

properties and behavior of many-particle systems, a field which includes many of the most significant applications of quantum mechanics.

The scope of the book can be indicated by a brief review of its contents. In the first four chapters, the author develops the mathematical formalism which is based on the Dirac-Jordan representation theory, and discusses in a succinct, yet clear, manner the physical principles of quantum mechanics. Although these chapters constitute an introductory summary of the quantum theory of states and observables, they succeed in clarifying, at least for this reviewer, some bothersome questions. For example, the author's treatment of fixed and moving operators and representations, and of change of state in time is particularly helpful. The fifth chapter deals with the fundamentals of perturbation theory. The sixth chapter considers some of the properties of groups which are useful in the treatment of many-particle problems. In chapter seven, the anti-symmetry principle is studied as is the density matrix in many-electron systems. Chapters eight and nine are devoted to the methods for determining the eigenvectors which give the best approximation to the solution of the wave equation of a many-particle system (the method of the self-consistent field). The variational method is treated first, with emphasis on the derivation and physical aspects of the Hartree and Fock-Dirac equations. This is followed by a discussion of the statistical or semiclassical approximation which is used to select the first approximation to the potential with which to start the iterative process of solving the Hartree and Fock-Dirac equations. The section closes with a discussion of the Thomas-Fermi approximation. Chapter ten consists of a detailed treatment of the Dirac vector model including its relationship to group theory. Here the author has succeeded in avoiding an overly formal group-theoretic approach without diluting the elegance of the method. Applications to the theory of valence are considered, and the four, six, and eight electron problems are discussed at considerable length. The eleventh chapter deals with second quantization. The author discusses its operational aspects, its place in the general representation theory and its relationships with the method of the self-consistent field, with the Dirac vector model and with the hole formalism. The treatment of this subject is excellent. The book closes with a short chapter on the S-matrix theory.

The author is to be commended for undertaking the formidable task of writing a book of this scope, and for the successful achievement of his goal. His exposition is clear and logical; the mathematical treatment is elegant. It is understandable that space limitations did not permit including illustrative examples in all cases where they might have been desirable. However, considering the many literature references cited, the general theory and methods have been presented in a sufficiently detailed way so that the volume should be very useful. One must agree with the author's belief that the subject matter presented constitutes a representative cross section of applied nonrelativistic quantum me-

chanics. For these reasons Dr. Corson's book is highly recommended to research physicists and to graduate students of physics.

Finally, the printers, Blackie and Son Ltd., of Glasgow, are to be congratulated on the beauty and artistry with which this volume has been made. The book's merits, both internal and external, should compensate amply for its price.

Irving Kaplan

Brookhaven National Laboratory

Cloud Physics

Cloud Physics. By D. W. Perrie. 119 pp. John Wiley and Sons, Inc., New York, 1951. \$4.50.

This is a book on a subject which has recently assumed much popularity in scientific circles, as well as among the news and magazine supplements, since it is related to "rainmaking".

During the past fifty years, a number of books and monographs have appeared based on the physical and chemical properties of the atmosphere. Humphreys' *Physics of the Air* is an example of a book covering most of the general properties of the atmosphere. Landsberg's *Atmospheric Condensation Nuclei* is a monograph which deals with a highly specialized field.

As a result of the many excellent basic research studies in the field of meteorology which were started during World War II and have continued up to the present time, many new discoveries have been made in this important science. *Cloud Physics* is apparently directed toward partially filling the gap in the available printed information dealing with clouds. As such, it will be welcomed by all who are interested in the subject.

A useful feature of the book is the references it contains to the historical development of the study of clouds. These should not be accepted as completely authoritative, however, without some additional check on the references cited. An example of a reference to the historic literature which may be misleading is that of the "seeding" of clouds with dry ice which was carried out by Veraart in Holland during the 30's. A study of Veraart's experiments shows that he employed methods suggested by Gathman of Chicago in 1891 in patent applications. This involved the dumping of large quantities of dry ice into the atmosphere so that the cooling of the air would either produce cloudiness or precipitation in existent clouds. This use of dry ice to affect clouds was thus based on an entirely different idea than that which is used by the reviewer and his colleagues when seeding supercooled clouds with dry ice. To have any appreciable effect in the atmosphere Gathman and Veraart's method would require countless tons of dry ice. To modify supercooled clouds, a few pounds of dry ice are enough to produce a major effect in a cloud area several miles in diameter.

This book is recommended primarily since it indicates the many gaps in our present knowledge of cloud physics and the uncertainties which exist in this important field of the physical sciences.

