

Fourier Series. By Georgi P. Tolstov. Transl. from Russian by Richard A. Silverman. 336 pp. Prentice-Hall, Inc., Englewood Cliffs, N. J., 1962. \$13.00. *Reviewed by Ellis H. Dill, University of Washington.*

ALTHOUGH it reads as easily as a novel, this is a thorough and rigorous presentation of Fourier series. The mathematical tools are elementary and the book is suitable as a text for a one-quarter senior course in applied analysis.

The author considers trigonometric Fourier series, theory of orthogonal systems, Bessel functions, and the usual applications of the eigenfunction method. The treatment of trigonometric series is unusually complete and clearly stated, and the subject is viewed with computational aspects in mind. The treatment of orthogonal systems and Bessel functions is minimal.

This book may certainly be recommended as a reference book and even as a bedtime story for research workers and teachers.

Operational Methods for Linear Systems. By Wilfred Kaplan. 577 pp. Addison-Wesley Publishing Co., Inc., Reading, Mass., 1962. \$10.75. *Reviewed by T. Teichmann, General Dynamics Corp., General Atomic Division.*

LINEAR differential equations and their application to physical problems have long been one of the most popular subjects for mathematical and applied physics texts, and the appearance of another expository work in this well-cultivated field requires some justification. In the case of Kaplan's book this is provided (subject to the comment below) by the wide span of topics covered from the point of view both of technique and of mathematical depth. The subject matter ranges from existence theorems to the mechanics of the root-locus method, and includes complex-variable theory, Fourier series and integrals, Laplace transforms, and linear differential equations with variable coefficients, all in some detail. Among features particularly worthy of note are fairly extended discussions of finite Fourier and Laplace transforms, a systematic, if brief, discussion of generalized functions (i.e., δ -functions and their derivatives), complemented by a short appendix on the operational calculus of Mikusinski, and a comprehensive and useful discussion of Green's functions and the related "system functions" for linear differential equations with variable coefficients. Each section is accompanied by a number of problems and their answers, and all important tables of transforms are gathered in an appendix as well as included in the text.

While the material covered is extremely comprehensive, in this reviewer's opinion, the author would have done better to have concentrated on those (many) aspects of the work which are not to be found to any appreciable extent in other books of this kind, and to have eschewed the complete presentation of "standard" material. Nevertheless, the almost encyclopedic nature of the contents will make this book very valuable as a

reference, and with some self-discipline, it should also be useful as a text.

Group Theory and Its Application to Physical Problems. By Morton Hamermesh. 509 pp. Addison-Wesley Publishing Co., Inc., Reading, Mass., 1962. \$15.00. *Reviewed by Carson Flammer, Stanford Research Institute.*

A SUBJECT not usually stressed in the formal education of theoretical scientists is group theory. Fascinating in its own right, it is also an important tool in those aspects of theoretical physics where symmetry is involved. Since their publication in 1931-1932 until quite recently, the German classics by Weyl, Wigner, and van der Waerden were main references for group-theoretical methods in quantum physics. Useful supplements to these, known I am sure to many US scientists, have been sets of notes based on lectures by Dr. Hamermesh at Argonne National Laboratory during the past several years. These notes have now been expanded into a good-sized book that gives a detailed treatment of many aspects of group theory that are of importance for the application of group-theoretical methods to certain quantum-mechanical problems in atomic and nuclear physics.

The book opens with a chapter on the rudiments of the theory of finite groups, but only those aspects that are directly relevant to the future applications are included. As a consequence, such useful and simple group-theoretical concepts as ring and field are not even mentioned. In the excellent second chapter on the so-called symmetry groups, not only the well-known 32 point groups are derived, but also the additional 58 Shubnikov groups (called "color groups" by the author), which together with the point groups yield the 90 magnetic point-symmetry groups that pertain to crystals with a magnetic structure. Several fine chapters on various aspects of the representations of groups follow. Applications are then made to the splitting of degenerate atomic energy levels by a perturbation, to selection rules for optical transitions, and to coupled systems. Next comes a long chapter on the symmetric group that is important in the case of a system of identical particles. Then there is a chapter on continuous groups that contains sections on the structure of Lie groups and their algebras, subjects which are useful, for example, in understanding the structure of various dynamical theories (see E. C. G. Sudarshan, 1961 *Brandeis Lectures in Theoretical Physics*, Vol. 2, published by W. A. Benjamin, Inc., New York). A well-done chapter follows on the rotation groups in two and three dimensions with applications to the splitting of atomic levels in crystal-line fields for both single- and double-valued representations, and to the coupling of angular momenta. A chapter on irreducible tensors in n -dimensional space is followed by one dealing with applications to atomic and nuclear spectra. The last chapter treats the ray or projective representations, with which quantum mechanics is really concerned, and little groups or the

