to have considerable support. These difficult species problems are found in the family throughout the world and are troublesome to solve because black flies do not lend themselves to laboratory colonization and experimentation.

The introductory portion contains good discussions of the life history, adult habits, zoogeography, relation to disease, anatomy of adult, pupa, and larva, and of the collection, preservation, and examination of material. This is followed by a taxonomic treatment of the species, which are arranged in the two genera *Cnephia* and *Simulium*. Characters are given for dividing the latter genus into two divisions, not named as subgenera, and these are again divided into seven species groups. The classification of the Simuliidae is still far from satisfactory, and there is great need for the coordination of the several systems that have been suggested for various faunas. The species are well described, and figures and keys are given to separate the females, males, and pupae. Distribution is given by country and, wherever known, there are notes on the larva and habits. This most welcome addition to our knowledge of the fauna of tropical Africa will be extremely useful in determining the species.

ALAN STONE

*Entomology Research Branch,*
*U.S. Department of Agriculture*

***Biology.*** Paul B. Weisz. McGraw-Hill, New York, 1954. 679 pp. Illus. $6.50.

The first 13 pages of *Biology* present the properties of life in broad outline against a background of the physical environment of the earth that furnishes the conditions where life is possible. Following this, at the "second level," 94 pages are devoted to a more intensive treatment of environmental relationships (soil and carbon and nitrogen cycles), composition of protoplasm (elements, compounds, ions, colloids, membranes, and osmosis), basic metabolic processes (catalysis, enzymes, photosynthesis, energy metabolism, and types of nutrition), and self-perpetuation (cellular and organismic regulation and reproduction, adaptation, sexuality, heredity, and evolution). The remaining 543 pages consider successively cell structure and function, differentiation and specialization, plant structure and function, skeletal and muscular physiology, community and social organization, photosynthesis and transpiration in plants, digestion and circulation in animals, respiration and energy metabolism, synthesis, vitamins, hormones, blood functions, excretion, circulatory mechanisms, nervous system and sense organs, reproduction (mitosis, growth, and gametogenesis), plant life-histories, human reproduction and its hormonal regulation, and genetics and evolution.

In returning to the same principles at successively higher levels of treatment, this book differs somewhat in plan from other biology textbooks. The author consciously tries to avoid methodical, compartmentalized handling of his material by integrating the main ideas of biology around processes rather than taxonomic groups or organ systems. Classification is relegated to six pages in the appendix. Only the briefest treatment is accorded to invertebrates, and even the comparative treatment of the lower vertebrate groups is only moderately developed. The emphasis is predominantly on human functions. The claim is made in the foreword that formal physics and chemistry are not necessary, that such physicochemical concepts as are needed are developed in the textbook itself. It may be questioned, however, whether the student with no previous chemistry can acquire from a few pages of simplified and condensed synopsis the necessary background for an adequate understanding of the role of pyruvic acid, adenosine triphosphate, and so forth, in energy metabolism. Weisz thinks that it is possible and makes a courageous attempt to give the student an insight into the chemical workings of the enzymes in cell metabolism.

LOWELL E. NOLAND

*Department of Zoology, University of Wisconsin*

***Introduction to a Study of Mechanical Vibration.*** G. W. Van Santen. Philip's Technical Library, Eindhoven, Holland; U.S. Dist., Elsevier Press, Houston, Texas, 1953. 296 pp. Illus.

The preface of this book states, "The object . . . is to review the elementary theory of Mechanical Vibrations, as well as some of the more important problems of vibration encountered in practice. . . . Every effort has been made to present each individual subject so as to demonstrate the essentials of the problems and thus provide a jumping off point for a special study of any particular branch of the work. At the same time we have tried in each instance to indicate practical lines for the direct solution of many problems."

To fulfill this object, the author has chapters in the usual order on definitions and free and forced vibrations. These are followed by chapters on electromechanical analogies, coupling between two and three mass systems, and simple isolation. Vibrational waves are studied to introduce the subject of sound isolation and control, and there are brief discussions of associated topics ranging from ultrasonics to seismology. Lateral critical speeds in shafts are briefly covered from the engineering point of view, since only the first critical speed is considered. Tangential effort diagrams and Holzer tables are outlined in the section on torsional vibrations. This is followed by a brief discussion of balancing, damping, self-excited vibrations, fatigue in materials, and human reactions to vibrations.

Three chapters are used to survey the general field of vibration measurement, with emphasis on vibration equipment manufactured by N. V. Philips, Eindhoven, Holland. The last chapter is a short but well-illustrated and interesting discussion of the human ear. Three short appendixes give common trigonometric formulas, complex quantities, and phase deter-

mination from a Lissajous figure. The table of symbols furnished shows only minor variations from nomenclature common in this country. The index appears to be complete. It should be noted that all units are in the cgs system.

