

that should give no trouble to the average college freshman. In it, the scientific name follows the common name for almost every organism mentioned. (I find this practice tedious when it is used for man and his common domestic plants and animals.) The book is well illustrated, and there is an adequate index. It is an excellent book for its intended use.

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**ECOLOGY, EVOLUTION, AND POPULATION BIOLOGY.** Readings from *Scientific American*. 1974. W. H. Freeman & Co., San Francisco. 315 p. \$5.95 softback, \$12.00 hardback.

Edward O. Wilson introduces this latest collection of *Scientific American* reprints with the statement, "It is in the study of adaptation that evolutionary theory and ecology are joined. One discipline no longer makes much sense without recourse to the other." The articles are grouped into four sections which build upon each other. "Evolutionary Process" presents a background of genetics and an example of its importance in the specific study of protein structure as related to the tracing of a population. Today research is being done to trace evolution to speciation variations. Using available data from birds or mammal studies is applicable, but studies of the age of dinosaurs do not correlate with such theories as adaptive radiation. Thus in the second section, "The Multiplication and Dispersal of Species," selections on continental drift have been included to tie together the fossil records with the present. Bjorn Kurten brings out in his article the idea of two supercontinents of the Mesozoic era, Laurasia and Gondwanaland, that lead to the proof of the evolution of mammals and the continental drift. As a continuation of the evolution of species, the next section, "The Growth and Interaction of Populations," shows how population studies have uncovered some of the problems of survival. Only man seems not to have a natural control of population growth. In other populations, such factors as food, space, and predators automatically determine the size of the group. Concluding this section, Lynn Margulis' article on symbiosis and evolution brings up the idea that organelles such as chloroplasts and mitochondria might once have been independent organisms. To complete the compilation of articles, the last section, on "Ecosystems," shows the relationship of life with the planet Earth. The vital impact of man can be seen through agriculture—how man has simplified the living environment by supplanting forest, grasslands, and other habitats once rich in species favorable

to man's own survival—and in the alteration of the material cycles. "Trace-Element Deserts," gives a vivid account of how man has been able to turn a barren wasteland into fertile fields.

The articles chosen for each section seem to carry out the themes stated in each prefatory introduction. The articles describing evolutionary changes by color and the concept of mimicry would have been much more useful if there were colored plates to illustrate the varieties. Color is used sparsely throughout the articles and could be more effective. For each article a bibliography is listed at the conclusion of the book to provide a more inclusive study, and the articles themselves date from 1950 to 1972. The collection provides a small grouping of articles helpful to anyone doing research on the relationship of ecology, evolution, and population biology.

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#### Education and Professional Concerns

**STRUCTURE AND PROCESS IN SECONDARY SCHOOLS: THE ACADEMIC IMPACT OF EDUCATIONAL CLIMATES,** by Edward L. McDill and Leo C. Rigsby. 1973. Johns Hopkins University Press, Baltimore. 201 p. \$8.50.

McDill and Rigsby have compiled a wealth of data, collected from a detailed evaluation of numerous learning conditions across the nation. Supported by grants from the U.S. Office of Education, HEW, the Ford Foundation, and NSF, the study concentrated upon the origins and consequences of traditional relationships existing in secondary classroom environments. The impact of the home influence—an interesting and often ignored dimension of the total learning environment—has not been overlooked.

The book is presented in characteristic research report form, with a statement of the problem, related literature, review, statistical analysis, discussions, conclusions, and assorted appended questionnaires. Perhaps the statement of the problem and the conclusions will be of greatest interest to educators other than those who intend to incorporate portions of this study into one of their own. Nevertheless McDill and Rigsby have established, by means of this horizontal study, validity for many assumptions which to date may not have been accompanied by the necessary documentation. Strengths which are lacking for the want of longitudinal analysis are readily acknowledged by the authors.

Heavy reliance on the questionnaire method has produced data pertaining

to students' relationships to their peers, teachers, schools, communities, families, past academic success, and future plans. It is significant to note that these data were collected nine years before the book was published.

The beauty of the book lies in the accessibility of the data it presents and the rather readable style in which it is written. I do not consider it a book that all biology teachers will—or should—rush out and buy. In fact it is for the few educators who desire to further study the specific relationships established and who may be in a position to cause change across total school systems and other broad educational settings.

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#### Evolution

**DARWIN AND DARWINISM,** ed. by Harold Y. Vanderpool. 1973. D. C. Heath and Co. Lexington, Mass. 220 p. \$2.50 (softback).

Charles Darwin and his work have created a variety of intense and fascinating reactions throughout the years. The current furor of creationism vs. evolutionary theory demonstrates that the 100-year-old controversy is far from dead. This book is timely and should provide the reader with insights concerning science, religion, and society.

Vanderpool has compiled an interesting list of original papers which are grouped in three categories: before the origin of species; evolution, nature and religion; and, evolution, man and society. The introductions, both to the book and to each paper, provide the reader with historical data and a focus for reading. Vanderpool does a masterful job of describing the setting in which the papers were written and the social context of the issue. The collection is a usable and critical mechanism for assessing the impact of Darwin as well as encouraging the probing of contemporary problems. This latter result may be of particular value to the reader grappling with personal concerns.

This is not a book about biology. Rather this publication illustrates the interrelationship of biology and society as seen through the works of poets, philosophers, and theologians, as well as scientists. These perspectives indicate both the impact and scope of the theory of evolution on the Western intellect.

The book will be of interest and use in a variety of ways. It will prepare the teacher of biology to better teach evolutionary theory and its significance beyond the realm of biology. This book might serve as a basic textbook for a course for members of the community at large or a general education course. The research scientist might gain some

additional insight into the relationship of science and society.

