this entire section and the following one on thermocouples could compose a good part of an experimental-thermodynamics book. The section on the calibration and use of liquid-in-glass thermometers is invaluable to anyone who is engaged in standardization work.

The final two sections on optical pyrometry and spectroscopic thermometry cover each area very well. Both of these methods involve temperature considerably higher than those usually encountered in most laboratory work. However, with the increase of work in plasma physics, the spectroscopic methods are increasing in interest and value.

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James B. Kelley has recently become vice-president for academic affairs at Adelphi University, New York. He has done research in thermometry, particularly resistance techniques.

Pocket encyclopedia

THEORIE DU MAGNETISME. By André Herpin. 882 pp. Presses Universitaires de France, Paris, 1968.

by DANIEL C. MATTIS

André Herpin has written the most complete textbook in magnetism, one that recommends itself to all physicists who are familiar with the French language. Some of the topics covered in rather substantial detail are local-field theory, domain theory and ferro-, ferri- and antiferromagnetism.

There is a chapter on the experimental methods of magnetism, that is, Mössbauer effects, nuclear-magnetic resonance and neutron diffraction. The author is particularly clear in correlating experimental parameters with theoretical analysis. He discusses atomic properties in some detail, including the rules of Hund, and then introduces the crystalline field and discusses its effects on ions of the transition series.

Also covered are thermodynamics, the exchange forces, anisotropy, dynamic phenomena and molecular-field theory. This last is perhaps the weakest feature of the book. The most recent theoretical developments define thermodynamic functions of magnetism, which often differ considerably from the molecular-field results.

It is, however, difficult to fault this book, which manages in addition to tell all about hysteresis, rare earths and many other miscellaneous aspects of the field. Perhaps it should not have been titled *Theory of Magnetism* but rather *Pocket Encyclopedia of Magnetism*. It is recommended for all students in this field.

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The reviewer, professor of solid-state physics at Belfer Graduate School of Science, Yeshiva University, is the author of Theory of Magnetism, *which is more theoretical and much less encyclopedic than Herpin's book.*

Hot and fast

PHYSICS OF SHOCK WAVES AND HIGH-TEMPERATURE HYDRODYNAMIC PHENOMENA, VOL. 2. By Ya. B. Zel'dovich and Yu. P. Raizer. Wallace D. Hayes, Ronald F. Probstein, eds. (Trans. from Russian) 916 pp. Academic Press, New York, 1967. $18.00

by ROLF LANDSHOFF

The existence of shock waves was predicted theoretically by Bernhard Riemann and proven experimentally by Ernst Mach, but for many years research in this field proceeded at a very slow speed. This situation changed quite drastically when the development of nuclear bombs and of missiles led to technical problems. The implosion of fissionable material, the expansion of and radiation from the nuclear fireball and the reëntry of missiles could not be solved without a thorough understanding of these phenomena. Obvious interest also arose through astrophysical applications, such as the explosion of a supernova and the observed optical phenomena on the surface of certain stars.

Both authors have been active contributors in this field. They are members of the USSR Academy of Sciences, Ya B. Zel'dovich in the section designated as Astronomical Soviet and Yu P. Raizer in the Institute of Mechanical Problems. Among their numerous publications, one by Raizer once gave me a bit of a chuckle because of a not quite successful attempt to "declassify" the title of the English summary of the article. It was given as "The Formation of Nitrogen Oxides in the Shock Wave of a Strong Explosion in Air," and somehow the editor in charge of the clean up had overlooked the original Russian title just above the English one, with the word "atomic" in place of the word "strong."

This book is the second of two volumes; the first is devoted to fundamental hydrodynamic, physical and chemical processes and the second one to details of the shock-wave structure and to numerous important applications. Discussion of the shock-wave structure deals with the role of various nonequilibrium type processes. In very strong explosions the most important of these is the radiative transfer of energy. Radiative transfer is also a major factor in determining the luminosity of a fireball. One of the phenomena observed is the so called "cooling wave" that moves toward the center of the fireball and whose theory was developed by the two authors together with A. S. Kompaneets.

Other applications include spark discharges and shock waves in solids at the surface of stars and in an inhomogeneous atmosphere with an exponential density distribution. Many of these problems can be successfully attacked by similarity transformations.

Altogether, these two volumes are required reading for anyone working in this field. The presentation is comprehensive, authoritative, and clear, and the translation reads very smoothly. Much of the credit for the latter must go to the US editors, who are themselves reputable scientists and authors. The books are also intended for graduate courses, and they will be useful for engineers who want to apply the results to specific problems.

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A senior member of the Lockheed Palo Alto Research Laboratory, the reviewer is the editor of a recent book on excitation and nonequilibrium phenomena in air.

The cultivated reader

ANOTHER LOOK AT ATLANTIS AND FIFTEEN OTHER ESSAYS. By Willy Ley. 229 pp. Doubleday, New York, 1969. $5.95

by JACQUES E. ROMAIN

Most of this book is not concerned with physics. However, any scientist will read with pleasure this refreshing series of essays on topics ranging from history through zoology and technology to cosmology and, of course, space science.

