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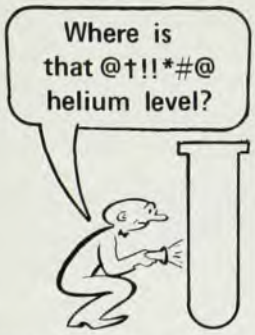

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ber of minor errors slipped through in proofreading.

Two cautionary comments are in order. First, as the authors emphasize, the properties of the molecule-ion M^+, not those of M, are directly obtainable from a photoelectron spectrum. Comparisons with ground-state properties of M are therefore subject to the qualifications given by Koopmans' Theorem. Second, the utility of photoelectron spectroscopy in elucidating detailed properties of larger molecules is, in this reviewer's opinion, not yet well established. Within these limitations the technique can provide new information about any molecular species that can be brought into the gaseous phase. It should accordingly be of interest to anyone concerned with the chemistry or physics of small molecules.

DAVID A. SHIRLEY
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Thermophysics

***By* W. H. Giedt**
594 pp. Van Nostrand Reinhold, New York, 1971. $13.95

This book is intended as a text for undergraduate students of engineering. The title *Thermophysics* was "selected to stress that this study embraces practically all branches of science and technology."

In the last ten years approximately 100 undergraduate thermodynamics books have been published in English (my count). The various pedagogical approaches in this rich collection are roughly as follows: classical or macroscopic; combination of classical and statistical; statistical alone, and emphasizing the connection between entropy and information theory. W. H. Giedt takes the now popular second approach in *Thermophysics*, stating that (the elaboration of) $S = k \log W$ provides a "physically reasonable explanation and definition of entropy as an equilibrium state property."

The book starts off ardently—the head for Chapter 1 ("Energy") runs:

"We are approaching the end of countdown.
All systems are go!
The ignition system is started.
All engines are running.
LIFT OFF! WE HAVE LIFT OFF!"

A short motivational discussion of rocket propulsion follows, focused on energy. The rest of the chapter outlines classical thermodynamics in an historical framework.

The first five chapters build up ideas such as internal energy, work, heat, equilibrium state and temperature more by accretion of examples than by formal development. Chapter 6 brings an abrupt change with the introduction of Schrödinger's equation in full bloom, followed by the elementary particle-in-box solution and cursory discussion of concepts such as phase space. Entropy is introduced as $S = k \log W$ in Chapter 7, and the statistical mechanics of ideal gases is discussed in the following chapter. Entropy change is treated in Chapter 9, the Gibbs equation suddenly appearing for the first time under "Gas Tables" on page 283. The remainder of the book may loosely be described as a wide variety of applications, including energy-conversion cycles, availability, Maxwell relations, chemical equilibrium in ideal gases, adiabatic flame temperature, and so on, each topic being rather briefly treated.

This is a serious effort to deal with a difficult and beautiful subject. There are many examples and exercises, primarily numerical. The historical annotation is often interesting (for example, according to the author the now cumbersome Fahrenheit temperature scale was originally pegged at 0 deg as the freezing point of a saturated salt solution and 100 deg as the temperature of the human body). The book is reasonably clear and accurate in its details. Unfortunately, the author has a distressing tendency to omit mentioning what are the basic irreducible principles and fundamental assumptions in his development. This leaves the student with a collection of material that needs to be taken somewhat on faith, but the articles of faith are unspecified.

P. A. THOMPSON
Rensselaer Polytechnic Institute

Lasers

***By* B. A. Lengyel**
2nd ed. 386 pp. Wiley, New York, 1971. $14.95

Lasers, 2nd edition, is the third in a sequence of approximations by Bela Lengyel to the ideal introductory laser text. The first edition (1962—125 pages) was the first book on the market in which the uninitiated could get a realistic but comprehensible glimpse of laser theory and technique. It was followed three years later by *Introduction to Laser Physics* (1965—311 pages) which includes a chapter on the interaction of laser light with matter (nonlinear optics) as well as much more information on the theory of operation of various types of lasers. In his latest version, Lengyel has dropped the chapters on applications and nonlinear optics and returned to the earlier title.

