

THE CHEMISTRY-BIOLOGY INTERFACE SERIES

Several years ago, a few dozen biologists, chemists, physicists and other scientists spent several days on the campus of the University of Washington under the joint sponsorship of the Commission on Undergraduate Education in Biology, the Advisory Council on College Chemistry and the Commission on College Physics. The purpose was to study ways to improve teaching in areas of mutual concern to two or more of the disciplines involved. The groups considering the area between chemistry and biology agreed that a series of paperback books, prepared for elementary college level students in either biology or chemistry, could serve a useful purpose toward this end. Prepared by authorities in their fields, these books could, for the chemists, indicate the biological significant reactions useful to illustrate chemical principles and, for the biologist, summarize up-to-date information on molecular phenomena of significance to a modern understanding of biological systems.

To implement this proposal, CUEBS and AC₃ appointed an editorial board of several well-known professors.

Published books in the series include:

INTRODUCTION TO ORGANIC REACTION MECHANISMS by Otto Theodor Benfey, Earlham College. 1970, 198 pages, \$2.95c (soft-cover)

LIGHT AND LIVING MATTER, VOLUME I: THE PHYSICAL PART by Roderick K. Clayton Cornell University, 1970, 143 pages, \$2.95c (soft-cover)

LIGHT AND LIVING MATTER, VOLUME II by Roderick K. Clayton, Cornell University. April 1971, 160 pages, \$2.95c (soft-cover)

GEOMETRY OF MOLECULES by Charles C. Price, University of Pennsylvania. March 1971, 128 pages, \$2.95c (soft-cover)

Books in Production

CATALYSIS by Myron Bender

CHEMICAL EVOLUTION by Melvin Calvin

MACROMOLECULES, by Paul M. Doty

SURFACES, FILMS, AND MEMBRANES by David E. Greene

McGraw-Hill Book Company/330 West 42nd Street/New York 10036

One is reminded that before Darwin's time most scientists were "natural philosophers" interested in all aspects of the earth and of life. Although this book stresses the geologic aspects of natural history, it makes clear the essential unity of the natural sciences—a unity that, today, becomes even more apparent.

Other features recommend this book. It contains a useful 21-page index, biographic sketches of the contributors, and a number of interesting figures and plates. Many of the articles have extensive reference lists. Anyone interested in the history of the natural sciences during the 18th and early 19th centuries will find this a useful and readable book. Unfortunately, the high price will put it out of the range of many who might otherwise buy it.

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Radiation Biology

RADIATION AND ITS USE IN BIOLOGY: A LABORATORY BLOCK, by William V. Mayer. 1970. Educational Programs Improvement Corp., Boulder, Colo. 62 pp. Price not given.

This is the most recent of the Biological Science Curriculum Studies

laboratory blocks. The block begins with an introduction designed to acquaint students with radiation and is followed by two inquiries using ultraviolet light and its effect on microorganisms. After an aside on the use of radionuclides, there are four inquiries that deal basically with the handling of radionuclides, including their detection by cloud chamber and by autoradiography, and the behavior of gamma rays and particles in relation to the Geiger-Müller counter. The subject of fallout, in the next inquiry, is correlated with half-life and background count, both of which are necessary to interpret data obtained by using radionuclides. The next five inquiries exemplify the use of radionuclides in the solution of biologic problems. Among these inquiries are the responses of plants and animals to injected radionuclides, the effect of irradiation on growth, the use of radionuclides in ecology, and their use in physiology, as shown by a study of photosynthesis.

The concluding "On Your Own" section allows the student to investigate the use of radionuclides in determining fluid volumes, to correlate the effect of irradiation on tissues with various rates of metabolism, to ascertain the possibility of preserving foodstuffs by irradiation, to determine genetic damage occasioned by exposure to radiation,

and to investigate the effect of irradiation on a typical enzyme. References are appended.

Given the experience and expertise of the author in developing curricular materials for secondary-school students, one would expect a piece of work that is both scientifically and pedagogically sound. In these respects the student and the teacher will not be disappointed. The block is organized so that the earlier inquiries are more structured than the later ones; and all inquiries are structured in a manner that enhances the use of imagination on the part of students and teachers alike.

The Teacher's Supplement for the block ranks among the best aids to inquiry-teaching this reviewer has seen. Some of the objectives that characterize research, the scientific enterprise, and the people involved in these activities are not merely listed in the preface; rather, these objectives permeate the entire block. An example of this is the inclusion of objectives stated in behavioral terms for each inquiry. This represents a first use of such objectives in the BSCS laboratory blocks. The author has provided a variety of objectives for the higher cognitive levels and has assumed that teachers will be capable of providing for the lower levels. The wide selection of action
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verbs should help avoid boring repetitions and intellectual embolisms.

The judicious selection of materials and the inclusion of matter-of-fact precautions minimize the possibility that students would be subjected to health hazards. The former is reflected in the choice and quantity of materials used. The safety precautions are designed to foster careful work without evoking fears that might contribute to accidents.

The appended materials contain a wealth of suggestions for the teacher. Among these are background information, sources of supplies, and reference materials. It is hard to imagine a biology class that would not profit from a six-week concentration on these inquiries. The author suggests this block as a second-semester activity in a one-year course, after the students have developed sufficient information and laboratory expertise in biology. Because of the broad implications of these inquiries for biology and the possibility of eliciting a number of individual or group investigations requiring varying periods of time for completion, I would recommend its use soon after the students have developed expertise in the laboratory; that is, no later than the first nine weeks of the semester.

