

tinue to earn its popular acceptance because of a straightforward and reasonable approach, and because its small size and modest format should make it quite serviceable to those who do not desire some of the more encyclopedic and technical physiologies. It is one college level publication that could find realistic application to the high school situation.

The second publication, by Armstrong, was intended as a companion for Guyton's textbook. As far as laboratory manuals are concerned, it is one of the best I have seen. The contents parallel—section by section—the contents of *Function of the Human Body*, beginning with the cellular level and proceeding through the major organ-systems. Each exercise has an introductory "principles" discussion, then an experimental procedures section, and finally a data sheet to fill in and several questions to answer. Careful consideration discloses accurate, basic, and well-thought-out "experiments," select activities that have obviously been tried and perfected. The latter assessment can be appreciated only by those who have been frustrated many times by poorly explained and unworkable exercises found in all too many lab manuals. Some of the equipment and supplies required are rather sophisticated; therefore, this workbook is probably useful only in a well-equipped college physiology laboratory.

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### Related Fields

**MATHEMATICS IN BIOLOGY: CALCULUS AND RELATED TOPICS**, by Duane J. Clow and N. S. Urquhart. 1974. W. W. Norton and Co., Inc., New York. 708 p. \$8.50 soft-back.

This fascinating book presents a wealth of pertinent theory and methods to biologists. It is basically a calculus textbook, with biological applications cited, and seems much stronger in math than biology. Very few undergraduates would be able to absorb such a bonanza in less than two years' hard study, so its use may be limited to graduate classes. However, all mathematically oriented biologists could benefit from a thorough reading of this book.

The book is very readable. Good examples are given of each concept, followed by problems allowing the reader to try his skill. Even answers are given for selected problems—so rewarding for tentative students. The authors begin with a good presentation of set theory and Venn diagrams, continue through a complex section on probability, and arrive at the main content of the book, differential and integral calculus. The

calculus is well handled, and many higher forms not usually seen in beginning courses are found.

Several fields of great importance to modern biology—statistics in general and nonparametric statistics in particular and matrix theory—are only mentioned in passing, because as the authors state, they would add considerably to the length of an already long book. Since it is intended to be an introductory book for apprentice biologists, I believe a little less depth in calculus and a little more breadth in the above fields would have been indicated. Still the authors have done a beautiful job of teaching the reader, and their book is recommended for calculus courses with large numbers of brave biology majors.

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### Zoology

**THE LIFE OF BIRDS**, by Jean Dorst. 2 vol. 1974. Columbia University Press, New York. 718 p. \$35.00 hardback. Translated from French by I. C. J. Galbraith.

*The Life of Birds*, which was originally published in French (1971), has now been translated into English. This comprehensive, two-volume work discusses birds from an ecological standpoint by first elaborating the general anatomical, physiological, and behavioral characteristics of the organism and then its adaptations to a variety of habitats. The information is expressed in nontechnical language and is supplemented by more than 100 figures and photographs. A bibliography, found at the end of each volume, is divided into chapters and gives only the principle works cited in each of the specific chapters.

Although volume 1 examines such topics as coloration, feeding, thermoregulation, and evolution, the majority of the discussion centers on the topics of locomotion and reproduction and its consequences.

The chapters dealing with locomotion are illustrative of the clear, concise style found throughout both volumes. It is the author's ability to make a complex subject, such as aerial flight, understandable that makes this essay enjoyable. For example, the importance of flight is stressed immediately by the statement that "every aspect of their [bird's] biology and especially their ways of obtaining food and raising their young, is profoundly affected by their ability to move rapidly in all three planes of space." A logical, stepwise discussion of flight mechanisms is begun with the general modification of the vertebrate body plan which leads into specific anatomical adaptations and finally to the varied types of flight. Comparative examples, in tabular form,

aid in the clarity of the presentation. This developmental sequence is found throughout the chapters in volume 1.

Ten of the 16 chapters of volume 2 are concerned with adjustments that are necessary for birds to survive in varied environments (for example, marine, polar, desert, high mountains, and so on). The discussion again follows a logical development. For example, the chapter on polar environments first looks at the extremes of the Antarctic climate which the avifauna must combat. Several of the methods used by the birds for survival are discussed (microclimates, thermoregulation). Finally, the life cycles of the Adelie and emperor penguins and the Antarctic petrels are used to show specific adaptations to the environments. This is followed by a similar discussion of the Arctic environment and its avifauna.

