I might suggest that if Lavoisier had been the model for the whole volume, the result would have been superlative.

The book is handsomely printed, with very few printing errors, and with appropriate illustrations. The index greatly enhances the utility of the volume, although it is not without fault. Wiegleb, for example, who receives separate treatment in the text, is not to be found in the index. The price of the volume—$25—seems excessive.

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Experimental Phycology

Physiology and Biochemistry of Algae. Ralph A. Lewin, Ed. Academic Press, New York, 1962. xxvii + 929 pp. Illus. $32.

Ralph Lewin, the editor of this volume, states that "It is designed as a guide book, primarily for research workers and advanced students. . . ." That purpose has been well-fulfilled. Anyone who wishes to learn about any aspect of experimental phycology will begin here to gain access to the literature through May, 1960, as well as to a few more recent papers. There is no other inclusive treatment of this field in any form; this book's precursors are restricted either in scope or in size—Fogg's monograph on the metabolism of algae (Methuen, 1953), Blink's brief article on the physiology and biochemistry of algae in the *Manual of Phycology* (Chronica Botanica, 1951), and Myer's review of the physiology of algae in volume 5 of the *Annual Review of Microbiology* (1951).

The text proper (826 pages) consists of 55 separate articles contributed by 57 authors. The average chapter contains 12 pages of text and 3 pages of references (about 65 references per chapter). In keeping with the purpose of the book, the references include full titles. The longest article (31 pages) is by Stadelmann on permeability; the shortest (4 pages by McLaughlin and Zahl) is devoted to endozoic algae.

The articles are grouped into four sections. These sections and randomly chosen illustrative chapters are: Nutrition and Metabolism, consisting of 17 chapters covering such topics as light reactions in photosynthesis by Marcia Brody and Seymour Brody, fermentation by Gibbs, enzyme systems by Jacobi, nitrogen fixation by Fogg, nucleotides and nucleic acids by Iwamura, and inorganic micronutrients by Wiessner; Composition of Cells and Metabolic Products, with 13 chapters including those on storage products by Meeuse, mucilages by O'Colla, chorophylls by Bogorad and volatile constituents by Katayama; Physiology of Whole Cells and Plants, made up of 19 articles on such topics as salt and osmotoic balance by Guillard, intracellular movements by Haupt, cell division by Hase, nuclear-cytoplasmic interactions by Richter, sporulation by Erben, and biochemical genetics by Ebersold; and Physiological Aspects of Ecology, made up of six articles including those on freshwater algae by Talling, seaweeds by Biebl, and lichens by Ahmadjian.

The last 100 pages of the book are devoted to three appendices and an author index, a subject index, and a taxonomic index. Appendix A, prepared by Silva, lists all algae mentioned in the book according to their taxonomic positions, with notes on taxonomic questions. Appendices B and C are each two-page afterthoughts, one on the uptake of radioactive wastes, by Eppley, and the other on antibiotics from algae by Ralph Lewin, the editor.

The consistent style of the chapters is a tribute to the editor, who must have done rather more rewriting than is implied in his apologetic statement—"The more abstruse syntactical features of some of the contributions were smoothed over as far as possible." English is not the native tongue of 18 of the contributors.

There is little point in commenting on the problems an author faces in attempting to discuss respiration or the light reactions in photosynthesis more or less strictly in terms of work done with algae; the difficulties are self-evident. Many of the articles reflect the fact that most facets of biochemistry and many of physiology are universal among life forms and assume an air of artificiality when considered only on the evidence derived from particular kinds of organisms. Nor is it worth much comment to chide the editor for his slightly supercilious dismissal (in his preface) of the continuing progress in the older, established aspects of phycology—taxonomy and the anatomy and morphology of life cycles. The need for competent people in these areas has perhaps never been so pressing as it is now that the intensity of research on the oceans has been increased at the behest of the United States government. The space devoted to taxonomy in the volume belies the impression given by the editor in his opening remarks.

This book attests to the mass of information available on the physiology and biochemistry of algae. It indicates that the time is ripe for some ambitious or dedicated scholar to prepare a unified and fully integrated textbook on the physiology of the algae, a book like those already available for the higher plants and the fungi. Such a textbook is needed for use in those undergraduate or graduate courses in algal physiology that already exist and also to stimulate the development of more courses on this subject in the colleges and universities.

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Studies on Speciation

The Taxonomy and Speciation of Pseudophonus. A subgenus of *Harpalus*: Harpalini: Carabidae, known to occur in North America. George E. Ball and Joseph N. Anderson. Catholic University of America Press, Washington, D.C., 1962. xii + 94 pp. Illus. $3.95.

Few detailed studies of "problem" groups of invertebrates are available to the nonspecialist speciationist. This one, which deals with a group of widespread and readily obtainable ground beetles, opens a fertile field for investigation. Beetles include one-fourth or more of the known species of animals, yet their study has been disproportionately neglected. *Pseudophonus* is the subgenus of *Harpalus* (Coleoptera: Carabidae) that includes the ubiquitous and extremely common H. *pennsylvanicus*. Before Ball and Anderson made this painstaking study, even a specialist could differentiate *H. pennsylvanicus* from its close relatives only with considerable difficulty and uncertainty.

