preparation. Moreover, the strangeness of modern algebra is likely to wear off rapidly in the years ahead. Some of the contents of the first chapter, which is on set theory, are already included in the curriculum of grade schools, the earliest introduction often being made at the kindergarten level. For this and other reasons biologists should take the book seriously.

COLIN WHITE

OSMOTIC AND IONIC REGULATION IN ANIMALS. By W. T. W. Potts and Gwyneth Parry. New York, The Macmillan Co. (Pergamon Press), 1964. xiii, 423 pp. $9.00.

This book is an excellent reference for workers in invertebrate ionic and osmotic regulation, and an excellent introduction on vertebrates and the biophysical bases of ionic and osmotic regulation in general. The authors are well qualified to write a book such as this since their own research covers a wide spectrum. They have done particularly well with the invertebrates in synthesizing an immense literature on osmotic and ionic regulation. They illustrate the historical development of concepts by well chosen examples from many diverse animal types. They show that the technological revolution in the use of radioisotopes and microchemical analysis has led to the evolution of the views of ionic and osmotic regulation through a steady state concept of a balance between excretion, secretion, evaporation, and ingestion to a homeostatic concept involving hormonal and nervous control of specific transport systems. This book is invaluable for its most thorough coverage of regulation by invertebrates for, unlike the case of vertebrates, the data are relatively new and are not available in summary form, much less as critically reviewed by the authors of this book.

More could have been done with the conceptual basis of osmotic and ionic control had this chapter followed the introductory chapter on biophysical concepts so that, as with biophysical concepts, the concepts of control could have been integrated into the discussions of data in subsequent chapters. I recommend reading Chapters 1, 8, and 9 first, which enables the reader to integrate the conceptual material with the data discussed, the value of which is seen in the authors' critical application by biophysical approaches to the data. For example, they frequently point out the danger of invoking mechanisms of ion movement when membrane potentials are unknown.

Omitted entirely is a discussion of cell membrane structure in general and of cells of excretory organs in particular. (An unfortunate choice of terms is made in using "cell wall" to distinguish the bounding cell membrane from intracellular membranes). Much is known from permeability and EM studies and the outlines of this knowledge seem to me essential to interpretations of osmotic and ionic regulation. Evolutionary and ecological aspects of transport would have been appropriate to include. There is a great diversity of transport systems, and examinations of these from a comparative point of view are yielding new insight into function. Comparative studies also show ecological correlates. It is surprising that the authors did not discuss B. Schmidt-Nielson's correlations (*Annual Reviews of Physiology, 1961*), based on diverse phyla, of fine cell structure of

excretory organs of fresh water organisms with the production of hypotonic urine by their excretory organs. From a more practical ecological view it is not clear to me that the authors have been critical in assessing whether states of acclimation, season of study, or source of animals were taken into account, in evaluating experimental evidence of others. On the positive side of the ledger the ecological organization of the book by chapters is a refreshing institution and has allowed some important synthesis. Of special interest are the summary flux diagrams for routes and magnitudes of exchange and Potts' pioneer attempts at generalizing the energetics of osmotic and ionic regulations.

It is unfortunate that vertebrate material is slighted in this book. Although the vertebrate story is better known to readers, the cell and tissue level ionic and osmotic regulatory mechanisms show many parallels between vertebrates and invertebrates. For example, the subject of control of electrolyte metabolisms is covered in an all too short 11 pages and there are no water balances given for vertebrates. Furthermore, the authors discuss neither the findings on electrolyte control in vertebrate kidneys based on micropuncture or stop flow, nor the comparative studies on mammalian kidneys which support the counter-current multiplier hypothesis. It is in treatment of verterbrate kidneys that the only important errors of fact are found in this book as, (*e.g.* the statement that birds have no renal portal system).

Obviously, as the authors point out, one cannot cover everything in a book so that one cannot please everyone, as my comments on the vertebrates indicate. The authors, in fact, apologize for not being able to include even the most pertinent of recent work although some do appear in footnotes. Perhaps a better way of avoiding this problem would have been to use "addenda" to chapters. All the literature that is included is cited in an extensive Literature Cited section and the subject material of the text is well indexed by author and subject. The tables and illustrations are uniformly excellent as is the prose.

THOMAS L. POULSON

PHOTOCHEMISTRY OF PROTEINS AND NUCLEIC ACIDS. By A. D. McLaren and D. Shugar. New York, Pergamon Press, The Macmillan Company, 1964. xii, 449 pp. $15.00.

The application of photochemistry to compounds of biological interest, particularly the nucleic acids, has been progressing at a phenomenal rate, during these past 15 years. It is to the credit of the authors that they have been able to blend skillfully the older literature with that reported through a good portion of 1963. It is hoped that a future revision will include the even more recent exciting breakthroughs in our understanding of the mechanism that exists for the enzymatic repair of ultraviolet-damaged DNA reported, since publication of this book, by Howard-Flanders, Setlow, and their associates at Yale University and Oak Ridge respectively.

Following a brief discussion of the principles of photochemistry and factors that influence photochemical reactions in solution, is a detailed discussion of the various mechanisms involved in the formation of absorption