Two chapters are devoted to aspects of migration and one to the place birds occupy in various ecosystems, with emphasis on their place in energy transfer.

Man's relationship with birds, be it through domestication, hunting, science, habitat destruction, or pesticides, is the final consideration of volume 2. Man's disruption of the equilibrium between birds and the environment, as well as the consequences, is well documented. A plea is made for rational management to allow for the survival of all species.

The author has done a superb job in presenting the biology of birds from an ecological standpoint. The sequencing of topics is logical, and the well documented writing is clear and concise. *The Life of Birds* is "an essay on the ecology of birds, written not so much for the specialist as for the well informed public." These volumes deserve the attention of both groups.

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**TURTLES: EXTINCTION OR SURVIVAL**, by Sarah R. Riedman and Ross Witham. 1974. Abelard-Schuman, New York. 156 p. \$6.95 (hard-back).

The title of this book is somewhat misleading because the question of extinction or survival is not raised until the very end. Instead of being a dirge for another vanishing animal, this highly readable book is actually packed full of information about turtles, ranging from their prominence as ancient religious figures through their importance as food for early explorers and colonizers to their anatomy, physiology, and behavior. The vocabulary is simple; the chapters are short (on the average five pages). Almost every other page has a photograph or drawing directly related to the text. (A photograph of copulating turtles adds conviction to the text's answer to a classic

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puzzler.) Several physiology experiments that could be easily duplicated in the classroom are described and illustrated. Two new, relatively unexplored areas for careers are described—tracking turtle migrations and farming turtles commercially.

This book would appeal particularly to the teacher who is looking for well written low level reading material in the content area. The chapters and paragraphs are so uncluttered and direct they could easily be used for exercises in outlining, yet the information in them is generally interesting enough to hold the attention of anyone even faintly interested in turtles, be he an elementary student or adult.

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**THE PRIVATE LIFE OF THE RABBIT**, by R. M. Lockley. 1974. Macmillan Publishing Co., New York. 152 p. \$6.95 (hardback).

Despite the 1974 copyright, this book is based on observations made in the 1950s and 1960s, and its first copyright date is 1964. The only new part is a two-page introduction by Richard Adams. Still, if you want to know anything

about rabbits, this is the book for you to read. The subjects are not fictional Peter Cottontails or Br'er Rabbits. They are real rabbits, living the struggle of life as real rabbits must. In the words of the author, this book "attempts to give a picture of the social structure of rabbit communities from first hand observation." Naturally, to do this, the author must describe rabbit behavior under various circumstances. He takes the liberty of attributing human characteristics to the subjects of his study—thinking, wonderment, loneliness, love, jealousy. Despite this bit of anthropomorphism, the book is a scientific study, well planned and well executed.

Five rabbit-proof enclosures of varying sizes and terrain were set up. The largest covered several acres of farmland. Central to these five areas was a large elm tree with an observation blind in which the observers could watch the rabbits with telescopes. A fifth enclosure housed an underground warren. It butted up against the plate-glass window of a hut where the observers could sit and watch the rabbits in their burrows. Every rabbit was marked with a large tattoo and a numbered ear-tag. Males were tagged in the right ear and females in the left. Each animal could be identified readily from a distance.

Lockley and his staff recorded the rise and fall of a series of rabbit dynasties. They observed the growth of a society, the struggle of dominance, the establishment of a peck order. At the top of the social structure is the "King" buck rabbit. He controls the domain. He has a "Queen" doe rabbit as his consort, and perhaps a few concubines on the side. Other bucks and does step aside when he passes, allow him the best grazing and the best living quarters. They are allowed to live in peace, in corners of the royal domain, as satellites, as long as they do not challenge the king's dominance or trespass on his territory. One usually thinks of rabbits as baby-faced, cuddly things. But Lockley describes brutal attacks, physical battles to the death, biting, kicking, tearing of fur, cutting of hamstrings.

One of the most significant concepts growing out of Lockley's research relates to overpopulation. When rabbit population becomes too great for the territory to support, the stress becomes intolerable. This is especially so for the young and the subordinate. They are hounded and threatened by the more aggressive, older, and dominant animals. They fail to reproduce. Even if a female becomes pregnant, the young are likely to be resorbed before pregnancy is half way through. This is a