

Oxford



The Properties of Liquid and Solid Helium

By J. WILKS, *Pembroke College, Oxford*. This volume presents an extensive and critical survey of the physical properties of condensed ^3He and ^4He . The behavior of the liquid and solid phases are discussed against the theoretical background, which is now sufficiently developed to unify many diverse experimental results. Particular attention is also given to the wide variety of experimental techniques employed in the study of helium at low temperatures. 356 figures, 3 halftone plates. (*International Series of Monographs on Physics*.) \$20.20

Space Vehicle Dynamics

By K. J. BALL and G. F. OSBORNE. This book develops the theory of space vehicle dynamics expressly for the purposes of aerospace engineering, and is written for those actively engaged in this field. The numerous chapters cover performance and stability aspects of single and multistage vehicles; techniques of separation and ballistic flight; satellite orbit; angular motion in space; and satellite location. It is assumed that the reader will follow the mathematical formulae easily and thus understand the techniques evolved. 106 text figures. \$13.50

The Detection and Measurement of Infra-red Radiation

SECOND EDITION

Edited by R. A. SMITH, *Massachusetts Institute of Technology*; F. E. JONES; and R. P. CHASMAR. Since the first edition of this book was published in 1957 it has been a leading text for students and research workers in the rapidly growing field of activity associated with the use of infra-red radiation, both for scientific investigation and for technological applications. Since then many new developments have taken place, and the purpose of the new edition is to give an up-to-date account of the methods of detection and measurement of infra-red radiation, including all recent advances. 5 plates, 146 figures. (*Monographs on the Physics and Chemistry of Materials*.) \$12.80

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son then distinguishes between the "covariance group" and the "symmetry group" of a theory. A covariance transformation maps solutions of the theory into solutions; a symmetry transformation leaves the absolute objects of the theory unchanged. Thus the symmetry group is a subgroup of the covariance group. Anderson then argues (in part III) that general-relativistic theories possess the group of curvilinear coordinate transformations as a symmetry, and not merely as a covariance group. It is possible that Anderson's argument may require some additional refinements, but to this reviewer it appears sound in the fundamentals and destined to terminate a discussion of the foundations of general relativity that is as old as the theory itself.

Part II is devoted to the special theory of relativity, including a long chapter on relativistic particle dynam-

ics, and part III to the general theory of relativity. The book closes with a chapter on cosmology.

There are many references to the journal literature, and in a number of areas recent advances are covered well into 1966. No author can make all readers happy; the best he can do is to satisfy those who agree with his approach. Anderson develops his themes not as an extrapolation from prerelativistic physics but as a set of theories whose validity has been established and that ought to be studied in their own right, just as classical mechanics has been studied, or Maxwell theory. If this attitude is shared by the instructor in charge of the course, Anderson's book can be recommended without reserve as the principal text.

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The reviewer is professor of physics at Syracuse University and himself the author of a text on relativity.

Quantum optics reviewed

LASERS: A SERIES OF ADVANCES, Vol. 1. A. K. Levine, ed. 365 pp. Marcel Dekker, New York, 1966. \$14.50

by H. J. Hagger

The interest in lasers is growing not only from the scientific point of view but also from the applications side. The frequency spectrum covered by these quantum-mechanical devices is steadily extended to longer wavelengths into the infrared. This field has also a very stimulating effect on spectroscopy demonstrating its close relationship to this fascinating but not so famous branch of knowledge. The number of books on lasers is large, the papers in journals enormous, but there was a gap in not having careful and critical reviews on the different kinds of laser devices. The editor states in the introduction to this first volume of a series that it should be a critical review of the progress made in this field. I think that this aim has been reached. This book reviews the total field, and at the same time it is critical in comparing results and in drawing the future lines of research.

One third of the book is devoted to pulsed ruby lasers, the most important device for high-power work. Experimental and theoretical results are com-

pared, and most of the content of the first chapter discusses the output characteristics of pulsed ruby lasers. About 300 references are cited. In a second chapter other optically pumped crystal lasers are considered. Here we find a very detailed and critical review of laser action by rare-earth, actinide and transition-metal ions (nickel, cobalt). Together with a short description of experimental procedure the most interesting remarks of the author of this chapter consist in a discussion of the host crystals for the different ions. These laser materials, which are not so well known, seem to open quite a large field for further investigation. Even less known are organic laser systems and the large number of luminescing organic compounds will certainly be a reservoir of new laser materials, even if we can say at this moment that organic lasers have not yet been operated very successfully. Organic lasers will find applications where the laser frequency must be varied. One can vary it easily with changes in chemical structure. Also metalorganic compounds (chelates) are discussed.

For high-power lasers Q switching is very important to control laser action. The book compares theory and techniques and discusses electrical and mechanical modulators. It also de-

scribes briefly other methods such as acoustic-wave modulation, saturable dyes, etc. This chapter lacks a bit in depth; one would have expected to learn more about the less usual methods. The last chapter deals with optical resonators. The main emphasis is on spherical mirror systems, on beam radius and on propagating modes. Diffraction losses and mode selection are briefly discussed. The chapter closes with a review of lenses in optical resonators. Very helpful for the propagating-mode discussion is a selection of references.

