cold-plasma approximation (i.e., for a fully ionized plasma in which the zero-order thermal motions may be neglected) and the corresponding dispersion relation evaluated. Chapter 2 contains a thorough discussion of the Clemmow-Mullaly-Allis Diagram while Chapter 3 discusses energy flow and accessibility of a resonant region in an inhomogeneous plasma. Some instabilities of bounded plasma are the topic of Chapter 4, while Chapter 5 covers free and forced oscillations of a cold cylindrical plasma. The transition to discussion of hot plasmas proceeds through plasma beams in Chapter 6, and Landau damping in Chapter 7 to the complete dispersion relation for an infinite hot plasma in a uniform magnetic field in Chapter 8. Chapter 9 contains many special cases of interest following from the general dispersion relations, and the last chapter deals more broadly with propagation through inhomogeneous plasma.

No text is perfect and one can, with difficulty, find some small objections. Equations are referred to in the fashion illustrated by (2–11) where 2 identifies the chapter and 11 the equation number in that chapter. Unfortunately, the equations themselves are followed by the second number only; and the chapter numbers are not displayed at the top of each page. This leads to unnecessary page thumbing in referring back. One might also wish that some of the derivations were a little less condensed. This will not trouble the expert but will make the text somewhat difficult for all but the brightest students. Finally, a little more discussion of the eigenmodes associated with the many interesting waves which are treated would have been welcome.

The minor nature of these objections only serves to point up the generally excellent quality of the book. This volume will surely prove to be an invaluable reference text for the worker in this field. It is a most welcome addition to the plasma physics literature.

ALBERT SIMON

(About the Reviewer: The author of this review is the Head of the Plasma Physics Division, John Jay Hopkins Laboratory for Pure and Applied Science, General Atomic Division of General Dynamics Corporation. He is also currently the Vice-Chairman of the Plasma Physics Division of the American Physical Society. Simon was at the Oak Ridge National Laboratory from 1950 to 1961 and was closely associated with the fusion project there. He is the author of An Introduction to Thermonuclear Research, *Pergamon Press, London (1959).)*

Proceedings of the International School of Physics "Enrico Fermi," Varenna, Italy. Course 15: Nuclear Spectroscopy. Edited by G. RACAH. Academic Press, 1962. 269 pp., $9.00.

If one combines Greek origin of the word school, viz. "schole" meaning leisure, with the more familiar definition of the term, then the learning amid pleasure which must have taken place on the shores of Lake Como from June 20 through July 9, 1960 can be pictured. This book is a summary of the material presented in the course and is organized as the course is into six long review papers and six shorter "seminars" which deal with particular aspects of the subject of Nuclear Spectroscopy. The editor of the volume is G. Racah of Hebrew University who also functioned as the director of the course. The papers of uniformly high caliber are necessarily brief, and thus require that the reader have previous knowledge of some nuclear physics, such as might be received on the graduate level or at the end of a comprehensive quantum mechanics course.

The introductory lesson, entitled "Mathematical Techniques" was given by Professor Racah, who modestly refrained from using the term "Racah algebra" for the work. This chapter begins with the formal rules for the coupling of angular momenta and applies them to a calculation of the energy matrix with additional sections devoted to the concepts of seniority and isotopic spins.

The next two chapters which introduce the reader to seemingly opposing yet complementary points of view concerning the structure of the nucleus, the independent particle model and the collective model, were presented by two of the foremost practitioners of these theories, respectively, I. Talmi of the Weizmann Institute, Rehovoth, and B. Mottelson, NORDITA, Copenhagen. Talmi presented calculations to show that the inclusion of an appropriate two-body potential enabled one to calculate the position of the energy levels of a variety of nuclei. Mottelson in his relatively long article (56 pages) demonstrates how a succession of two-body interactions results in collective oscillations. The wave functions corresponding to a nonspherical potential are described and energy levels calculated with them compared with various known level structures of nuclei. Finally, for the special case of the spectra of even–even nuclei, where the first excited (2+) state lies with roughly constant energy separation above the ground state, an interpretation in terms of the creation and annihilation operators of quantum field theory is made, in analogy with the Bardeen–Cooper–Schrieffer explanation of the energy gap in superconductors.

The next chapter, by G. Alaga of the University of Zagreb, is a fine exposition of the theory of beta decay beginning with the Fermi assumption of the scalar Dirac interaction potential and the five categories of possible forces, including both parity conserving and nonconserving ones. The application of beta decay results to nuclear spectroscopy was discussed. Finally, an excellent appendix on the Dirac equation especially as related to beta decay theory was presented. The subsequent chapter by G. Morpurgo of the University of Firenze, entitled "Selected Topics in the Theory of Electromagnetic Properties of Light Nuclei" is a less satisfying paper, mainly because of its brevity. The final long paper by J. Goldstone of CERN presents the formal theory of nuclear matter in as reasonable a manner as possible in the limited space available.