It is not light reading. Anyone who picks up this work should be prepared to struggle with a variety of literary styles. The poetry of Wordsworth and Cowper are considerably different from the compact writings of Spencer and Huxley. However, anyone who makes it through a few of the articles will be the better for it.

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### General Biology

BIOLOGICAL SYSTEMS, by Shelby D. Gerking. 2nd ed., 1974. W. B. Saunders Co., Philadelphia. 519 p. \$11.50.

This textbook, designed for a one-quarter or one-semester college course for nonscience students, gives a broad picture of the sweep of biological science, from the molecular to the ecological levels. The author has attempted to be brief and succinct in his treatment, limiting the presentation to just over 450 pages. Overall, the book is attractive in physical appearance, with clear and informative diagrams and well-chosen photographs, including a number of interesting transmission and scanning electron photomicrographs. Additional positive features of this textbook are brief introductory and concluding sections to each chapter, which present historical perspectives on major topics and special problems, ideas, or illustrations that relate to the particular discussion of each chapter and extend the discussion further—"beyond the classroom."

Despite these good and attractive features, it is questionable whether *Biological Systems* is truly appropriate for its target audience, for it shares with so many other elementary textbooks the fault of nonselectivity. Although the later sections of the book would be more understandable for the general student, the first chapters offer biochemical and structural details without adequate explanation. To what extent does the non-science major, with minimal chemical background, actually grasp the significance of the Krebs cycle, the electron transport chain, or the PGA pathway in photosynthesis? The teacher's manual accompanying the textbook confirms—through the nature of suggested test questions—the orientation towards easily-memorized details, rather than towards the broader concepts and problems of biology. While not fully suited for use by the non-scientist, this textbook does not appear to offer special advantages—as compared with other available textbooks—for students who are planning to major in scientific areas. For such students, this textbook is too general. Further, though some sections are presented with sup-

porting experimental evidence, much of the treatment is narrowly didactic.

There are many small errors in the discussion, as is almost inevitable in any book written today by a single author. Among numerous examples, selected at random, are the citation of dehydration as a major biochemical process for synthesis of macromolecules; and the statement that fluid exchange between circulating blood and tissues occurs at the level of arterioles and venules.

It is disappointing for a reviewer who explores new books or editions that have been faithfully and carefully prepared by authors and publishers to be forced to conclude that they do not meet educational needs in full. The development of new approaches to provide effective textbooks for nonscience majors should have high priority, as the author of *Biological Systems* suggests in the preface to this second edition. Presentation of a watered-down version of the conventional biology textbook is not, of course, the answer. *Biological Systems* is somewhat more than that, yet its innovative features fall short of achieving an interesting and provocative introduction to biology for students whose future activities will be outside the scientific area.

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### History and Philosophy

PHILOSOPHY OF BIOLOGICAL SCIENCE, by David L. Hull. 1974. Prentice-Hall, Inc., Englewood Cliffs, N.J. 159 p. \$6.95 hardback, \$2.95 softback.

This is an important book. It will help the reader to move behind the familiar subject matter of biology in order to understand its structure as a science and how its claims as such are justified. At the same time, it is a difficult book. The issues that join biology and philosophy are not easy to comprehend. Many teachers will find the concept that there is a philosophy of biology difficult to accept. And the writing, though well-organized, is highly compressed.

Hull, who seems equally at ease in biology and philosophy, is concerned broadly with that type of explanation in biology, involving "antecedent events organized in causal chains," that began with the physics of Galileo and Newton. But this is not a historical discourse. The five concise chapters, that need not be read in sequence, examine how such explanation is applied to current problems in biology. "The Reduction of Mendelian to Molecular Genetics" involves not the replacement of one theory by another but the change from a biological to a physical-chemical theory. In "The Structure of Evolu-

tionary Theory," Hull divides its development into classical, genetic, and synthetic stages, taking up, for example, the alleged tautology in the idea of fitness, what is meant by falsifiability, and how evolutionary theory differs from the Newtonian paradigm with respect to prediction. Distinguishing between "Biological Theories and Biological Laws" often requires identifying necessary and sufficient causation and recognizing the relationship between explanation and prediction. The author claims that "Teleology," always a problem, can remain useful, provided its language is freed of metaphysical content. He examines how teleological explanations, usually expressed as goals, purposes, and functions, might be recast as valid deductive or inductive arguments that are different from causative statements. And the old vitalism-mechanism controversy still remains in biology in current notions of "Organicism and Reductionism."

By a "philosophy" of science, Hull means not the *doing* of science, as in a laboratory, nor tracing its development, that is frequently the task of the historian, but an interpretation of the methodology of science and its logical structure. Whether there is a single "philosophy of science" or whether each science has its own is an underlying question in this book. The author also examines how biology is related to all of science in its methods of explanation. The chapters have useful sub-sections, such as "Theory Reduction in Genetics," "The Deductive Nature of Evolutionary Theory," and "Physical Models for Teleological Systems." There is happily a minimum of philosophical terms, and these are defined when they first appear.

Part of the 19-volume "Foundations of Philosophy" series, this slim book will reward only those ambitious teachers who have the will to study it slowly and carefully. For those who do, classroom teaching can only be enriched.

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### Physiology

SEX AND HUMAN LIFE, by Eric T. Pengetley. 1974. Addison-Wesley Publishing Co., New York. 384 p. \$5.95 softback.

Frankness and detailed and informative commentary distinguish this treatment of human sexuality, which stresses the limitations of our knowledge and the complexities of the subject of sex. The book is well illustrated with appropriate line drawings that are clear and concise. Natural life photographs used wherever appropriate and in good taste may dictate some constraint by