tained in his 1978 book, *The Evolutionary Ecology of Animal Migration* (lifetime track, programmed restlessness, the importance of exploration and route-based navigation). He extends these principles to man and describes the earliest of his experiments on human navigation, all of which have been previously published.

All of the chapters in this book are good and solid. My only reservations result from the fact that much of the material contained herein is already available in published form, and that the two year delay in publication has rendered some of the chapters considerably less than current.

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ANIMAL OSMOREGULATION. *Tertiary Level Biology. A Halsted Press Book.*

By J. C. Rankin and J. Davenport. John Wiley and Sons, New York; Blackie & Son, Glasgow; Furnival House, London. $39.95. vi + 202 p.; ill.; index. 1981.

This strikes me as a book in search of an audience. My guess is that it will not find one. The book is too brief (202 rather small pages) to be of interest to professionals in osmotic regulation, and too expensive to be suitable as a textbook in a comparative physiology course. Thus, its only asset is that most of its discussions are of quite up-to-date material, ranging from contractile vacuoles to the mammalian kidney. There is a final brief chapter on some of the newer techniques of osmoregulation research.

Some of my specific complaints about the book include its complete lack of electron micrographs of transporting epithelia, a most exciting cell type. Connected with this omission is the lack of mention of Ernst's brilliant work on the ultrastructural localization of the Na-K ATPase in salt gland and related cells. Indeed, the only photograph in the book is an electron micrograph of lamprey glomerulus.

Other work of interest to students of osmotic regulation that is omitted is the considerable contribution of C. R. Taylor on the water balance of desert antelope. Also, the authors claim to have an interest in presenting controversial material, yet no mention is made of Bern's studies on the teleost urophysis, nor of Bodil Schmidt-Nielsen's extremely controversial findings on the mammalian kidney.

In short, in view of its small size, high price, omissions of "hot" topics, and lack of an original approach, *Animal Osmoregulation*, up to date as it is, cannot be recommended.

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THE RUMINANT IMMUNE SYSTEM. *Proceedings of an international symposium held July 7–10, 1980, in Plymouth, New Hampshire. Advances in Experimental Medicine and Biology, Volume 137.*

Edited by John E. Butler; Associate Editors: J. Robert Duncan and Klaus Nielson; Series Editors: Nathan Back et al. Plenum Press, New York. $85.00. xxiv + 891 p.; ill.; index. 1981.

The field of ruminant immunology has always presented unique features and its study is doubly rewarding both for the peculiarities discovered and for the economic importance of the animals involved. Since it is ten years since the last international meeting devoted to this subject, the appearance of these proceedings of a meeting held to review the progress in the intervening years is most timely.

Many symposium volumes are flawed by the presentation of new experimental results which inevitably are less carefully refereed than in more orthodox journals. The contributors and editors of this volume are to be congratulated for avoiding this pitfall. Nearly all the articles are reviews of the field by prominent workers and most are valuable indications of the progress (or lack of it) made during the last decade.

Although inevitably the standard of the contributions varies, together they provide a comprehensive coverage of the field. The book should appeal both to those already working in this area and to those who wish to keep up to date with a fascinating and economically important subject.

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MUSCLE RECEPTORS AND MOVEMENT. *Proceedings of a symposium held at the Sherrington School of Physiology, St. Thomas's Hospital Medical School, London, on July 8th and 9th, 1980.*

Edited by A. Taylor and A. Prochazka. Oxford University Press, New York; Macmillan Publishers, London. $50.00. xviii + 446 p.; ill.; no index. 1981.

This symposium appears to have gathered in a large fraction of those active in experimentation on muscle receptors and movement. A thoughtful introduction by Sears refers to the first Nobel Symposium (1965) on virtually the same subject and provides a background for judgments on the advance of knowledge over a period of 15 years. The leading contributions deal with muscle spindles, beginning with anatomy and excitatory effects on intrafusal muscles (subjects in which knowledge apparently has reached an asymptote). In the foreground now stands the insight that spindles must be studied in natural movements, a central theme of the book. The fact that their messages reach the cortex tends to trivialize the past

overemphasis on firing rates and their significance for 'gain' in the circuit. The decisive factor has now become the sensitivity of the cortical recipient to slight shifts in the rate of the afferent discharge. The volume also illustrates the increasing realization that the enormous versatility of the motor 'marionette' may require a corresponding differentiation on the part of the afferent input.

