# BOOK REVIEWS

**Lectures in Theoretical Physics. Volume II.** Lectures Delivered at the Summer Institute for Theoretical Physics, University of Colorado, Boulder, 1959. Edited by PROFESSOR WESLEY E. BRITTIN and PROFESSOR B. W. DOWNS, Department of Physics, University of Colorado. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. vii + 483 pp. 16 × 23.5 cm. Price, $9.00.

In addition to expository books, review articles and annual reviews, a new method of bringing physicists abreast of recent developments recently has become popular, namely that of summer school lecture notes. Not everyone interested gets the time or leisure to participate in the summer schools themselves, but the lecture notes bring the material within reach of a much wider group of interested workers. These notes, in general, occupy an intermediate position between review articles and informal lecture notes with some flavor of conference proceedings.

The present volume contains lectures by eight lecturers on a variety of topics in theoretical physics. The varying treatments of these topics reflect in part the personal tastes of the authors and in part the nature of the subjects. The lectures by J. J. Sakurai ("Symmetry laws and elementary particle interactions"), by N. M. Hugenholtz ("Many body problem in quantum mechanics") and by M. Dresden ("Aspects of abstract field theory") are excellent and detailed treatments of the respective subjects. Sakurai's article attempts to present the role of symmetry principles in correlating elementary particle phenomena and as a guide to the formulation of relevant questions in the field; and in this he succeeds admirably well. The article by Hugenholtz presents the recent advances in the treatment of interacting many particle systems and the use of powerful techniques in general developed in connection with quantum field theory; since this excellent review also develops the appropriate quantum mechanical results it is self-contained and appropriate as an introduction for a person unfamiliar with the fashions in this field. The review by Dresden discusses the general theory of quantized fields which has as its aim the study of quantized fields without recourse to any specific interaction Lagrangian density; the article is carefully written and should be easily understandable to anyone with a background in standard quantum mechanics. It would have been desirable to motivate the axioms of relativistic field theory from, say, Lagrangian perturbation theory, and to show that the "reduction formulae" which express scattering matrix elements in terms of vacuum expectation values of ordered products of Heisenberg operators can be obtained from the Feynman perturbation series by formal manipulations.

The lectures by B. W. Downs ("Hypernuclei and the Λ-nucleon interaction"), J. H. D. Jensen ("Present status and problems in the theory of beta decay") and W. E. Lamb, Jr. ("Quantum mechanical amplifiers") are shorter expositions; while they are authoritative and well-written, they suffer to some extent from the brevity of the articles. Downs reviews the extensive calculations on the properties of systems formed by a Λ hyperon bound in a nucleus ("hypernuclei") based on assumed force laws. Within the framework of the assumed force law (and other assumptions of convenience like the undeformed "core") the calculations are the best that can be done. There does not seem to be any very convincing reason to believe the force law or the validity of approximations when using such short range forces; nevertheless the calculations are ably summarized here. The article by Jensen reviews the essentials of beta decay theory and the significance of some experiments; the treatment seems to have been deliberately made "old-fashioned." It would have been desirable to have a more satisfactory treatment of time reversal invariance, etc., but Sakurai's article can be used for this purpose by the readers of this volume. The review by Lamb on quantum-mechanical amplifiers deals with a subject not often seen in conjunction with particle physics; one only wishes that the article could have been longer and was developed more fully.

The two remaining short lectures are of somewhat unique character. The article by Abdus Salam ("Invariance properties in elementary particle physics") is really a review of certain topics in the theory of group representation; and presents an elementary exposition of the rotation groups in 2, 3 and 4 dimensions, some of which material is not easily accessible in the physics literature. But the treatment is very brief, sometimes to the point of only a statement of results; and the "elementary particle physics" part is almost an apology. The article by F. Rohrlich ("The classical electron") is of a very different kind and, while the title may sound old-fashioned, it treats admirably the question of consistency of classical electrodynamics. As in many other places, an investigation of the consistency presupposes a precise formulation of the theory; and this had been hardly done properly for classical electrodynamics elsewhere. In this article Rohrlich shows, for example, that the transformation properties of the energy momentum four-vector are automatically satisfied irrespective of the stability of the point electron, in contrast to the apparent paradox raised by Abraham. Rohrlich also reviews Dirac's electrodynamics and discusses classical mass renormalization. But this reviewer is not quite clear as to what constitutes "classical electrodynamics" here: the third-order equations giving rise to the unusual features of Dirac's electrodynamics are only feebly motivated and there does not seem to be very much connection of the particle equations of motion here with the corresponding equations in quantum electrodynamics.

On the whole this volume will be of use to a very wide audience. The editors are to be congratulated in assembling such a variety of well-written articles; the format is attractive and the binding is durable. The price ($9.00) is reasonable.

DEPARTMENT OF PHYSICS AND ASTRONOMY
UNIVERSITY OF ROCHESTER E. C. G. SUDARSHAN
ROCHESTER 20, NEW YORK

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**Encyclopedia of Physics. Volume X. Structure of Liquids.** Edited by S. FLÜGGE. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1960. vi + 320 pp. 17 × 25 cm. Price, DM. 198.—.

This volume of the "Handbuch" is of handbook weight, only 0.76 kilograms for 320 pages. The weight of erudition per page is about normal for the "Handbuch" series, and is compressed into three articles: an 126 page article "The Structure of Liquids" by Herbert S. Green, Adelaide, an 143 page article "Molecular Theory of Surface Tension in Liquids" by Syu Ono and Sohei Kondo of Tokyo and Misima, Japan, respectively, and a shorter 23 page article by Frank P. Buff of Rochester. All three articles are excellent, but hardly light reading.

The article by Green starts with a chapter of 10 sections almost free of equations entitled "General nature of liquid structure" which forms an excellent introduction. This chapter alone is quite complete and self contained; the reader is given a well developed summary of the present state of knowledge of liquid structure. In each of the four succeeding chapters the first section is relatively simple, and the notation in the equations is explained, rather than leaving the reader to thumb back through innumerable pages of equations to find the first time a symbol is introduced.

Needless to say, since the article presents a rather complete and detailed treatment of a difficult subject, many of the sections are not simple. The density of equations is high, but in almost every instance that a new subject is introduced a good summary, without excessive equations, is given. The style is clear, and except for a very few slips (twice energy was used when free energy would have been correct) and one or two rather obvious missprints in the equations, the logic and mathematics are excellent. The author is to be complimented on an excellent article.

The second article on surface tension by Ono and Kondo is also admirable. The introduction is clear and simple, although not as thorough in its self containment as Green's.