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## TWO STANDARD WORKS ON ZOOLOGY.

- (1) *A Student's Text-book of Zoology*. By Prof. Adam Sedgwick, F.R.S. Vol. iii. The Introduction to Arthropoda, the Crustacea, and Xiphosura. By J. J. Lister, F.R.S. The Insecta and Arachnida. By Dr. A. E. Shipley, F.R.S. Pp. xii+906. (London: Swan Sonnenschein and Co., Ltd., 1909.) Price 24s.
- (2) *A Treatise on Zoology*. Edited by Sir Ray Lankester, K.C.B., F.R.S. Part vii. Appendiculata. Third Fascicle, Crustacea. By Dr. W. T. Calman. Pp. viii+346. (London: A. and C. Black, 1909.) Price 15s. net.

THESE two ample volumes suggest that a comprehensive text-book on the whole animal kingdom can no more be written by a single zoologist. The advanced student needs an encyclopædic work in which several naturalists with wide general and deep special knowledge have united their labours. The great "Treatise" which is slowly taking shape under the editorship of Sir Ray Lankester has been planned from the outset on these lines, and Dr. Calman's volume is worthy of the best of its predecessors. Prof. Sedgwick now issues the third volume of his text-book, eleven years after the appearance of the first, and he tells us in his preface that, but for the help of his colleagues, Messrs. Lister and Shipley, this present volume would still be far from completion.

(1) When Prof. Sedgwick's second volume was reviewed in NATURE (November, 1905), the arrangement by which the Chordata were placed in the middle of the series, and the Arthropoda widely separated from the Annelida, was naturally criticised. The author, in his preface, now briefly replies to this criticism, pointing out that he followed "the clue given by the coelom," and postponed the section on the Arthropoda until after that on the "enterocoelic" phyla. In defending this separation of the Arthropoda from the Annelida Prof. Sedgwick differs from Sir Ray Lankester, who adopts a single phylum—the "Appendiculata"—to include Arthropoda, Annelida, and Rotifera. Prof. Sedgwick is fully justified in regarding the Arthropoda as an independent phylum, as they "differ so fundamentally from the Annelida in their coelomic arrangements," but in separating the two groups so widely in his system he surely puts too great a strain on the fascinating coelomic theory.

To the volume before us Prof. Sedgwick himself contributes the chapters on the Tunicata, Enteropneusta, Echinodermata, Onychophora, and Myriapoda. His account of the Tunicata, which occupies sixty-five pages, is a masterly summary of the complex details of structure and life-history which characterise that interesting and puzzling class. The author's scepticism as to many current morphological ideas is shown by his remark that the ascidian subneural gland is "in its origin actually a part of the embryonic brain which the pituitary body never is." Nearly fifty pages are devoted to the Enteropneusta, a testimony to the great advances lately made in our knowledge of the group and to its zoological importance.

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While upholding the vertebrate affinities of the Enteropneusta, Prof. Sedgwick insists that several fundamental features clearly indicate relationship to the Echinodermata, and his account of that great phylum, occupying nearly 200 pages, comes next in the volume. His discussion on the relationship between echinoderms and chordates is especially valuable and suggestive. Besides the well-known correspondences in the coelomic spaces, the central nervous system, and the mesodermal limy skeleton, and the likeness of the tornaria to the echinoderm type of larva, attention is directed to the left-hand position of the mouth, both in the developing echinoderm and in the larval Amphioxus. This character is considered of the greater importance because no adaptational explanation of it, at least in the latter instance, is forthcoming. Incidentally, the author discusses the Dipleurula theory as elaborated by Bather, and gives reasons for doubting the existence of bilateral symmetry among the ancestors of echinoderms, though he has no other explanation of the free-swimming larvæ to offer. He further differs from most special students of the Echinodermata in his rejection of the association of the Crinoidea with the Palæozoic Blastoida and Cystidea in a sub-phylum Pelmatozoa, holding our knowledge of the structure of the two latter classes to be too incomplete for any certain estimation of their affinities, while "Holothurians stand further from Asteroids and Echinoids than do the Crinoids." The value of the chapter on echinoderms is much enhanced by a remarkably well-chosen series of illustrations, including some hitherto unpublished drawings by Prof. E. W. MacBride.

The remainder of the volume (about 550 pages) is devoted to the Arthropoda. Mr. J. J. Lister contributes a short but admirable introduction on the phylum as a whole. On the disputed question of the segmentation of the crustacean and insectan head, Mr. Lister follows in the main the views of Hansen and Folsom, accepting the maxillulæ of the Apterygota as true appendages; but he ranges the arachnidan chelicerae with the insectan feelers, and thus makes the whole cephalothorax of a scorpion equivalent to the head of a cockroach. There is a remarkably good account of arthropodan eyes and vision.

(2) Mr. Lister has also written the chapter on the Crustacea, which occupies some 200 pages, and this section can be appropriately compared with Dr. Calman's volume of Lankester's "Treatise." In the former work the Trilobita are included among the Crustacea, while in the latter they are relegated to the Arachnida. Both writers agree that this ancient group of arthropods has affinities with the Arachnida and with the typical Crustacea, but, in view of their feelers and biramous limbs, their actual inclusion among the Arachnida can hardly be defended. In the classification of the Crustacea Mr. Lister is conservative, preserving the Entomostraca as a subclass, and holding to the long-recognised and familiar orders. Dr. Calman, on the other hand, rejects the Entomostraca as a natural group, and raises the Copepoda, Ostracoda, Cirripedia, &c., to the rank of "sub-classes," dividing each into two or more "orders."

