the approach which the rest of the book is to follow. Chapters 2 and 3, on "The plant world" and "Classification and naming of plants," are good ones to have at the beginning, for they allow teachers who want to start the course with field work—to familiarize students with plants and to teach them to see the world of plants in which they have been blindly living—to do so, with reading of these chapters assigned to complement and extend the laboratory work.

The authors, wisely, I think, discuss flowering plants in the next 12 chapters, enabling the teacher who uses the book to capitalize on the common interest of students in the plants that are conspicuous in their lives and clearly valuable to man. The illustrations are good, well selected, and sufficiently numerous so that it is not necessary for a student to make many drawings for himself in order to have some means of recalling what it is hoped he has had time to see in the laboratory. It would be most unfortunate, however, if a well-illustrated textbook were substituted for observation of living plants and for study of prepared slides of parts of them.

As might be expected, the rest of the book is a survey of the plant kingdom (including the viruses) and ends with a chapter on evolution. This portion of the book, although it contains a good deal of detail, is made more interesting for the student (I would think) than are similar surveys in many books. The importance of unfamiliar plants to man's activities is stressed. A teacher might skim over a few of the life-histories, which are diagramed, and use them only to put across the definite point that there are similarities and differences in the ways in which different kinds of plants maintain themselves. The descriptions and illustrations of the more common families of flowering plants would fit in with field work, which might well come in the spring of a year's course in botany.

In this revised edition, many of the errors noted in the first edition have been removed. A few remain, over which one could quibble, and a few have been introduced in the rewriting of portions to add new material. Some sentences still remain which are correct if a reader knows how to interpret them but which might mislead a student who is unfamiliar with the subject.

A final word must be said about the glossary and the index. Both are very complete. Furthermore, in the glossary, the language from which we have derived each term is noted, and the meaning of the word in that language is given. Thus, an interested student can develop a feel for botanical terminology and a competence in its use.

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Physical Techniques in Biological Research. vol. II, *Physical Chemical Techniques.* Gerald Oster and Arthur W. Pollister, Eds. Academic Press, New York, 1956. 502 pp. Illus. $12.80.

Physical Chemical Techniques, the second volume in this series, deals with select physicochemical techniques which are employed in elucidating the nature of molecular structures that occur in biological systems. Like its predecessor volume, it is composed of a series of essays, written by individual contributors who have made contributions to, and extensive application of, the methods described.

The first two chapters are devoted to the use of stable and radioactive isotopes as tracers for following the distribution and uptake of labeled compounds. Both sections introduce the subject with extensive surveys of radioactive phenomena *per se,* which would appear to be unnecessary for the advanced worker to whom the text is addressed. One would like to see the space devoted to a more extensive discussion of the methodology to specific biological problems.

It would appear from the nature of the bibliographies and from antiquated statements in the text that many of the sections were prepared 3 or 4 years prior to the publication of the book. Thus, in describing the mechanism of beta-decay, the neutrino is described as a mathematical concept invoked to conserve momentum. No mention is made of the convincing experimental evidence for the existence of this fundamental particle that has been established during the past 2 years with the aid of the large atomic piles as sources for these elusive particles.

In a description of autoradiographic techniques, the growth of fog with the aging of the recording medium is attributed to the cosmic radiation. While this is a contributing factor, particularly in laboratories located at high elevations, the major part of the noise originates from chemical and mechanical effects, often unwittingly increased by storage of the film in proximity to x-ray machines and radioactive sources.

The greater part of this volume is devoted to concise, highly informative treatments of sedimentation, diffusion, and viscosity as means for securing information about the nature of complex solutes. Other techniques for the *in vitro* study of protein systems are presented; these include the preparation of surface films, adsorption phenomena and chromatography, electrophoresis, the measurement of electric potentials originating at membranes and phase boundaries, and the use of x-ray diffraction methods in the study of large biomolecules, such as cellulose and the nucleic acids.

