

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.

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The chapter on radio astronomy falls a little apart from the rest of the book.

In a small compass the author illuminates his chosen subjects with his own ideas, and he does not fear to be speculative or controversial. Where the general reader will catch something of modern astronomical thought, the astronomer will read between the lines.

Even though the book is a short one, the absence of an index is to be regretted.

Dynamics. By Robert L. Halfman. Vol. 1, Particles, Rigid Bodies, and Systems, 379 pp., \$7.50; Vol. 2, Systems, Variational Methods, and Relativity, 584 pp., \$6.00. Addison-Wesley Publishing Co., Inc., Reading, Mass., 1962. Reviewed by C. H. Holbrow, Haverford College.

AS physics has grown in scope and content, curricula have been adjusted to meet the demands of contemporary physics. In classical mechanics, this has resulted in a reduction in depth and comprehensiveness of treatment as for example, rotating and linearly accelerating coordinate systems, which are emphasized by the treatment of small oscillations and the forced damped harmonic oscillator with little concern for the broader significance of linear systems. Furthermore, there is little indication of the implications of non-linearity of a system. Many lovely techniques and methods of approaching problems are never considered, thus leaving the student ignorant of them with embarrassing gaps in his general knowledge of the tools available to him.

The increasingly better mathematical preparation of many students makes it possible to upgrade intermediate level mechanics courses and to fill in some of these gaps. Robert L. Halfman's book *Dynamics: Particles, Rigid Bodies, and Systems* is a text which could well be useful to such a course. The author designed his book as a text for a full-year advanced engineering course. However, its mathematical sophistication and generality of treatment would make it an excellent supplementary text for a one-semester (perhaps slightly longer) physics course.

Vector algebra is used from the start, making possible concise but meaningful treatment of the problems of complicated motion. The author's treatment of rotating and linearly accelerating coordinate systems is unusually thorough and lucid. For this feature alone, the book can be recommended.

Matrices are also introduced, first very simply for transforming from Cartesian to cylindrical coordinates, and then with increasing intricacy as for principal-axes transformations of the moment-of-inertia tensor. For the benefit of those students unacquainted with matrices, matrix algebra is adequately described in an appendix.

One surprising feature, in view of the general level of mathematical maturity, is the absence of vector calculus. Treatment of dynamics of continuous media is awkward in the absence of the del operator. Further-