

new information. This should give him more confidence in the study of such a broad science as biology.

The textbook has much of the newer information. It is well presented so that the student with little chemical or physical sciences background can still grasp the significance of the facts presented. The illustrations are very well done and should aid in the presentation of such ideas as the homologous and analogous structures at the subcellular, cellular, organ, and individual levels. The basic relationship of subcellular structures and biochemical reactions are also well illustrated. Although the authors have separated plants and animals at the level of the individual, they are very well united in the discussion of cellular and subcellular concepts. This should help the student to understand the basic unity of both plants and animals. Each of the phyla are given individual attention and the more important characteristics of these groups are considered, but the student is not overwhelmed with detail.

In summary, this is a well written textbook with information presented so that it can be considered by the college student and even perhaps excite him. From the material presented, he should be able to see the frontiers in biology that will occupy scientists in the future.

Dona J. Fowler
Division of Biological Sciences
Purdue University

Botany

THE LIFE OF PLANTS, E. J. H. Corner, 290 pp., \$12.50, World Publishing Company, Cleveland, Ohio, 1964.

It is a little difficult to imagine the audience for which this book was intended. It can hardly have been written as a textbook, although one reviewer has so assumed (Schultes, R. E. in *Science* 146:910. 1964). It is far too technical in its details of life cycle to have much appeal for the general reader, and yet it contains far too much elementary botany to attract the biologist. The author points out that books dealing with general botany have become "tediously compendious . . . thoroughly dull and dully thorough . . ." Although the book does sparkle in places, chiefly when the author's detailed knowledge of tropical plants comes into play, parts of it to this reviewer were, to use the author's own words, thoroughly dull. Even if one isn't willing to accept all of the author's theories, he has to admit that his message that general botany needs orientation from a tropical standpoint comes through loud and clear.

C. B. Heiser
Department of Botany
Indiana University

Zoology

DISSECTION OF THE FETAL PIG. 7 loose-leaf experiments, Warren F. Walker, Jr., 20c each, W. H. Freeman and Company, San Francisco, 1964.

Dissection of the Fetal Pig is presented in a series of seven loose-leaf experiments. These pages are printed in a durable paper, punched for a three-ring notebook, and securely stapled where more than four pages are required to cover the unit. With the extensive utilization being made of the fetal pig as a laboratory specimen in the high school biology classes as well as in college biology and zoology, the activities outlined in these laboratory exercises will be most helpful.

The titles of the exercises will give some idea of the materials covered: External anatomy, skin and skeleton; The digestive and respiratory systems; Circulatory system, veins and arteries; Circulatory system, heart and circulation; Urogenital system; Nervous coordination, sense organs; Nerves, coordination, nervous system.

The exercises introduce the student to the major features of mammalian anatomy. Technical terms are printed in bold type, and the drawings are very effectively reproduced and all parts are labeled. Specific dissection instructions are given to the students and are presented in such a manner as to require careful and thorough observations.

It is my opinion that these laboratory exercises would serve as very effective instructions in the laboratory where the fetal pig is to be dissected. They could be used as the complete reference for the laboratory study of the fetal pig in the high school or college biology class, and would serve as a most effective supplement to any laboratory manual where the anatomy of the fetal pig is not extensively considered.

Wm. M. Smith
Howe High School
Indianapolis, Indiana

BIRD MIGRATION, Donald R. Griffin, 171 pp., \$1.25, Anchor Original, Doubleday, New York, 1964.

The serious minded student will find this book on the biology and physics of orientation behavior of birds interesting and challenging reading. Not only is a review of early studies on bird migration included but there are also selected notes on migration of bats, butterflies, bees, and other animals. Many of the current books covering some biological topic emphasize how very important it is for young people interested in a career in biology to have a firm background in the physical sciences. In the book under review, for example, he will find the discussion on radar, polarization of light,

the Coriolis effect, and orienting thermal radiations more meaningful if he has had some work in physics. The book ends by letting the reader know that there is much yet to be learned about bird migration.