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□ DIFFUSION IN SOLIDS

By PAUL G. SHEWMON, Carnegie Institute Of Technology. *McGraw-Hill Series in Materials Science and Engineering*. 214 pages, \$9.50.

Offers a coherent, complete treatment of diffusion in solids. The primary aim is to make clear the physical meaning and implications of the concepts which apply to diffusion in all crystalline solids. References are cited only as they will help the reader build on what is given in the book. The book evolved from a one-semester course taught to first-year graduate students, and it can be used for senior or graduate courses in diffusion, or in courses where diffusion is discussed as a basis for studying reactions in solids.

□ HIGHER EDUCATION IN ENGINEERING AND SCIENCE

By HERMAN A. ESTRIN, Newark College of Engineering. In Press.

This collection of authoritative articles covers all important aspects of engineering and science education, and presents improved techniques and approaches to engineering and science teaching. Philosophies and methods are those not only of outstanding engineers and science instructors, but also of effective and prominent educators. The contents are so arranged that they help enable the instructor to acquire a philosophy of engineering and science teaching; devise methods of evaluation; and develop techniques for inspiring and guiding engineering and science students. Because of the wide range of excellent sources, the book will be of value both to the beginning and experienced instructor.

□ OPERATOR TECHNIQUES IN ATOMIC SPECTROSCOPY

By BRIAN R. JUDD, University of California, Berkeley. *McGraw-Hill Advanced Physics Monograph Series*. Available in February, 1963.

The purpose of this book is to provide a theoretical background for physicists engaged, or about to engage, in spectroscopic work with atoms or ions, particularly those of the rare

earth or actinide series. The methods developed by Racah in the 1940's and 1950's are emphasized, and in describing these methods, the author has stressed the applications of the theory, to give physicists a working knowledge of electron structure. The methods discussed are by no means limited to atomic spectroscopy. Many of the ideas are of equal importance in nuclear and molecular physics.

□ BASIC MATHEMATICS FOR THE PHYSICAL SCIENCES

By HAYM KRUGLAK, Western Michigan University; and JOHN T. MOORE, University of Florida. Available in February, 1963.

A supplementary "mathematics refresher" book for the average liberal arts student taking a course in the sciences. Studies have revealed that more gifted students would choose science for a career if it were not for their real or imagined weakness in mathematics. For many of these students, it is simply a matter of review and extensive practice with elementary arithmetic, geometry, algebra, trigonometry, and calculus. The authors represent the ideal team of physicist and mathematician to choose review topics for their mathematical usefulness in the physical sciences, for general education, astronomy, chemistry, and physics.

□ ENVIROMENTAL RADIOACTIVITY

By MERRIL EISENBUD, Director, Institute of Industrial Medicine, New York University Medical Center. Available in April, 1963.

A post-graduate text and reference book consolidating the information that has developed during the past twenty years on the major problems of radiation hygiene which involve passage of radioactive materials into the environment. Beginning with the atom bomb project of World War II, laboratory and field studies have been conducted throughout the world which have shed considerable light—and provided considerable information—on the physical and biological factors involved in the ecological system of which we are a part. This knowledge is useful to understand the behavior of natural radioactivity, the effects of wastes from the atomic energy industry, and the effects of fallout.

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groups of the wave vector that are of great importance in solid-state physics. An introduction to the Lorentz group is also given. Many problems are interspersed throughout the book. Only a few minor misprints have been noticed.

One might wish that the book contained a wider range of applications. This reviewer would like to have seen included some detailed treatments of the application of group theory to the energy-band structures of solids and perhaps a general discussion of the relation between symmetry properties and conservation laws, as well as more than just the short introduction on the Lorentz group. However, the topics that are discussed are treated for the most part in much greater detail than in most other books. The book is therefore recommended to anyone familiar with the basic principles of nonrelativistic quantum mechanics who wishes a detailed introduction to group-theoretical methods in physics.