An attractive feature of the book is the coming together of those working on cats and physiologists using microneurography and a variety of techniques for analyzing reflexes in locomotion in man. Pre-prepared critical comments, some of them quite relevant, add to the value of this well-edited volume.

RAGNAR GRANIT, *Emeritus, Neurophysiology, Nobel Institute for Neurophysiology, Karolinska Institutet, Stockholm, Sweden*

MARINE INVERTEBRATES: LABORATORY ANIMAL MANAGEMENT.

Committee on Marine Invertebrates (US National Research Council). National Academy Press, Washington (DC). $19.25 (paper). x + 382 p.; ill.; subject index. 1981.

This is a how-to book with a philosophy promoting the use of marine invertebrates as animal models for research and teaching. Although never explicitly stated, the book could be related to the National Academy of Science's mandate from the government to limit the use of vertebrate models to appease anti-vivisectionists. Sea-urchins are less empathic organisms than bunnies.

Part I surveys available technologies for establishing closed, recirculating seawater systems in inland locations and marine species suitable for such systems. It is a good primer and a valuable source book for even experienced marine biologists. Its extensive bibliography of North American species from sponges to squids that have been maintained in captivity sets it apart from hobbyists' guides. Amateur marine aquarists will find the book useful, but access to a university library is needed for optimal use of this section.

Part II is a collection of articles by authors experienced with particular species in specific types of research. These eight, well-chosen examples include sea anemones, polychaetes, molluscs, crustaceans and echinoderms useful for experiments ranging from developmental biology and neurophysiology to aquaculture and toxicological bioassays. The appendixes list a few sources of equipment and marine organisms and point out the need for and sources of collection permits and licenses. Despite the reassuring emphasis of the book on *culture* (rearing organisms in the laboratory for the laboratory), in its zeal to promote invertebrate use the Committee has, perhaps, not spelled out clearly enough the ecological dangers of uncontrolled collection of wild animals.

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THE NORTH AMERICAN GRASSHOPPERS. *Volume 1: Acrididae-Gomphocerinae and Acridinae.*

By Daniel Otte. Harvard University Press, Cambridge (Massachusetts). $45.00. xii + 275 p. + 8 pl.; ill.; taxonomic index. 1981.

In this first of three volumes on the grasshoppers of Central and North America, Daniel Otte provides keys to the families and subfamilies of grasshoppers, and to the genera of Gomphocerinae and Acridinae. For each species, he gives characteristics useful for identification, along with information on habitat preference, life cycle, and distribution (including maps). He also provides synonymies, a comparison of classification schemes, and numerous literature references. The book is illustrated with drawings and color plates. It will be a useful reference for general field biologists as well as for orthopterists.

HOWARD GINSBERG, *Ecology & Evolution, State University of New York, Stony Brook, New York*

BRITISH PLANARIANS. *Platyhelminthes: Tricladida (Keys and Notes for the Identification of the Species). Synopses of the British Fauna, Number 19.*

By Ian R. Ball and T. B. Reynoldson; Series Editors: Doris M. Kermack and R. S. K. Barnes; illustrated by Julian Mulock and Maria Tran Thi Vinh-Hao. Published for the Linnean Society of London and The Estuarine and Brackishwater Sciences Association by Cambridge University Press, Cambridge and New York. $32.50. vii + 141 p.; ill.; taxonomic index. 1981.

CHEMICAL DEFENSES OF ARTHROPODS.

By Murray S. Blum. Academic Press, New York. $55.00. xii + 562 p.; ill.; empirical formula, animal/plant, and subject indexes. 1981.

The author has provided a thorough and current (through 1980) summary of the chemistry of arthropod defense secretions. In addition to tabulating all published defensive compounds, Blum provides extensive critical commentary in later chapters on chemical systematics, biosynthesis, coevolution and detoxication. Proteinaceous venoms of arthropods are also surveyed briefly. A complete reference list, a complete empirical formula index for all chemicals discussed, separate indexes for general subjects and for binomial names of animals and plants make this book an extremely valu-