

Books

Progress in Biophysics and Biophysical Chemistry. Volume 3. Edited by J. A. V. Butler and J. T. Randall. 386 pp. Academic Press Inc., New York, 1953. \$9.50.

The third in the Progress Series, this volume is another welcome addition to the literature on biophysics. The selection of subjects for the volumes of this series has been of especial interest since the editors recognized early the difficulty in specifying the topics which might be called biophysics. In the preface to Volume I, 1950, they said: "Excluding biochemistry on the one hand and physiology on the other, there lies between a vast and rather amorphous field of study of which the frontiers and lines of demarcation are anything but well defined."

The subjects selected for Volume 3 show that the editors, Butler and Randall, have taken a broad and long-range view of biophysics. There is an extension of the subject toward chemistry. In his chapter on Methods of Determining the Form and Dimensions of Particles in Solution: A Critical Survey, C. Sadron refers to "the importance of this new branch of physical chemistry to biologists", and in his concluding paragraph he speaks of "the common efforts of chemists and physical chemists".

The affinity between biophysics and physical chemistry suggested by Sadron's paper is seen in other papers. For example, F. Booth, in the chapter on the theory of the ionic double layer, finds it necessary to explain the connection between his subject and biophysics and adds: "Practically all the questions we shall discuss are ones usually assigned to colloid chemistry rather than biophysics." A similar extension of the domain of biophysics is found in T. Teorell's paper on transport processes in ionic membranes. These vital aspects of tissue structure are fertile fields for the physicist to explore. The editors are to be commended for including these subjects in their progress report. And the contributors have ably pointed up the fundamental physics involved in each subject.

Five of the chapters deal with the applications of physical techniques to biological situations. They are: Autoradiography, Polarized Ultraviolet Microspectrography and Molecular Structure, The Infrared Spectra of Biologically Important Molecules, Some Physicochemical Studies on Viruses, and Microspectrometry of Living and Fixed Cells. These chapters give an appraisal of results as well as a critique of method. The evaluations are excellent and will be of interest to bi-

ologists as well as to physicists and chemists. The chapters are not mere descriptions of physical procedure.

The discussion on mechanisms of biological action of ultraviolet and visible radiations by M. Errera is noteworthy in that it deals with ultraviolet and visible radiations only. This seems to be a timely supplement to the current extensive literature on the actions of ionizing or penetrating radiations.

This stimulating volume is an essential part of the biophysicist's library. There are nine chapters along with the author and subject indices. The treatment of each subject is thorough and even gives considerable mathematical analysis where necessary. The photographic plates and illustrations are excellent.

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Electron Optics (Second Edition). By O. Klemperer. 471 pp. Cambridge University Press, 1953. \$9.50.

Those who have known and perused the earlier edition of Klemperer's *Electron Optics* (Cambridge University Press, 1939, 107 pages) have a pleasant surprise coming in the second edition of this book. The new version is presented in a volume about $4\frac{1}{2}$ times the size of its predecessor. Little has been conserved from the original. Most of the presentation is new and includes some of the most modern achievements of this rapidly growing field. It speaks fully on geometrical electron optics, but a $4\frac{1}{2}$ fold expansion of the earlier work alone cannot account for the tremendous advances made in the intervening 14 years. It is still a condensation of the subject. Condensation means a very careful selection of what is and what is not important for inclusion in a document of this nature. The author succeeded almost everywhere in choosing what this reviewer considers the essential part of geometrical electron optics. A short review of the chapters illustrates this point best.

After a historical introduction, four chapters are devoted to a discussion of electron lenses. This includes, as in the first edition, the cardinal points of electron lenses (Chapter II), the field plotting and ray tracing (Chapter III), some discussion of electrostatic lenses (Chapter IV) and magnetic lenses (Chapter V). The relative expansion of this material is perhaps less noticeable as the 60 pages of the first edition became only 120 pages in the new book. Much more marked is the increase in space allotted to aberrations. Chapter VI, tracing the geometrical aberrations, and Chapter VII, what the author calls electronic aberrations, total 74 pages instead of 17. Entirely new are the following four chapters: VIII. Electron optics and space charge, IX. Emission systems, X. Electron lenses and emission systems with line, focus, and XI. Deflecting fields.

Some of the material contained in these chapters existed in a very rudimentary form in the first edition, distributed between other chapters and the "Appendix". The last chapter in this volume is devoted to applications in industry and research.

