

interesting problems of manned space travel. Vaeth clearly points out the requirement for fundamental step-by-step research and exploration of those problems and the extremely serious limitations on making a sudden "jump" from the present high-altitude rockets, jet aircraft, and proposed *unmanned* "minimum satellite" to full-fledged *manned* trip to the moon or further.

It should be pointed out that, though the Navy first employed the Aerobee rocket for high-altitude research, the extent of Aerobee firings and research programs by other agencies in the United States has been at least equal to those sponsored by the Navy. As of the present time nearly 140 Aerobees and Aerobee-Hi rockets have been launched for upper-atmosphere research. Of these, at least 60 firings have been by the Air Force and over 30 by the Army Signal Corps. Similarly, though the Office of Naval Research was responsible for the basic development of the Skyhook high-altitude plastic balloon, the very extensive Air Force programs of "Moby Dick" high-altitude balloon flights for upper-atmosphere and space-biology studies should be given more than passing notice.

In discussing the cause of the blue color of the sky the author states that this is due to "dust particles". Leonardo da Vinci first suggested that the blue of the sky was due to scattering by the gaseous molecules of the atmosphere, and since Lord Rayleigh's development of the inverse fourth power of the wavelength theory of atmospheric scattering of light there appears to be little opposition of the *gaseous molecular* explanation of the blue color of the normal sky. The reports of the observers in the Explorer I and II balloon flights to 72 000 feet, indicate that the sky was still *blue* 20° to 30° above the horizon, grading to very dark *blue-black* higher up. This observation appears to be consistent with gaseous molecular scattering theory.

In conclusion, Vaeth emphasizes the value of the international coordination and cooperation which should result from the International Geophysical Year and from the achievement of the artificial Minimum Earth Satellite. Certainly, from the viewpoint of scientific knowledge of the upper atmosphere, and as factors leading towards true space flight, these points will be invaluable. Can we hope that the items of international cooperation and of political "uncertainty" which will be interjected into the present international picture by the proposed artificial Minimum Earth Satellite will also give us a firm incentive towards world peace? *200 Miles Up* suggests that this may be so.

Determination of Organic Structures by Physical Methods. Edited by E. A. Braude and F. C. Nachod. 810 pp. Academic Press Inc., New York, 1955. \$15.00. Reviewed by Joseph G. Hoffman, Roswell Park Memorial Institute.

The preface points out that applications of physical principles and chemical methods to the analysis of organic structures had not hitherto been collectively reviewed. The editors with the aid of twenty-two con-

tributors have made a compilation of such methods of analysis. Many diverse and specialized aspects of physical chemistry bearing on organic structures are reviewed in sixteen chapters. The book is subdivided into three main sections, the first on molecular size, the second on molecular pattern, and the third on molecular fine structures. Its 810 pages make it a compendium essential for workers in the many different sciences such as physics, biophysics, biochemistry, and physical chemistry where knowledge of organic structures of molecules has almost become an everyday requirement.

Inasmuch as there is broad coverage of a wide range of highly technical subjects this review can only point out some of the typical contributors. Thus the chapter on Magnetic Susceptibilities reviews, by means of specific examples of compounds, magnetic analysis by means of static and alternating magnetic fields. The chapter on Dipole Moments is equally specific in that it shows what can be done with dipole moments and how to do it. Likewise the chapters on Dissociation Constants and Reaction Kinetics are filled with data accompanying remarkably clear discussions of structure problems. The last chapter on Wave Mechanical Theory provides a fine summary of theory pertinent to molecular structure.

Many workers in borderline fields such as biophysics or biochemistry will find here much useful and timely material. Indeed, many of the numerous examples discussed are compounds sometimes called biomolecules. The text is generously illustrated with appropriate figures and diagrams, and is supported by ample data. The very good author and subject indices serve the reader well in this broad and complex subject which crosses several different basic disciplines.

Harmonic Analysis and the Theory of Probability. By Salomon Bochner. 176 pp. University of California Press, Berkeley, Calif., 1955. \$4.50. Reviewed by T. Teichmann, Lockheed Aircraft Corporation.

In recent years the boundary between mathematical probability theory and Fourier transform theory has all but vanished due to the extensive use of the characteristic functions (essentially Fourier transforms) of probability distributions in so many applications. While probability theory to some extent restricts the transform theory to positive definite functions, it also elicits in a natural way the deeper and more general concepts discussed in the latter portion of this book.

