Synaptology

Synapses and Synaptosomes: Morphological aspects. By D. G. Jones. Pp. xiv+258. (Chapman and Hall: London, July 1975; distributed in the US by Halstead.) £14.40.

THE demonstration by Whittaker and by De Robertis in the early sixties that nerve terminals carrying synaptic complexes can be isolated in enriched fractions after controlled tissue rupture, initiated a new approach for synaptology and caused an urgent reappraisal of the nature and purity of subcellular fractions from brain tissue. Gareth Jones' monograph sets out to provide an up-to-date review of the current picture of knowledge on nerve terminals, synaptic complexes and their *in vitro* derivatives, the synaptosomes. Although the subtitle predicts a basically ultrastructural content, the text ignores this constraint and provides a biological overview of the synapse, dealing with the biochemical and physiological correlates of the observed morphology.

The final chapter gives in outline the continuing debate over the source of transmitter released in to the synaptic cleft, and deals with the vesicle hypothesis, exocytosis, and the current indications that contractile proteins may be involved in the mechanism. Another chapter describes in some detail the preparation of synaptosomes from the precise conditions of tissue rupture, the use of gradients of different types and compositions, and subfractionation of the synaptosome itself. The use of synaptosome-enriched fractions in the study of nerve terminal metabolism and of transmitter synthesis, storage and release constitutes a separate chapter. In particular it emphasises the awakening of neurochemists to the opportunities offered by the fact that synaptosomes are sealed structures, most likely generating membrane potentials and carrying a full complement of metabolic and transmitter-linked enzyme systems, fully capable of functioning in a controlled and integrated fashion for many hours *in vitro*. Moreover, they respond to depolarising stimuli with transmitter release.

The real strength and authority of the book, however, is in the two chapters on ultrastructure, reflecting the author's long association with synaptic morphology. He deals with the synapse *in situ* and the changes which may be seen in the derived synaptosome. There is a useful account of differential electron microscopic staining techniques for various synaptic constituents and components, using phosphotungstic acid, bismuth-

iodide-uranyl acetate or zinc iodide-osmium tetroxide mixtures. There is an appraisal of the ultrastructural status of an array of synaptic components including pre- and postsynaptic dense projections, coated (complex) vesicles, baskets, cytonets, reticulosomes, tetrasomes and other structures observed using new fixation, staining and other visualising methods.

The text is written in an interesting and vigorous style and is fully illustrated with copious line drawings and over 100 micrographs. It is a useful addition to the literature on synaptology and will no doubt find its way into most libraries of neurobiology provided the price is not too strong a deterrent.

H. F. Bradford

Chordate morphology

The Chordates. By R. McNeill Alexander. Pp.vi+480 (Cambridge University, April 1975.) Cloth £10.00 \$28.50; paper £4.25.

MORPHOLOGY is a dull subject, and there are only two good reasons for teaching it: either that the structures are important in the animal's way of life, or that they illuminate its evolution and relationships. But, in many universities, the systematic morphology section of zoology is now isolated in a separate course unit, divorced from the related physiological and ecological viewpoints which help to make it significant and interesting.

Those who teach such courses therefore have to find individual topics in which the importance of morphology is shown clearly, or in which its study can be used to exemplify the aims and methods of modern research. The adaptive significance of many of the gross morphological structures is clearly obvious, and is already described in many textbooks. But analyses of the mechanics of swimming or mastication, for example, have developed a great deal since most of the commonly-used textbooks of vertebrate biology were written. Alexander's book not only provides these up-to-date analyses, but also a similar range of examples of the ways in which vertebrate structures are physiologically adapted. He has succinctly set out his aims in the Preface:

"Most of the book is about animal structures, how they seem to have evolved and how they work. A great many experiments are described because it is often as interesting and worthwhile to know how an item of knowledge was obtained as to know the item itself. Since the book is about structures, many of the explanations involve physics or engineering. There are many simple calculations designed either to throw light on the dimensions of a structure, or to test the plausibility of an explanation.

There is information in this book about locomotion, respiration, blood circulation, feeding, osmotic and ionic regulation and sense organs. These topics relate well to gross structure."

Alexander has cast his net fairly widely. For example, some of the topics covered in the first 200 pages of the book are rates of water flow through gills and of gas diffusion into gills, the structure and mechanical properties of bone, the hydrodynamics of swimming, the mechanics of jaw and gill action, the physics and physiology of teleost swim-bladders, the optics of silvery reflective fish camouflage and the physiology of electric organs. Such topics are considered thoroughly and clearly, as relevant to the life of the group in question. They are dealt with at both the theoretical and the experimental level, and will help students to realise that morphology is really only a series of problems in adaptation, not all of which are, as yet, properly understood.

The book does not pretend to uniform coverage of the different chordate groups; 190 pages are devoted to fish, as against 230 for the remaining vertebrates. Criticism of this imbalance could fairly be countered by pointing out that it does not matter which group is used to illustrate a principle, as long as it is adequately illustrated. Also, since Alexander's research has been centred on fish, it is natural that he should turn to them for many of his examples. Nevertheless, it does mean that those of us whose sympathies have accompanied the tetrapods onto land will feel a little disappointed.

About half of the 214 figures were drawn especially for the book, and many of the remainder have been taken from research papers. Many will be new to those accustomed to more conventional textbooks of vertebrate morphology, for there are many figures of experimental apparatus, graphs and physiological recordings of different kinds. The diversity of sources has led to a variety of styles, and a few figures have reproduced poorly.

This book does provide a new and up-to-date functional approach and it is a valuable addition to the library of anyone designing a course in vertebrate zoology, or for students taking such a course (for whom there is a reasonably-priced paperback edition). Of course, this new approach has been at the expense of the conventional coverage of such topics as the adaptive radiation of the groups, or their relationships to one another or to geological periods and time. But for those of us who want it, this information is easily available in other books, and such omissions are a small price to pay for such a welcome, innovative book.

Barry Cox