

range of current solid-state physics—and one on phase transformations in metals which well indicate the extreme complexity of real matter, and both the interest and the challenge of systems that are not ideally simple.

The introductory chapter, by Harvey Brooks, is particularly commendable, and supports the view that neither the pure scientist studying ideally simple materials nor the technologist with real complexities can be self-sufficient. What is now needed is another symposium with the interest reversed, to produce a book in which the engineer, *qua* engineer, writes for education of the physicist!

Microwave Principles. By H. J. Reich, J. G. Skalnik, P. F. Ordung, H. L. Krauss. 427 pp. D. Van Nostrand Co., Inc., Princeton, N. J., 1957. \$8.75. Reviewed by Charles Süsskind, University of California.

This is an abridgement of *Microwave Theory and Techniques*, which the same authors published in 1954. A year after the original version appeared, this reviewer made a survey ("Microwave engineering: How a new course is adopted", *Journal of Engineering Education* 46: 838-841, 1956) in which the book was shown to be one of the top three then used in American engineering schools offering courses in ultra-high-frequency engineering. (The other two were *Fields and Waves in Modern Radio* by Ramo and Whinnery and *Theory and Application of Microwaves* by Brownwell and Beam.) Nevertheless, the original version does not seem to have sold briskly enough to suit the publishers or the authors, and they have now issued a smaller book intended for use as a one-semester text for seniors, or as a quick review for practicing engineers, experimental physicists, and the like. According to the authors' own statement, the condensation has been accomplished largely by the elimination of mathematical details and the rewriting of waveguide equations and other vector relationships in scalar form. On the other hand, an appendix containing fifteen experiments developed at Yale over the years has been added, and there is some other new material. The resulting more compact book is sure to prove very popular with those among the large number of engineering schools (more than half) that the above-mentioned survey showed to offer no specific courses in microwave engineering at all, but which would like to include such a topic in their curriculum. The book will also serve as an excellent reference for any physicist, biologist, or chemist who would like to gain a general understanding of basic microwave techniques without necessarily mastering the detailed theory.

Elastic Waves in Layered Media (Lamont Geological Observatory Contribution No. 189). By W. M. Ewing, W. S. Jardetzky, F. Press. 380 pp. McGraw-Hill Book Co., Inc., New York, 1957. \$10.00. Reviewed by Arthur Beiser, New York University.

Very often the experimental and theoretical methods of approaching a complicated problem start from differ-

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ent points of view and comparison between their results may not be very meaningful. Generally this is the situation when the development of the theory has required simplifying assumptions to be made, while the data obtained reflect perversely complicated reality. Seismology and related fields such as underwater sound propagation are cases of this sort, where the mathematical development is not always in a physically meaningful form. *Elastic Waves in Layered Media* represents a diligent effort by its authors to remedy this situation by providing a unified treatment of their subject in which "the experimental viewpoint has, to a large extent, governed the selection of problems". While the exposition of the theory is largely self-contained, even to working out some relatively standard derivations, a knowledge of the relevant experimental information is usually assumed on the part of the reader. As a result this is a book for the initiate in seismology and its offshoots, for whom the detailed, though terse, exposition and liberal bibliography will make a useful reference. A listing of the chapter titles conveys the range of the text: Fundamental Equations and Solutions; Homogeneous and Isotropic Half Space; Two Semi-Infinite Media in Contact; A Layered Half Space; The Effects of Gravity, Curvature, and Viscosity; Plates and Cylinders; and Wave Propagation in Media with Variable Viscosity. Such specific topics as the structure of the earth's crust, underwater sound (including SOFAR), and model experiments are covered. The authors have themselves been among the principal contributors to the study of elastic waves, and this volume consequently provides an authoritative and up-to-date picture of this branch of geophysics.

Radioactivity and Nuclear Physics (3rd Revised Edition). By James M. Cork. 415 pp. D. Van Nostrand Co., Inc., Princeton, N. J., 1957. \$7.75. *Reviewed by R. Hobart Ellis, Jr., New York City.*

An old friend is back with some new clothes ready to take his place in the nuclear classroom. This classic introduction to nuclear science has been brought up to date.

The format is unchanged. Where the author found that the words of the first and second editions were all right, he has chosen to leave them alone. On the other hand a new chapter describes the nucleus for itself—shell structure, liquid-drop model, moments, and even the overthrow of parity conservation.

Readers of earlier editions will remember that the author chooses to follow the historical approach to each subject as it comes along. Thus we meet experimental evidence first and the explanations that untangle it later. By this means much of the magic aura of discovery is preserved. It is for the beginning student to tell us whether the resulting inspiration is worth the cost of some confusion.

No textbook can hope to keep up with nuclear science as it is advancing today. An attempt to do so in a format that has not changed, basically, in a decade must

meet some frustrations. The subject has become very big, and this little book still aims at all of it. The coverage must be spotty in places, and it is not always clear what background is expected in the reader. This we can accept. A greater shortcoming is the brevity of the index.

However, good introductions to the nucleus are hard to find, so let us overlook some faults and welcome an old friend back to the bookshelf.

Light Scattering by Small Particles. By H. C. van de Hulst. 470 pp. John Wiley & Sons, Inc., New York, 1957. \$12.00. *Reviewed by V. Twersky, Sylvania Electronic Defense Laboratory.*

The scattering of a plane electromagnetic wave by a homogeneous sphere is one of the few separable boundary value problems of Maxwell's equations. However, although Mie's formal solution in terms of spherical waves functions has been available since 1908, and although more computations have no doubt been done on this problem than on any other, satisfactory results for all values of the parameters of physical interest are still to be derived. True enough, using modern computers, one can evaluate the generally slowly converging Mie series, or its Watson transform, for specific values of the parameters. However, closed-form approximations, and physically motivated stories to go with them, are still not available for the full range; and these are needed before one feels the problem of the single sphere is indeed closed. Aside from the interest in the sphere problem for its own sake, and this is largely because of practical applications ranging from x-ray scattering to propagation of radio waves around the earth, the sphere has perhaps even greater interest as a test case. Thus, general analytical or heuristic procedures leading to closed forms for more complex scatterers may be specialized to the sphere and checked numerically.

The major portion of van de Hulst's book (Chapters 9 to 14, pages 114 to 296) contains the most detailed treatment of the sphere problem available in the literature; this extends his 1945 Utrecht Thesis to include developments to about 1954. It collects, checks, and presents systematically most of the relevant numerical results of others, gives additional numerical and graphical results for a wide range of parameters, and provides closed-form approximations for various regions of the domain of the index of refraction versus radius/wavelength; in the regions where numerical methods must be used, several analytical properties of the "phase shifts" are exploited to check the rigorous computations, and to obtain quick approximations of their essential characteristics.

Chapter 15 sketches a similar development for the circular cylinder, and Chapter 16 has some results for the disk and strip. The earlier Chapters 1 to 5 contain some general relations for scattering by arbitrary objects, and for single scattering by a random distribution; these include a detailed discussion of the "Stokes parameters" (the four functions specifying the inten-