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IONIZING RADIATION AND LIFE, by Thomas G. Overmire. 1970. Rand McNally & Co., Chicago. 30 pp. Price not given.

In spite of the limited size of this booklet, the author has cited and briefly treated many of the more important topics of radiation biology. This compact summary of what ionizing radiations are and of what effect they have on living systems aims to introduce the reader to the fundamental concepts of ionizing radiations in an orderly way. The booklet also includes a brief section on the application of radiation techniques. Obviously, there is no in-depth treatment of the topic. Nevertheless, the presentation could well serve as a directive guide to the inquiring student and as a useful summary to the teacher who already has a basic understanding of radiation biology.

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Zoology

THE BUFFALO, by Francis Haines. 1970. Thomas Y. Crowell Co., New York. 242 pp. \$7.95.

This book, written by a professional historian and veteran writer on the American West, is a fascinating and competent account of the ecology of the Indian-buffalo-horse complex that flourished for two centuries in the vast region between the Mississippi and the

Rocky Mountains. Haines describes the transformation of the small, scattered bands of Indians who hunted buffalo on foot, or farmed the forest clearings bordering the plains, into the populous tribes of warriors who had learned from the Spaniards how to manage the horse and quickly adapted it to hunting buffalo. The book begins with an account of the paleohistory of the Indian and of the buffalo; is filled out by judicious descriptions of the lives of the Indian, of his ally the horse, and of his prey; and concludes with a stirring narrative of the last days of this colorful episode in the history of Indian civilization. The Plains Indian culture of the 18th and 19th centuries was indeed a civilization, for the abundance of food yielded by the great buffalo herds gave it leisure for the development of elaborate art forms and ritual warfare.

Haines' account of the collision between the European invader and the Indian includes much of the background needed to understand the history of the settlement of the West. His is a broad natural-history, or ecologic, approach. The result is an adult book eminently suitable also for the junior or senior high school student.

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LABORATORY ANATOMY OF THE DOMESTIC CHICKEN, by Michael C. Robinson. 1970. Wm. C. Brown Co., Dubuque, Iowa. 114 pp. \$2.25.

LABORATORY ANATOMY OF THE SHARK, by Laurence M. Ashley, 2nd ed., 1969. [Same publisher.] 92 pp. \$1.95.

LABORATORY ANATOMY OF THE FETAL PIG, by Theron O. Odlaug. 4th ed., 1969. [Same publisher.] 130 pp. \$2.35.

Robinson's manual will be helpful to the beginning student who is dissecting the domestic chicken. This guide is especially valuable because avian anatomy is universally neglected in comparative-anatomy courses. However, the manual contains some serious weaknesses. There is no written guide on how to dissect the structures, and it is impossible for a beginning student to search at random for a particular muscle with a diagrammatic systemic drawing as the only guide. And there are numerous errors in the spelling of anatomic terms. Furthermore, some of the terms used are unconventional and in violation of accepted nomenclature; for example, the use of brachialis, radialis, medialis, ulnaris, tibialis, and fibularis for, respectively, the brachial, radial, median, ulnar, tibial, and fibular nerves. I have also found numerous factual errors; for example, the midbrain is called the diencephalon and the olfactory lobe is labeled the olfactory tract. Altogether, this manual is of extremely poor quality.

In Ashley's manual of *Squalus*, the dogfish shark, the 34 line drawings, by the author and Carl Petterson, are clear, generally accurate, and of good quality. The beginning comparative-anatomy student will find this manual very useful and instructive. There are good verbal descriptions of the structures to be studied and instructions on how to perform the dissection: the student does not have to rely on figures only.

One of the drawbacks of the systemic approach, used in this manual and in Robinson's, is that it does not stimulate the student to think in functional terms. Giving the simplified functions of each muscle is futile: muscles do not act singly. Would it not be better to introduce the student to the biomechanics of respiration and feeding? Consideration of functional complexes in relation to major functions is more meaningful, both anatomically and evolutionarily (see below). A discussion of muscle coordination and function in relation to respiratory movements, locomotion, and feeding mechanisms is both more meaningful and easier to understand than is the single-muscle-single-function approach. Numerous publications are available on the general pattern of muscle function in the dogfish shark. It would have been advisable to keep the section on myology strictly descriptive, as is the case in the other systems covered in the book.

Odlaug's manual of the pig was first published in 1951. The exceptionally high quality of the text, illustrations, and photographs have undoubtedly contributed to its continuing success. The inclusion of a clear, simple outline drawing of topographic relationships accompanying each detailed description of an anatomic system prepares the student to think in terms of the animal as a whole and the interactions among various organs belonging to different systems. Such an approach prepares the premedical student for human regional anatomy and the biology student for future research in functional anatomy. The descriptions and the instructions for the dissection of the various muscles help the beginning student to make a good, meaningful anatomic preparation. Brief descriptions, accompanied by good photomicrographs, of the microscopic anatomy of the organs contribute to the breadth and thoroughness of the student's background in comparative anatomy. There is a special chapter on cross-sections. All systems are well covered. One omission is the absence of a clear discussion of the anatomic and functional differences between the adult and fetal cardiovascular systems.

This manual is highly recommended.

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