

BOOK REVIEW

Embryology and Phylogeny in Annelids and Arthropods. D. T. ANDERSON. Pergamon, New York. 1973. \$24. 495 pp. International Series of Monographs in Pure and Applied Biology. Zoology Division. Vol. 50.

THE excellence of this series is so well established that scientists are assured of accuracy and thoroughness in printing and publication, high quality of illustrations, and indices that are complete and useful. This volume on annelids and arthropods lives up to these expectations on all counts but the illustrations deserve special commendation.

Although there have been many investigations of the development of various annelids and arthropods, these studies have been variable in degree of completeness, in viewpoint, and level of excellence. A comprehensive treatise has not been available; hence most embryologists have not acquired a broad view of the embryogenesis of these phyla. Anderson's work is the missing reference. It is unique in integrating and evaluating the development of these animal groups. His conclusions are supported with detailed summaries of the relevant evidence and arguments.

The book begins with a short introductory chapter reviewing the history of the field and stating the objectives of the volume, a major one of which is to determine if the arthropods are a single phylum, with some underlying unity in their embryogenesis, as is the case in all other phyla.

Anderson examines cleavage and organogenesis but places major emphasis on the analysis of presumptive areas of the blastula (fate maps) as the basis for his conclusions. Two chapters deal with annelids, and one with each of the following: onychophorans, myriapods, apterygote insects, pterygote insects, crustaceans and chelicerates. The tenth and final chapter is an analysis and synthesis of the presented data with the phylogeny derived from it.

Anderson concludes that the Arthropoda, as presently conceived, consists of three major assemblages: (1) Crustacea, (2) Chelicerata, and (3) Uniramia. The annelids, crustaceans and uniramians are clearly shown to belong to the general grouping of protostomous spiralian but there is little evidence to allow conclusions concerning a closer relationship between any of these groups. The absence of spiral cleavage and the differences in fate maps indicate little if any relation of the chelicerates with the other groups. The embryological evidence therefore supports Manton's view of a polyphyletic origin of the arthropods.

Anderson's well-balanced treatment of the information available is logical and fair; thus the critical question concerning the validity of the conclusions involves an evaluation of the information itself, and some judgement as to its value in determining relationships.

The significance of spiral cleavage with the 4d style of mesoderm formation for the determination of common evolutionary origin is convincing. The crustacean method of spiral cleavage is so different that Anderson has concluded that the annelids and crustaceans are not more closely related than any other spiralian. In fact, it is difficult to conceive of a possible "ancestral type" characterized by a method of cleavage general enough to encompass both the annelids and crustaceans except possibly the acoel turbellarians. One can reasonably argue that the crustacean's origin of spiral cleavage is independent of the generally recognized spiralian.

Fate maps have been used in the study of vertebrates and have been remarkably consistent with other data used for systematic evaluation. In annelids where the situation is not unduly complex, most biologists are likely to accept Anderson's conclusions. The arthropod groups, however, are more difficult to evaluate, because differences in their fate maps are probably due to the different ways that embryos handle large amounts of yolk. It is conceivable that the number of developmental modifications that an embryo can make to large yolk content are limited to a few; thus there may be a similarity of presumptive areas because of convergent evolution. If this were true, the significance of fate maps for evolutionary evaluation would be reduced. Similarly, some of the major aspects of organogenesis in arthropods involve structures which utilize yolk, and therefore may have limited value in tracing evolution.

This book is an outstanding contribution to the biological literature. It should be read by all who are interested in comparative embryology, anatomy or phylogeny of annelids and arthropods, for it will henceforth play a major role in the stimulation of research and discussion in these areas.

*Department of Zoology,
The University of Michigan,
Ann Arbor, Michigan, 48104,
U.S.A.*

JAMES N. CATHER