A rather unexpected and welcome addition is a section on magnetic methods applicable to biological materials that possess appreciable paramagnetic properties. At one time, this experimental approach was limited to select problems in mineralogy and inorganic chemistry, such as the separation of certain mineral grains from gangue, or in the analysis of rare-earth elements that possess distinctive magnetic susceptibilities. With the current availability of more powerful magnetic fields and more sensitive methods of measurement, it is now possible to secure information on the magnetochemical behavior of nucleic acid constituents, and paramagnetic resonance methods can be applied fruitfully to the study of the structure of hemoglobin and related metalloporphyrins.

The basic value of this volume resides in the presentation of the scope of diversified techniques, which, in this age of specialization, may not always be within the ken of the individual investigator. Its study may reward the reader with some new experimental approach that will contribute to the solution of the difficult analytic problems that are associated with biochemical research.

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Technical Aspects of Sound. vol. II, *Ultrasonic Range, Underwater Acoustics.* E. G. Richardson. Elsevier, Amsterdam, 1957 (distributed in the United States by Van Nostrand, Princeton, N.J.). 412 pp. Illus. $11.75.

This is the second volume of a very comprehensive work on various aspects of sound technology. It continues, in the fields of ultrasonic applications, underwater acoustics, and aircraft noise, the "handbook" treatment that was given airborne and sonic range acoustics in the first volume.

The second volume starts with a chapter by E. G. Richardson, who contrasts the propagation of sound in the air and in sea water and points out some of the fundamental mechanisms that determine the transmission of sound in large bodies of water. In division I are two chapters, by B. E. Noltingk and N. B. Terry, who discuss methods for producing ultrasonic vibrations in liquids and solids, and a very complete account of the uses for such vibrations. These include flaw detection, gaging, elastic property measurement, machining, cleaning and dispersion, and chemical and biological effects.

In division II are described the techniques of measurement and absorption of

sound waves in water. E. Meyer contributes two chapters, one on instruments for measuring the transmission properties and the other on the effects of air bubbles on sound transmission in water. Bubbles can have a marked effect on sound transmission and, in the limit of high sound intensity, produce the phenomenon of cavitation. A chapter by K. Tamm discusses the various linings that have been used to absorb sound waves in tanks used for underwater sound measurements. The "Fafnir" construction used in German technology is emphasized. The section closes with an account by H. Oberst of the resonant sound absorbers that were used to reduce the reflections from German submarines during World War II.

A third division, by A. A. Regier, H. H. Hubbard, and L. W. Lassiter, covers the timely subject of aircraft noise. Noise from propellers, engines, jets, rocket motors, and sonic "booms" are discussed and compared. A final chapter, by Richardson, discusses the sound of propulsion in water.

It seems to me that the objective of producing a handbook to cover all the technical aspects of ultrasonics, underwater sound, and airplane noise is admirably achieved. The separate writers are all well-known experts in their fields and produce an authoritative account of their subjects. The book should be very useful and should have a wide sale among engineers and physicists working in these fields.

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Handbook of Snakes of the United States and Canada. vols. 1 and 2. Albert H. Wright and Anna A. Wright. Comstock; Cornell University Press, Ithaca, N.Y., 1957. 1105 pp. Illus. $14.75.

Virtually every naturalist dreams, at some time during his career, of writing a great compendium, a thorough, outstanding reference work on his chosen subject. Albert Hazen Wright had such a dream four decades ago. Unlike the vast majority of his colleagues, he had the persistence and knowledge for translating vision into reality. And in the process he became the inspiration for an entire series of volumes on herpetology —the Comstock handbooks, which are almost indispensable for anyone deeply interested in this field.

In coauthorship with his wife, he first produced the *Handbook of Frogs and Toads of the United States and Canada*, now in its third edition, and the same team has just given us the two-volume *Handbook of Snakes*. A third volume, containing a bibliography of North American ophiology, is soon to be published. (Other authors produced the handbooks of salamanders, turtles, and lizards, but they drew heavily on the Wrights' photographic library and on their advice and counsel.)

