the possibility of the partial or complete obliteration of segmental characters due to tertiary aggregation, and their modification in most various ways in the evolution either of an individual or of a group.

Further, as to Mr. Wallace's expressions with regard to the segmentation of insects. From what was said above as to the relation of segmentation and zooid production, it follows that the conception of segmentation is erroneous which leads to ascribing to insects peculiar physiological or psychical properties on account of their being composed of "a number of individualities fused into one." This expression should not be allowed to lead to wider conclusions than those it formulates. As a matter of fact, insects are not a number of individualities fused into one, but rather one individuality partially (and as a reminiscence rather than actually) broken up into many, this partial breaking up being due to the mechanical properties of its tissues at a certain period of development.

If, by the "spiracles" of Annelids, Mr. Wallace means the segmental organs, it should be clearly stated that the identity of these with the tracheæ of insects has not yet been in any way proved. The comparison of the mode of development of these two sets of organs is just one of the points upon which embryologists are now at work.

Lastly, the researches of the last fifteen years do not, I venture to submit, lead to the conclusion adopted by Mr. Wallace, that the parthenogenesis of the higher Annulosa is analogous to or identical with gemmation as opposed to sexual reproduction or digenesis, but to the conclusion which is exactly opposed to this, namely, that it is identical with digenesis in all particulars but the absence of the male element.

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