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In this matter Mr. Lister's caution may, perhaps, be commended. In his arrangement of the Malacostraca, Dr. Calman adheres to his published views, in agreement with Boas and Hansen, splitting up the old order Schizopoda, so that the Mysidacea, with their reduced carapace, developed brood-pouches, and elongate tubular heart, are grouped with the Cumacea, Isopoda, Amphipoda, &c., in a division Peracarida, while the Euphausiacea are associated with the Decapoda to form the division Eucarida, characterised by an extensive carapace, a condensed heart, and the absence of brood-pouches. Mr. Lister, on the other hand, retains the order Schizopoda in its familiar signification. Here he clings to a position that must ultimately be abandoned, and he has little, except the opinion of Claus, to offer in its defence.

As might have been expected by those who have followed his excellent work, Dr. Calman's volume is especially strong in the morphological and systematic aspects of carcinology, while Mr. Lister deals more fully with development and bionomics. For example, we find in the latter author's chapter a summary of Keeble and Gamble's recent important work on colour-changes in the Decapoda, which has no place in Dr. Calman's volume. In both accounts of the Crustacea due regard is given to palæontology, and Mr. Lister appreciates no less than Dr. Calman the great importance of the Tasmanian Anaspides and its Palæozoic allies. By a judicious use of the two works, no student can fail to gain an admirable introduction to the study of the Crustacea.

Prof. Sedgwick has himself written the chapters on the Onychophora and the Myriapoda included in his volume. His epoch-making work on the structure and development of the Cape species of the former class might have prepared us for the excellence of his descriptions. In spite of Goodrich and Lankester's recent teaching on coelomoducts, he still calls the peripatid excretory tubes "nephridia," a piece of conservatism in which he may find support from some zoologists; but it is hard to understand his rejection of the generic distinctions in the group, introduced by Pocock, and supported and extended by Bouvier, Dendy, and other recent workers. Except for Evans's *Eoperipatus*, he refuses to use the terms of these authors even in a subgeneric sense, needlessly coining a series of uncouth zoogeographical compounds such as "Chilio-peripatus," "Congo-peripatus," and "Capo-peripatus."

The unattractive yet interesting groups of Arthropoda known as "Myriapods" are dismissed in thirty pages. It is a matter for regret that the unnatural "Class Myriapoda" is retained, and in the discussion wherein the author defends this arrangement he does not even mention the natural solution of the difficulty—to treat the Chilopoda, Symphyla, and Diplopoda as independent classes—though he rightly insists on the insectan affinities of the Symphyla.

Mr. A. E. Shipley contributes a good chapter on the Insecta to Prof. Sedgwick's volume, giving a trustworthy account of the main structural features, and a clear, if brief, introduction to insect embryology, though the general discussion of metamorphosis is dis-

appointingly curtailed. The denial of evidence for pre-Carboniferous insects ignores the ephemeroid and other remains described by Scudder from the American Devonian. Mr. Shipley's classification of insects is modified from Sharp's recent scheme; its only serious fault is the presence of the unnatural group "Anapterygota," including the Mallophaga, Anoplura, and Siphonaptera. In the account of the Apterygota, the two very remarkable genera, *Anajapyx* and *Acerentomon* (the latter regarded as the type of a new order), recently described by Silvestri, and the systematic work of Börner on the Collembola, should not have been neglected. In the description of the Lepidoptera, attention should have been directed to the importance of larval and pupal stages in the classification of the order, as pointed out by Chapman and others; from the statement on p. 710 it might be inferred that no lepidopterous pupa emerges partially from its cocoon.

The last chapter of the volume, occupying 90 pages, is devoted to the Arachnida. For this also, except a section on the Xiphosura by Mr. Lister, we are indebted to Mr. Shipley. The Pycnogonida, which appear as a subclass of the Arachnida, are too briefly dismissed; no reference is given to the works of Sars, Meinert, and Cole, nor is there any allusion to the puzzling ten-legged Antarctic genera; but the account of the Xiphosura and Eurypterida is especially good. The scorpions, spiders, and mites are excellently described, while the fairly full accounts of the Phalangidea and Palpigradi are welcome. The Tardigrada and Pentastomida appear as "appendices" to the Arachnida.

It is easy in reviewing such volumes to point out omissions, if not errors, and to suggest how this or that feature might be better otherwise. But the leading thought with which one lays them down is of gratitude to the authors for the labour expended on them and on the other volumes of the series to which they belong. With the yearly increasing output of research, the trustworthy text-book becomes more than ever necessary, and the modern English student is fortunate with sets of "Lankester" and "Sedgwick" on his shelves.

G. H. CARPENTER.

#### THE FLORA OF THE PRESIDENCY OF BOMBAY.

*The Flora of the Presidency of Bombay.* By Dr. Theodore Cooke. Vol. ii., parts ii. to v. (London: Taylor and Francis, 1907-8.)

THE appearance of the last part of the second volume of the above completes the first instalment of the series of local floras projected to carry on the task of which "The Flora of British India," by Sir Joseph Hooker, aided by other eminent botanists, forms the foundation. The object of these "local" (or, as they might well be styled, provincial) floras is to amplify and, where necessary, to revise for a particular area the taxonomic information set out in the more general publication, and the present volume, judged in this light, must be held to have attained a high standard both in fulness and precision.

The descriptions, although answering the severest