The author has achieved his objective in a workman-like manner, considering the space used, 296 pages. The discussions are clear, the numerous diagrams are well executed, and the mathematics used is well within the grasp of anyone who has had a college course in calculus.

For the engineer or plant executive who wishes to gain familiarity with the general field of vibrations, this is an excellent first book. For the serious worker in the field or for the prospective teacher of a college-level course in vibrations, the treatment would have to be amplified by material from other sources, since much of the treatment is descriptive rather than analytic. In general, it is a review of many aspects of the field rather than a textbook on the subject.

JOHN N. MACDUFF
*Department of Mechanical Engineering*
*Rensselaer Polytechnic Institute*

***Condensed Pyridazine and Pyrazine Rings.*** Cinnolines, Phthalazines, and Quinoxalines. J. C. E. Simpson. Interscience, New York–London, 1953. xvi + 394 pp. Illus. $12.50.

The advancement of science is highly dependent on the accurate classification of scientific data. Accordingly, much appreciation should be felt for the accomplishments of those who labor at the often unrewarding task of gathering and classifying chemical knowledge.

This book is the fifth volume published in a series of monographs devoted to the field of heterocylic chemistry. It is indeed lamentable that the capable author of this work passed away before publication time. Simpson died on 7 Feb. 1952, at a time when his manuscript was being set in type.

Dealing with the chemistry of condensed pyridazine and pyrazine rings, the subject matter of the book is divided into three distinct parts: cinnolines, phthalazines (both formed by fusion of pyridazine and aromatic rings), and quinoxalines (formed by the fusion of pyrazine and aromatic rings). As stated by the author

> . . . this book has been written with the objective of ensuring continuity with, and expansion from, Meyer-Jacobson's *Lehrbuch der organischen Chemie,* Volume II, 3, and in order to avoid the creation of possible gaps the literature has been fully covered from 1917 up to the end of 1948. Adequate reference is also made to the 1949 literature, and in many instances details of compounds there described have been included in the tables.

In all, 9, 14, and 16 chapters are devoted to cinnolines, phthalazines, and quinoxalines, respectively. Where adequate information is to be found in the literature, the subject matter of each chapter is organized in sections devoted to methods of preparation, properties, and reactions. Much of the material is presented in convenient tables listing for each compound: preparation, melting point, general remarks of chemical and physical character, and references to the original literature. Appendixes give data on the ultraviolet absorption spectra, basic strengths, and antibacterial-parasiticidal activities of various compounds.

The text is well prepared and the binding is excellent. As a reference, the book should be welcomed by all who are interested in the complex and difficult field of heterocyclic organic chemistry.

CARL P. SCHAFFNER
*Institute of Microbiology, Rutgers University*

***Annual Review of Nuclear Science,*** vol. 3. James G. Beckerley *et al.,* Eds. Annual Reviews, Stanford, Calif., 1953. 412 pp. Illus. $7.

Probably no one, certainly not the undersigned, can claim honestly and critically to review this book. The subjects of three full-page charts will make the reason clear: one shows the cross section for photoproduction of pi mesons from protons, over the whole energy range, including the quasi resonance at around 300 Mev; one, the time-scale for events in radiation chemistry, from the molecular transit of a fast primary electron to the reaction time of free radicals in water; and the third, the frequency of production of specific abnormalities in the development of mice, as a function of the amount and timing of the x-ray dose to the embryo. Nuclear science is broadly seen by the editors!

The editors and publishers deserve high praise for the production of such a volume of expert essays, with a good index and a set of more than 2000 references, in a time of only some 7 months between the latest citations and general availability of the book—moreover, one in serviceable letterpress typography.

One can group the 15 articles into three or four broad categories. Two authoritative articles, surprisingly up to date in such a volatile field, deal with "fundamental particle physics." Three Columbia experts present a succinct résumé of theory and experiment in the area of pion-nucleon interaction, and Leprince-Ringuet summarizes the situation of the "strange particles" of cosmic rays, as of late last summer (including the new nomenclature). Both of these pieces, particularly the first, can be highly recommended to students.

Three pieces concern themselves with nuclear physics of the more or less "classical" kind. Corson and Hanson review the interactions of photons and electrons, especially at energies from 10 or 20 Mev up. Hughes recounts the subtle and powerful technique of neutron optics and presents a useful up to date summary of coherent amplitudes for just about 100 nuclear targets. Wattenberg tells how neutron measurements have been made absolute, to a precision of about 4 percent.