It is unfortunate that it was not possible for the author to incorporate the many recent advances in our knowledge of nuclei, ice crystals, cloud properties, and thunderstorm electricity which have appeared in the scientific literature within the past two years. However, with the many research studies now actively under way in cloud physics in the United States, Canada, England, France, Australia, Switzerland, India, and other parts of the world, it is unlikely that anyone could publish a book on this subject without it being superseded by new knowledge and discoveries before leaving the hands of the publisher.

Cloud Physics is recommended for the library of all active meteorologists, reference libraries, and for any others interested in this fascinating aspect of the weather. The book is written in simple language and in a semipopular vein. Its illustrations are good, although, in general, they do not add significantly to the text. Figure 4 seems to be printed upside down. The fact that the illustrations do not bear any particular reference to the text probably explains the reason for locating them in a group.

A useful chart on cloud forms appears at the end of the book. The Glossary and Bibliography are rather incomplete for a book of this nature.

Despite these shortcomings, the book provides interesting reading on a subject of interest to many.

Vincent J. Schaefer

General Electric Research Laboratory

Briefly Noted

FLUID DYNAMICS

The University of Maryland's Institute for Fluid Dynamics and Applied Mathematics has made available at cost an informal publication of lectures by visiting professors, with the following titles and prices: Series No. 1, *Mathematical Methods Used in the Statistical Theory of Turbulence—Harmonic Analysis*, by J. Kampe de Fariet, \$2.20; No. 2, *Linearized Theory of Supersonic Flow*, by Sydney Goldstein, \$0.50; No. 3, *Turbulence*, by F. N. Frenkiel, price undetermined. Requests for the lecture notes, accompanied by remittance, should be addressed to the Office of the Institute at the University of Maryland, College Park, Maryland.

CANADIAN NRC REPORT

The National Research Council of Canada has published its *Annual Report* of investigations in progress which furnishes a bird's eye view of the Council's internal organization, the research carried on by its various laboratories and specialists, the work of its committees, and its assistance program to university science workers. Copies of the report, NRC No. 2254 (278 pp., 11 illustrations, 1 chart) may be secured from the National Research Council, Ottawa, Canada, for \$0.75, remitted by money order or check payable to the Receiver General of Canada for the credit of the NRC.

ALASKAN SCIENCE CONFERENCE

The National Research Council, in November, 1950, sponsored the first Alaskan Science Conference, a three-day meeting of more than 400 leading United States and Canadian scientists and administrators concerned with problems relating to the Alaskan area. The *Proceedings* of this conference, containing a full report of all general papers as well as abstracts of all technical material presented, are now available at \$2.00 per copy from the National Research Council, 2101 Constitution Avenue, Washington 25, D. C.

INSTRUMENT STANDARDS

In this new edition of the *American Standard for Electrical Indicating Instruments*, definitions and classifications of materials for switchboard and panel instruments have been completely revised, as well as extended to include specifications for portable and laboratory instruments. Covering alternating and direct current instruments, the Standard gives charts describing thirty-three types of equipment. Copies may be secured from the American Standards Association, 70 East 45 Street, New York 17, at \$1.60 per copy.

NUCLEAR PHYSICS

Progress in Nuclear Physics, edited by O. R. Frisch, is the first volume of what is planned to be an annual series, much like the same publisher's *Advances in Electronics*. It consists of a number of review articles on various phases of nuclear physics intended primarily for nonspecialists in the particular topics covered. These range from quite comprehensive treatments of nuclear emulsions, electronic circuits having specific application to nuclear instrumentation, the theory of beta-decay, and the scattering of neutrons by crystals to only slightly less extensive discussions of certain accelerators, the Szilard-Chalmers process, and beta- and gamma-ray spectroscopy. The material is very clearly presented in all cases, with a number of exceptionally comprehensive bibliographies included. Judging from this volume, the series should find an excellent reception among workers in the field. (224 pp. Academic Press, Inc., New York, 1950. \$6.80.)

PHOTONS AND ELECTRONS

Photons and Electrons by K. H. Spring, one of the well-known Methuen series, discusses the interactions between electrons and radiation. The photo-electric and Compton effects, bremsstrahlung, Cerenkov radiation, positrons, and pertinent cosmic ray phenomena are given concise, somewhat technical accounts. No attempt is made at an extensive theoretical treatment of the subject, although the results of the theory are frequently quoted. The book is most likely to be useful to those desiring the theoretical and experimental findings in a compact form, and might also be of interest to students seeking an introduction to this material. (108 pp. John Wiley and Sons, Inc., New York, 1950. \$1.75.)