As mentioned above, the choice of material for a condensation, while often being a matter of taste, seems to be mostly felicitous. Objection may be raised toward the arrangement of some parts. For instance: β -ray spectrographs are applications of electron optical principles. Nevertheless, their presentation is divided into three fragments: lens spectrometers are discussed in the chapter devoted to electronic aberrations; some "prismatic" spectrometers are to be found in the chapter dealing with deflecting fields; and the final chapter on applications has a generalized discussion of these devices. While there is some justification for discussing the principles underlying these devices in Chapters VII and XI, if a description of the instruments was shifted to the final chapter it would help those who like their information neatly gathered.

This brings us to the question: for whom was the book written? Condensations are mostly utilized by research workers engaged in other fields needing a concise introduction and by teachers. The second edition of Klemperer's *Electron Optics* fulfills the needs of the research worker remarkably well, principally because of its excellent bibliography. Some reservations will have to be made, however, on using the volume as a textbook. While it may be excellent as a guide for outlining a graduate course in electron optics, it will have to be supplemented by material contained in other books and/or periodicals. This is particularly evident in the presentation of the theoretical material: almost all equations are presented without derivation or other proofs.

Printing and binding are excellent. The price, while rather high, is perhaps not entirely out of line with the prevailing high prices of books.

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Mathematical Aspects of the Quantum Theory of Fields. By K. O. Friedrichs. 272 pp. Interscience Publishers, Inc., New York, 1953. Paperbound \$5.00.

In this book five papers which have previously appeared in the communications on Pure and Applied Mathematics are reprinted. A successful attempt is made to present some of the aspects of the quantum theory of fields in consistent mathematical language in a manner useful for mathematicians. The treatment is limited to linear interactions although current physical interest is centered on nonlinear fields. By representing states by functions and operators by functional operators, many of the field relations involving Dirac-functions are rigorized using the methods of L. Schwartz. The particle representation seems to be the most suitable in dealing with fields extending over infinite space.

The problems of a quantized boson field interacting with a given source distribution is treated in a Lorentz invariant form and a scattering operator is introduced. The notion of myriatic fields which possess no particle representations, even if enclosed in a box, is presented and discussed in conjunction with occupation number representations. A construct similar to Dirac's sea of negative energy electrons can be derived from the for-

malism. The problem of boson and fermion fields under the action of a source distribution linear and homogeneous in the field variable is solved in certain special cases and a Lorentz invariant treatment of the boson fields by B. Zumino is presented.

While the methods introduced do, indeed, rigorize many of the formalistic aspects of the quantum theory of fields, they do not seem to suggest physically useful extensions of present ideas.

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Experimental Nuclear Physics. Edited by E. Segrè. John Wiley and Sons, Inc., New York, 1953. Vol. I, 789 pp., \$15.00. Vol. II, 600 pp., \$12.00.

Nuclear Moments. By Norman F. Ramsey. John Wiley and Sons, Inc., New York, 1953. 169 pp., \$5.00.

For several years now there has been an increasing need for "a book which would bring the experimentalist up to date in experimental techniques, point out to him significant facts and data, and indicate the broad lines of theoretical interpretation". No individual physicist could hope to perform so ambitious a task by himself, nor is the random, uncorrelated publication of textbooks and monographs likely to give a complete picture of modern experimental physics either. A compendium of separate articles, each written by an authority, and the whole under the guidance of an experienced physicist is probably the best solution—the celebrated *Handbuch der Physik* originated in just such a cooperative effort. *Experimental Nuclear Physics* is an attempt at the same kind of synthesis in its own field, and before going any further it must be said that the attempt is a distinct success.

Of the three projected volumes of *Experimental Nuclear Physics* the first two have already appeared and the third is still in preparation. The closing dates for the material included in Volumes I and II were all toward the end of 1951 with the exception of Staub's paper, which was closed in December 1950. Each contribution is in the form of a self-sufficient monograph with its own bibliography.

Part I, Detection Methods (165 pp.) by Hans H. Staub, opens with a discussion of the motion of ions and electrons in gases. This leads naturally into the principles of operation of ionization chambers and proportional and Geiger counters, which are treated clearly and concisely. Crystal and scintillation counters unfortunately receive less than three pages each, doubtless because the material was prepared over three years ago. A more extensive section on cloud chambers follows, and nuclear emulsions and Cerenkov counters are also covered. Part I concludes with an account of the electronic instrumentation used with counters and construction and operational details of counters and cloud chambers.

Part II, Passage of Radiations Through Matter (191 pp.) by Hans A. Bethe and Julius Ashkin, is superb. Heavy charged particles, beta and gamma rays are covered in considerable detail, and much practical as