One must admire the Wrights' tenacity in seeing this work to its fruition despite innumerable difficulties, not the least of which has been a rapid acceleration of interest in North American herpetology and a resultant flood of papers on serpents. Another problem was that of obtaining living, healthy specimens of almost every species and subspecies of the area. Each of these is illustrated by generally excellent photographs that show, in most instances, the top, side, and under surface of the head, three similar views of the body, and a portrait of the serpent taken from directly above, plus, in a great many cases, a ventral view. These make the book unquestionably the most thoroughly illustrated in its field, and, since the publishers have provided a better grade of paper than in other books of the series, the reproduction is first-rate. There are also dozens of line drawings that illustrate details of serpentine anatomy, and there are maps that show the geographic distribution of the 305 different forms included in the book.

The text is based on wide experience in the field and laboratory, visits to the major museums of the United States, and several years of peregrinations through the herpetological literature. In fact, the book is so thoroughly documented that sometimes the reader must make his choice between conflicting statements of opposing authors. The original manuscript was so long that a considerable portion of it had to be excised in the interests of economy of space. What is left is meaty and well organized under such subheadings as range, size, distinctive characteristics, color, habitat, period of activity, breeding, food, and authorities. The recommendations of the Committee on Herpetological Common Names of the American Society of Ichthyologists and Herpetologists were published too late to be used; hence, the *Handbook of Snakes,* in spite of the important place it is bound to have in the history of herpetology, will not aid in achieving the standardization of common names that seems so highly desirable.

Despite the fact that much of the book was written years ago, the Wrights have made a notable effort to keep it up to date. In many instances, recent papers are mentioned, with appropriate comments, even though they were published after the manuscript for the *Handbook* had been completed. This results in some inconsistencies, for the distribution maps do not always reflect the latter-day statements in the text. There are a few minor errors, as is inevitable in a large book of this sort, but I believe that a reviewer should report such errors directly to an author rather than follow the common, but dubious, custom of enumerating them in print. Certain practitioners of polemics seem to delight in listing all manner of minutiae merely to impress their colleagues with their ability to find mistakes.

As a general reference work on North American serpents, as a valuable aid in identifying the different species and their races, and as an outstanding example of pertinacity despite many difficulties, the *Handbook of Snakes* will be indispensable for any naturalist or, for that matter, any natural history library. The third volume, when it is published, will be *the* key to the technical literature on the snakes of the United States and Canada.

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Handbuch der Physik. vol. XXX, *X-rays.* S. Flügge, Ed. Springer, Berlin, 1957. 384 pp. Illus. DM. 88.

This comparatively thin volume of the *Handbuch der Physik* is entitled simply *X-rays*. There are five sections, dealing with the various aspects of the subject; all of these are in English except for the first, which is in German and deals with the production of x-rays. The second section is entitled "Experimental methods of x-ray spectroscopy at ordinary wavelengths." The third section, "Experimental methods of soft x-ray spectroscopy and the valence band spectra of the light elements," is followed by a section on "X-ray microscopy." The last section is a discussion of "The continuous x-ray spectrum."

It would be both tedious and superfluous to comment in detail on the contents of this volume. Each section is complete and thorough. In discussing the production of x-rays, Schaaffs (76 pages), after a very brief historical introduction, discusses the properties of x-rays and the techniques which have been and are being used for their production. Of the five sections, this is the one which, for the most part, deals, of necessity, with older papers, since this is the area which has been longest under study.

In the second section, Sandström (163 pages) deals with experimental methods of x-ray spectroscopy at the more common wavelengths, leaving the very soft part of the spectrum to Tomboulian (59 pages), who follows him in this volume. Both of these subjects, while long established, are fields in which very active