Reflection and Refraction of Progressive Seismic Waves. By L. Cagniard. Transl. from French by Edward A. Flinn and C. Hewitt Dix. 282 pp. McGraw-Hill Book Co., Inc., New York, 1962. \$11.00. *Reviewed by Walter G. Mayer, Michigan State University.*

ONE of the most important problems in theoretical seismology is the following: what is the behavior of elastic waves generated by an impulsive radial vibration of a point source located in a system of two different semi-infinite media in contact with each other. Professor Cagniard devotes the entire book to a rigorous theoretical study of this problem, approaching it by introducing the Laplace transform instead of the Fourier transform. He considers the possible initial and boundary conditions of the problem in an attempt to make the development as general as possible. The author also gives many extensive proofs to demonstrate the mathematical rigor of his approach.

The translators, Flinn and Dix, have contributed much to the usefulness of the book by revising the somewhat unfamiliar notation of the original French edition of 1939. They also deserve credit for adding numerous clarifying footnotes to the text and for furnishing instructions for a fruitful study of this monograph. They point out which sections should be omitted on first reading and which sections contain information vital for the understanding of the method of approach. Occasionally they explain why certain proofs, theorems, and lemmas were included in the text. The comments by the translators usually refer to mathematical steps which the author apparently assumed to be sufficiently self-explanatory, requiring no further discussion.

Despite the very helpful revisions and comments by the translators, it is fair to assume that "Cagniard's method" as presented here will appeal more to the expert familiar with advanced mathematical analysis than to the average reader who is primarily interested in the physical aspects of wave propagation.

Advances in Geophysics, Volume 7. H. E. Landsberg and J. Van Mieghem, eds. 333 pp. Academic Press Inc., New York, 1961. \$11.00. *Reviewed by E. J. Öpik, University of Maryland.*

WITH the exponential rate of increase in the number of papers published in a variety of journals, the research worker more than before is in urgent need of competent review articles or research monographs, especially those in other fields related to his own. Even when the literature is accessible, a review saves immense time and mental effort. The present volume is an ideal response to these needs. As an astrophysicist, the reviewer is especially grateful for it. It contains six authoritative monographs: (1) on controlled experiments for the study of flow, transport, stability, waves, etc., in large-scale cosmic media, by Dave Fultz; (2) a theoretical study on atmospheric tides, among other things critical of their accelerating effect on the earth's rotation, by Manfred Siebert; (3) a mathematical treatise on generalized harmonic analysis, by J. Van Isacker; (4) a study of temperature and wind in the lower stratosphere, to an altitude of about 30 km, by H. A. Panofsky; (5) a ten-year review of Arctic meteorology, by A. D. Belmont; (6) a review of experimental research on phase relations of rocks and minerals at high temperatures and pressures, covering melting points of minerals, vapor pressures of hydrous phases, etc.

The volume can be warmly recommended as a precious manual in various fields of geophysics, meteorology, and astrophysics.

The Universe. By Otto Struve. 159 pp. The M. I. T. Press, Cambridge, Mass., 1962. \$4.95. *Reviewed by Cecilia Payne-Gaposchkin, Harvard College Observatory.*

"THE Universe" is too inclusive a title for a book comprising six lectures on selected topics. Addressing a general scientific audience, the author wisely chose to present, in some detail, a few of the many problems on which he has worked in recent years. He has not produced merely another of the many "popular" treatments of a newly fashionable subject; his chapters contain new ideas that should be food for thought to many scientists.

Dr. Struve reminds us that astronomy has gone through three revolutions: the "Copernican revolution", which put the earth in its place; the "Shapley revolution", which revealed the extent of the Milky Way; and the "Sputnik revolution", which opened the gates of space to mankind. The final lecture, "Man and the Universe", and the first, which considers the origin of the Solar System, stand together in their examination of the question: Are we alone in the Universe?

The chapters that fall between do not form a sequence, although they are closely connected in subject matter. "Galaxies", "Binary Stars and Variables", and "Stellar Evolution" would have fallen more logically into that order, rather than as Chapters 3, 5, and 2.