The first two subjects are unexpected

to the reader who only knows Willy Ley as a renowned expert in rocketry and space science, but he will soon realize how boundlessly cultivated the author is and will not be too much surprised that he was educated as a zoologist.

Two features characterize the author's writing. The first one is the uncommon depth of information on various topics and the orderly exposition. The second feature is charm: A vivid presentation, a good deal of humor and a beautiful style add up to a delightful reading. Ley's book proves that scientists can write with elegance.

Of particular interest to physicists, and a wealth of information to teachers, are the essays that are a rebuttal of the fancy theories about the inclusion of such numbers as π in the Egyptian pyramids; a historical review of discoveries on gas theory; a precise analysis of the physical possibilities regarding the noise produced by meteors; stellar evolution, and the old riddles solved and the new ones posed by the space age.

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The reviewer has taught physics and mathematics for several years.

Collective model advocate

COLLECTIVE MODELS OF THE NUCLEUS. By J. P. Davidson. 238 pp. Academic Press, New York, 1968. $12.00

by HENRY S. VALK

To those working in the field of theoretical nuclear physics, the name of John P. Davidson, physics professor at the University of Kansas, needs little introduction. He and his students have made many original contributions to our understanding of the nucleus, particularly its collective aspects.

With this background it is not surprising that Davidson's new monograph provides a lucid summary of the phenomenological approach to the collective nuclear models. The main text covers the fundamental physics of the liquid-drop model and describes specific classes of nuclei and their transitions. The work concludes with a chapter on mu-mesic atoms and their use as a tool for exploring the collective properties of heavy nuclei. The author wisely chooses to place the relevant algebra of angular momentum and other calculation detail in a set of appendixes. This keeps the book relatively self-contained and permits the reader to concentrate on the physics unhindered by lengthy mathematical digressions.

This book, the outgrowth of a review article prepared several years ago (*Reviews of Modern Physics*, 37, 105, 1965), fills a long standing need. The shell model and its close relations have found many expositors, but heretofore the phenomenological collective model has not had any representation in the nuclear physicists' library. It has now found an advocate.

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The reviewer is a theoretical nuclear physicist and chairman of the physics department at the University of Nebraska.

A compendium of results

ELECTRON IMPACT EXCITATION OF ATOMS (NSRDS-NBS 25). By B. L. Moiseiwitsch and S. J. Smith. 116 pp. National Bureau of Standards, Washington, DC, 1968. $2.00

by BRUCE W. SHORE

This monograph provides a timely review of the computational and observational methods currently employed to determine cross sections for electron-impact excitation of atoms and ions. It also provides a valuable compendium of theoretical and experimental results, in both graphical display and in tabular form. Equally valuable is the authors' critical assessment of existing experimental results.

The authors, B. L. Moiseiwitsch of the applied mathematics department, the Queen's University of Belfast, and S. L. Smith of the Joint Institute for Laboratory Astrophysics at Boulder, Colorado, are respected for their work in atomic physics; Moiseiwitsch is perhaps best known for his application of variational methods (for example, *Variational Principles*, Interscience, 1966). This monograph was simultaneously published in *Reviews of Modern Physics*, **40**, 2, (1968).

The theoretical half summarizes the numerous approximation methods now used in computations. These range from the simple Born approximation through the elaborate close-coupling equations and include classical approaches, simplified methods for including exchange and approximations that guarantee unitarity. The major portion of the discussion concerns electron-hydrogen collisions, showing the relative simplicity of the electron-hydrogen system, with appreciable discussion of electron-helium collisions, and briefer mention of excitations of more complex atoms and positive ions.

The experimental half follows a similar pattern. The authors discuss methods for measuring excitation cross sections, results for hydrogen and helium and selected results for heavier atoms, particularly alkalis. They critically examine polarization and angular distribution effects, and take experimenters to task for paying insufficient attention to these and other sources of experimental errors. They conclude that significant improvements are now possible in the quality of published experimental results.

The coverage is thorough, the exposition lucid, and, as befits a review, it is well documented with references.

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An associate professor of physics at Kansas State University, the reviewer is coauthor, with D. H. Menzel, of Principles of Atomic Spectra *(Wiley, 1968).*

From optical pumping to arcs

METHODS IN EXPERIMENTAL PHYSICS, VOL. 7B: ATOMIC AND ELECTRON PHYSICS. Benjamin Bederson and Wade Fite, eds. 374 pp. Academic Press, New York, 1968. $17.00

by GILBERT O. BRINK

This is the second volume of a two-part series on the techniques of experimental atomic and electron physics. It is intended as a summary of atomic and electronic interactions in bulk matter, primarily in the plasma state. As with any such book it only partially meets this goal because of rapid developments in the field. However, it still provides a useful starting point for a beginner, as well as a means for experienced workers to bring themselves up to date in bordering areas of physics.

The book is divided into six independent and self-contained chapters, each devoted to a separate topic. Bibliographies, though not complete, provide suitable material for further literature work. It is possible to read