In the reviewer's opinion the actual values of the different chapters vary very much. The critical review chapters on ruby, rare-earth and organic lasers provide not only an extremely good overview of the fields covered but also successfully compare different systems, review them critically and draw conclusions from such a comparison. They also show a way and a must for future research. The other parts, about a quarter of the total content of the book, are quite helpful but by no means so thoroughly treated as are the first three chapters.

Summarizing one can say that this book is, despite my criticism, a very important and also stimulating publication on lasers. I await with interest the following volumes of this new series which, I hope, will be on the same line and edited with the same care that has been taken with this volume.

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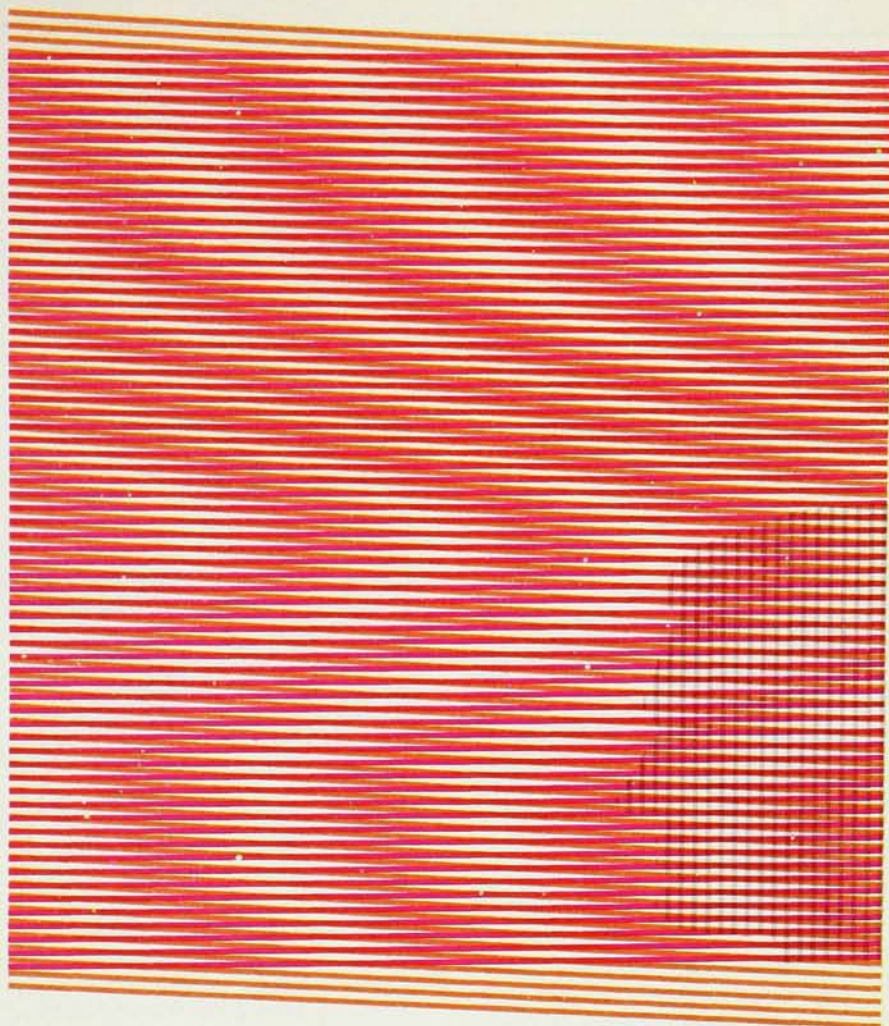
H. J. Hagger is with Albiswerk in Zürich.

Looking it up

FORMULAS AND THEOREMS FOR THE SPECIAL FUNCTIONS OF MATHEMATICAL PHYSICS. (3rd edition) By Wilhelm Magnus, Fritz Oberhettinger, R. P. Soni. 508 pp. Springer-Verlag, Berlin, 1966. \$16.50

by Eugene P. Wigner

It must be difficult to write a good collection of formulas and theorems; it surely is difficult to review one. This book is not meant for reading: It quotes theorem upon theorem without proof and hardly can hold the interest of any reader. It is not meant to be



profile of a project

Project Vela — the Spanish word for "vigil" — aptly describes its purpose: to more efficiently detect clandestine nuclear explosions in space. The Vela scientists evaluate data relayed from eight satellites carrying nuclear radiation detection systems developed by the Laboratory and currently in orbit. A large part of this effort involves basic research on natural radiation from the sun and from outer space. The Laboratory has also successfully developed a ground-based detection system utilizing the observation of radiation produced air fluorescence in the upper atmos-

phere. Efforts toward improvement include the study of natural backgrounds such as lightning and aurorae. Participating in this project are experimental and theoretical physicists, including atomic and molecular, nuclear, and plasma specialists, mathematicians, electronics engineers, and technicians.

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