The second half of the book contains papers averaging nine pages each, which are intended to supplement the longer articles. The authors and titles are the following: H. Daniel, Max Planck Institute, Heidelberg, "Techniques in β-Decay Experiments"; E. Hayward, National Bureau of Standards, Washington, "Nuclear Photoeffect in Deformed Nuclei"; H. D. Holmgren, Naval Research Lab., Washington, "Interactions of He^3 and T^3 with Light Nuclei"; S. Jha, Tata Institute, Bombay, "Course in Nuclear Spectroscopy"; D. Tadic, Institute "Ruder Boskovic," Zagreb, "Pseudo-Scalar Interaction in the β-Decay of Pr^{144}"; and I. Unna, Weizmann Institute, Rehovoth, "M1-Transitions in N^{14}." These papers vary widely in quality but were not the main purpose of the course and due to their subordinate nature would not be the major interest of the purchase of this book, and will not be commented upon.

It is rather unlikely that the typical spectroscopist or physicist in general would fully benefit from exposure to a

single lecture. Thus the publication of these papers in collected form is of great value, in spite of the fact that the publication date is more than two years past the date of the course.

DAVID T. GOLDMAN

(About the Reviewer: D. T. Goldman is a University of Maryland Ph.D., vintage 1958. After a year as a research associate in the Physics Department at the University of Pennsylvania, he went to Knolls Atomic Power Laboratory where he now specializes in nuclear and reactor theory.)

Mechanical Properties of Metals. By D. MCLEAN. Wiley, New York-London, 1962. $12.00.

The author is a member of the staff of the National Physical Laboratory, Teddington, England and has been active for some time in the study of imperfections in metals. In this book he has presented the insight that the knowledge of defect structures, obtained over the last 10 to 20 years, has provided in the understanding of the properties of metals. The scope of the book embraces many subjects which in themselves have been the topics of a number of comprehensive books. With each subject the author has presented a brief review of the observed phenomena in a well illustrated and referenced manner followed by a discussion of the relation of dislocation theory to these effects. Shortcomings in the present state of dislocation theory are also identified in these discussions, and the type of additional research needed for more complete correlation is suggested.

The initial portion of the book is devoted to a brief summary of elasticity and imperfections in pure metals. This review demonstrates the wide differences in observed properties as compared to calculated theoretical values assuming perfect crystals. Dislocations, grain boundaries, vacancies, and interstitials are described to serve as a basis for subsequent treatments of specific properties and their relation to these factors.

In a discussion of anelasticity, contributions due to thermal vibration effects, dislocations, and grain boundaries are reviewed. Plastic yielding is related to crystal type, the mechanisms of slip, and twinning which are further described in terms of dislocation sources, multiplication, and movement. Hardening effects in metals due to both strain and alloying additions are also discussed with particular emphasis on the dislocation theories that have been presented to describe the observed effects. With respect to solutes and precipitates, the effects of their spacing on dislocation movement and strength properties are reviewed.

Further treatments in this book concern the incidence, criteria, and theories presented for both brittle and ductile fracture. Mechanisms for the combination of dislocations to initiate cracks in both brittle and ductile materials are described, and brief mention is made of the adiabatic shear type of fracture. The various stages of creep are also discussed and the relation of dislocation movement to these stages is described. Further consideration is given to the effects of solutes and precipitates on creep behavior and the role of dislocations in such structures. Similarly, fatigue failure, its relation to slip bands, and the mechanisms by which dislocations can produce notches in slip, are reviewed.

Three sections of the book do not lend themselves readily to analysis by dislocation theory, primarily because the mechanisms in these phenomena are not well understood. These subjects include recovery and recrystallization, radiation damage, and stress corrosion. The author however has included them for the sake of more complete coverage of the properties of metals.

Although complete understanding of the properties of metals on an atomistic basis cannot be presented with the existing state of theory, the author has done a commendable job in summarizing the applicability of current knowledge. It is this type of basic understanding correlated with observed behavior that will eventually lead to a more complete control of material properties.

S. W. POREMBKA

(About the Reviewer: Mr. Porembka has been associated with Battelle Memorial Institute for over six years, conducting research on materials and process developments. His background also includes four years with the Bettis Atomic Power Laboratory during which time he was concerned with the development of control and fuel materials and the evaluation of spent cores. Presently, he is a Research Associate with the Advanced Materials Development Division of Battelle.