The first part of the book summarizes the basic properties of Fourier transforms and the more important underlying notions, such as approximations, additive set functions and summability. Poisson's summation formula is introduced in a very general and elegant way (though there is an obvious misprint in line 5, p. 31). Some of the basic properties of *n*-dimensional spherical harmonics are introduced very naturally in terms of *n*-dimensional Fourier transforms.

The next two chapters deal with closure properties and with Laplace and Mellin transforms. The treat-

ment is directed at the probabilistic applications, with extensive discussion of infinitely divisible processes, random variables, and positivity. There is also an interesting treatment of some of Bochner's own work on summation formulae and "modular relations".

The final part of the book is concerned with characteristic functionals and stochastic processes. These characteristic functionals are related to stochastic processes in an analogous way to the relation between characteristic functions and their corresponding random variable and Bochner introduces some of the basic steps in carrying this similarity further (e.g. generating functionals).

While the material is rather abstract, the style is kept lively, and, in fact, almost conversational, and it will certainly prove most valuable to anyone working in the field. The format and printing are also excellent and the book sets a high standard for future "California Monographs in Mathematical Sciences", of which set it is the first member.

Recent Advances in Optics. By E. H. Linfoot. 286 pp. The International Series of Monographs on Physics, Oxford University Press, New York, 1955. \$8.00. Reviewed by V. Twersky, *Electronic Defense Laboratory, Sylvania Electric Products Inc.*

A basic problem of instrumental optics is specifying the "best image surface" for a given optical system and object. In the first chapter this problem of selecting the surface that minimizes the various aberrations is first considered on a geometrical ray basis. Analytical approximations (with error terms in powers of the angular diameter of the image field) are derived, and applied to such questions in "aberration balancing" as: "What amounts of residual Gauss and Seidel aberration will give the smallest rms image radius over the best spherical field surface of a monochromat with specified Schwarzschild aberration coefficients?" Then the effects of diffraction at the exit pupil are discussed on the basis of Huygens' principle. The first chapter ends with a treatment of images of "partially coherent object surfaces". This concept is particularly important in microscopy, since light from an incoherent source is partially coherent after reflection or transmission, the "coherency" arising from effects at the observation point traceable to a common element of the original source. (The problems here are quite similar to some in communications theory.) The final pages of this section treat the phase-contrast microscope.

Chapter 2 uses Huygens' principle to develop a general theory of the Foucault knife-edge test. Because of its simplicity, and one's intuitive interpretation of the mirror's appearance as a perturbed plane under grazing illumination, this ninety-year-old test is still the most widely used check for astronomical mirrors, etc., during "figuring" (shaping) by optical polishing. The analytical problem is essentially that of the diffraction of a perturbed spherical wave front converging to a focus near the edge of a half plane.

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By E. BRIGHT WILSON, Jr., Harvard University;
JOHN C. DECIUS, Oregon State College, and
P. C. CROSS, University of Washington. 390
pages, \$8.50

This work covers the theory of the vibrations of polyatomic molecules and the applications of their theory to the interpretation of infrared and Raman spectra. Particular emphasis is laid on providing a sound foundation for understanding and utilizing the symmetry of molecules to simplify calculations. Advanced mathematical techniques, such as matrix algebra and group theory, are developed in the book as needed.

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By LEONARD I. SCHIFF, Stanford University.
International Series in Pure and Applied Physics.
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An exhaustive but succinct treatment of quantum mechanics. Seventeen new problems have been added, and revisions in material include a more precise discussion of wave packet and a more sound derivation of the Born approximation expression for the phase shifts. Illustrative examples appear both in the text and in the problems. Numerous problems, which comprise exercises, applications to systems of physical interest, and amplification of points are discussed.

MODERN PHYSICS

By JOHN C. SLATER, Massachusetts Institute of
Technology. 330 pages, \$5.50

Offers an elementary survey of modern physics, including its development from about 1900 to the present. The aim is to follow the development of the ideas of modern physics, in particular the quantum theory, and its application to the structure of atoms, molecules, solids, and the atomic nucleus. The keynote of the treatment is the logical historical development of 20th Century physics, showing how each of the great new theories followed each other almost inevitably.

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