The authors treat only North American representatives of the subgenus, of which 12 species are recognized. The taxonomy of the group is difficult, and a unique feature of this monograph is a special chapter entitled "Problems of identification." The unusually complete discussion of taxonomic characters employed makes the book readily intelligible to the nonspecialist. The final

chapter is a discussion of the zoogeography of North American *Pseudophonus*, which is illustrated with distribution maps. I missed a phylogenetic tree or dendrogram, but the reader can probably construct his own from the data presented.

This little volume is the first of a series, "Studies on Speciation," published for the Institute for the Study of Natural Species. It sets a high standard for future publications in the series, of which, let us hope, there will be many.

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Introductory Textbook

Basic Concepts of Physical Geology. Edgar Winston Spencer. Crowell, New York, 1962. v + 467 pp. Illus. $8.50.

Spencer's book, an introductory volume on physical geology, is another outstanding textbook in general geology that will contribute to the training of the next generation of geologists. Nothing in its basic approach and presentation is really new, except perhaps the attempt in the first chapter to introduce the student to the nature and the practical applications of the various fields of geology. This excellent idea is carried out successfully except for the one-sided, old description of the formation of mineral deposits. Another new feature of this chapter is the introduction of the structure of geology as a science and as a part of the scientific community.

The second chapter, entitled "Raw materials in geology," offers a systematic description of elements, minerals, and rocks, with respect to their major processes of formation. The third chapter, "Framework of the earth," is in essence a good summary of basic principles of structural geology, including geophysical evidence. Chapter 5, "Our dynamic earth," is largely a continuation of the third chapter, and in a future edition the material might be combined with that in chapters two and three.

Chapter 4, "Gradation of the earth's crust," deals with all processes taking place on the surface of the earth's crust. All textbook writers face the dilemma of whether the processes should be discussed before the material is described, or vice versa. In this book the difficulty is more obvious in the treatment of sedimentary rocks and processes than in the discussion of any other topic. The author found a happy medium by placing much emphasis on the extra-crustal processes with which we are, after all, in daily contact through weather, wind, temperature, and water.

The table of contents is extensive but not entirely complete. A most welcome addition is the five double-page topographic and geologic maps collected in the back of the book. Although this textbook still shows some typical earmarks of the old overemphasis on epi-exogenetic patterns of thought in such discussions as those on ore formation and granitization, it strikes the new keynote in placing the correct emphasis on sedimentary contemporaneous rocks and processes. It is well illustrated and the drawings (by Elizabeth H. Spencer) are excellent, but the reproduction of some of the full-tone photographs should be sharper. Otherwise the publisher has done a commendable job.

This book can be recommended for a one- or two-semester introductory course in physical geology, for either liberal arts students or geology majors. The suggested improvements do not diminish its present value.

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Science for the Layman

Exploring the Universe. Louise B. Young, Ed. Published for the American Foundation for Continuing Education by McGraw-Hill, New York, 1963. xxx + 457 pp. Illus. $6.95.

This collection of readings was selected for use as background material and subject matter for a study and discussion program. The 11 topics presented were chosen, in the words of the preface, "to provide the layman with a background of understanding of the principles on which the space age has been built, to give him a glimpse of the mystery and the majesty of the universe, which man has begun to explore with satellites, and, above all, to suggest the methods and nature of the search itself." An organizer's manual and a discussion guide are available for those who wish to start their own groups, and a series of educational television films based on this volume is being presented this spring in major metropolitan areas. The entire project is the first part of a long-range planned series of programs entitled "The Citizen and the New Age of Science," and it is the result of 3 years of research and experimentation by the American Foundation for Continuing Education, with support from the Fund for Continuing Education and the National Science Foundation.

The Foundation has done well. Selections from the writings of great pioneers of science, from Aristotle to Einstein, and philosophers, from Plato to Bertrand Russell, are interspersed with commentaries by present-day interpreters and critics of science, on the nature and aims of scientific inquiry, its methods and techniques, and its relation to human history and culture. Significant material has been selected and arranged into a well-ordered and progressive study, and very little of a trivial, sensational, or merely picturesque nature is in the book. The scope may be shown by some of the unit titles: part 2, Is there a scientific method?; part 6, Is there a limit to man's understanding of nature?; part 8, How was the universe created?; and part 10, Why explore space? These inquiries may sound overly speculative; actually, they arise from careful scrutiny of fact and theory expounded and analyzed in detail, and they represent very fairly the contemporary thinking on the significance of science. Each part ends with discussion questions and a list of suggested readings. Brief biographical sketches of the principal contributors precede the first unit; a glossary which includes some tables, derivations of formulas, and brief theoretical summaries and an index conclude the volume. The typography is excellent and the illustrations are well chosen. In cursory reading I noted no misprints, but one illustration is upside down and captions for two others have been interchanged.

I congratulate the editor and the foundation, and I recommend *Exploring the Universe* to the well-known "intelligent layman" and also to scientists, who may well benefit by seeing themselves as others (including each other) see them. It will repay individual as well as group study.

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