Jack Humbles
*Department of Botany
 Indiana University*

COMPARATIVE ANATOMY AND EMBRYOLOGY, William W. Ballard, 618 pp., \$10.00, Ronald Press, New York, 1964.

The entry of another text which combines the traditionally separate courses of comparative vertebrate anatomy and vertebrate embryology is welcome. If the undergraduate biology major is to be at one and the same time a biologist, a chemist, a mathematician, and have a solid liberal arts background, it is necessary that there be much culling and consolidation of traditionally separate areas. The flood of new knowledge for which the curriculum has to make room makes culling and consolidation even more imperative. What areas are more suited to a merger than embryology and anatomy? Who can effectively teach one without the other?

Ballard's book is an excellent initial attempt at consolidation. Those with more experience in morphology than in embryology will probably opine that Ballard tends to be too embryological. Some will object to his use of newer terminology. Endocrinologists will object to his handling of their favorite material. But it is not an endocrinology, embryology, anatomy, or physiology textbook and no author is an expert in every area.

If you knew everything in this book you would know quite a lot. Perhaps Ballard includes too much, especially if your aim is to spare time for the inclusion of other things in the curriculum. The diagrams are adequate. A glossary would be helpful. I suspect there would be a few problems in adapting a laboratory to this text, especially if *Amblystoma* is not your favorite animal.

The trend in biology toward the merging of various areas in order to cope with expanding knowledge should please Albert Szent-Gyorgyi who recently has had a few words to say on Teaching and the Expanding Knowledge (*Science*—4 December, 1964). To quote Szent-Gyorgyi, "It is thought that such (sic) books are something the contents of which have to be crammed into our heads. I think the opposite is closer to the truth. Books are there to keep the knowledge in while we use our heads for something better. . . . Dead knowledge dulls the spirit, fills the stomach without nourishing the body. The mind is not a bottomless pit, and if

we put in one thing we might have to leave out another. By a more live teaching we can fill the soul and reserve the mind for the really important things. We may even spare time we need for expanding subjects."

Murrill M. Lowry
*Department of Zoology
 Butler University*

VERTEBRATE EMBRYOLOGY, Laboratory Manual, Richard M. Eakin, \$2.75, University of California Press, Berkeley and Los Angeles, 1964.

This laboratory manual is a comprehensive manual covering many aspects of embryology which include gametogenesis and the estrous cycle, early development of the starfish and the development of the frog larva, chick embryo and the pig embryo and fetus.

Discussion and illustrations of serial sections comprise most of the work with the embryos. Review questions at the end of each chapter are used to magnify the significance of the preceding laboratory exercises.

The manual is too comprehensive for a general high school class, but it or part of it could be effectively used in an advanced high school biology class if enough time and laboratory material are provided.

James Yarber
*Howe High School
 Indianapolis, Indiana*

GROWTH AND AGE, Lorus J. Milne, Margery Milne, 36 pp., Subscription \$4.00 yearly, D. C. Heath and Company, Boston 16, Massachusetts, 1964.

Another one of the BSCS paperback series. The Milnes have been quite helpful in BSCS activities, and in this pamphlet they attempt to describe some of the principles of growth and aging. However, in a short pamphlet, they have ranged the spectrum of all organisms to the point where some of the basic illustrations which might be cited have been lost in the great area which they cover. For instance, aging barely rates a few pages. Some of the amazing material from growth studies of a longitudinal nature are not taken up in any detail whatsoever. Such instances as cited above offer a great many project ideas for the imaginative young mind. Particularly in the growth studies of a longitudinal nature, careful records of a great many young people would be most advantageous for the research people in this work.

Although the topic of the pamphlet is a "red hot" one, the material presented simply does not come off as well as this reviewer would have wished, primarily because not enough detail was given on each illustrative example.