The new *Lasers* shares with the earlier

versions an exceptional clarity of style and excellent organization. Two concise chapters are devoted to background material on radiation and atomic physics and a survey of the principal types of lasers, and two others deal with theoretical topics relevant to all laser types. The remaining discussion, the bulk of the book, appears under headings corresponding to each kind of laser. Solid-state (ruby and rare-earth), semiconductor, liquid and gas lasers are all covered sufficiently to provide the reader with an accurate picture of their operation. Organic-dye, ionic, molecular, and chemical lasers, which were infants or prenatal when the previous versions appeared, each have sections of their own in this edition. That's not to say that every kind of laser invented to date is included. Lengyel tells us in his preface that he stopped gathering materials for *Lasers* in 1968. Thus the reader will not find discussions of gas-dynamic or TEA (Transversely Excited Atmospheric pressure) gas lasers, electron-beam-pumped gas lasers, or of the ingenious distributed-feedback lasers recently developed at Bell Laboratories. But the current literature on these and other recent developments should be easily accessible for one who has digested Lengyel's exposition.

While the level of sophistication required to follow this exposition is generally low, courses in quantum mechanics and electromagnetic theory are probably indispensable prerequisites. Nevertheless Lengyel's style minimizes the ratio of math to prose, and physical principles are explained in physical, but entirely correct, precise, and honest, language. Most of the text is devoted to the physics of the various active media responsible for laser action. An instructor seeking illustrative examples of the application of quantum theory and spectroscopy to "real" problems can find a wealth of material here. While laser engineering (as opposed to basic science) is not slighted, it is not embellished, and remarks on peripheral technology such as antireflection coatings or optical isolators are often minimal. There are no set problems following chapters, but illustrative examples of theoretical developments are worked smoothly into the text.

Bela Lengyel is a scientist, a teacher and a scholar. He has spent ample time in classroom and laboratory, and has contributed notably to the field he expounds—just the sort of background that makes for a good general discussion of the important and hitherto largely unsynthesized subject matter of *Lasers*.

JOHN MARBURGER
University of Southern California

new books

CONFERENCE PROCEEDINGS

The Astrophysical Aspects of the Weak Interactions (Conf. proc. Cortona "Il Palazzone," Italy, 10–12 June 1970). 189 pp. Accademia Nazionale dei Lincei, Rome, Italy, 1971.

Dynamics of Nuclear Systems (Conf. proc. Nuclear Engineering Symposium, Univ. of Ariz., 23–25 March 1970). D. L. Hetrick, ed. 606 pp. The Univ. of Ariz. Press, Tucson, Ariz., 1972. $14.50

Numerical Methods of Nonlinear Algebraic Equations (Conf. proc. Numerical Analysis Specialist Group of the British Computer Society, 6, 7 Jan. 1969, Essex, UK). P. Rabinowitz, ed. 199 pp. Gordon and Breach, New York, 1970.

The Ocean World (Conf. proc. Joint Oceanographic Assembly, 13–25 Sept. 1970, Tokyo, Japan). M. Uda, ed. Japan Society for the Promotion of Science, Tokyo, Japan, 1971.

Origins of Life, Vol. 2: Cosmic Evolution, Abundance and Distribution of Biologically Important Elements (Conf. proc. NASA, 5–8 May 1968, Princeton, N. J.). L. Margulis, ed. 238 pp. Gordon and Breach, New York, 1971. Individuals, $9.95, prepaid, $7.95; libraries, $19.50, prepaid, $15.60

Proceedings of the Eighth International Conference on High-Energy Accelerators, CERN, 1971 (Conf. proc. IUPAP, 20–24 Sept. 1971, Geneva, Switzerland, M. H. Blewett, ed. 614 pp. European Organization for Nuclear Research, Geneva, Switzerland, 1971.

ELEMENTARY PARTICLES

Quantum Theory of Particles and Fields, Vol. 1: Introductory Theory of Particles. By K. H. Ruei. 472 pp. University Press, Taiwan, Republic of China, 1971.

ATOMS, MOLECULES

Theory of Charge Exchange. By R. A. Mapleton. 284 pp. Interscience, New York, 1972. $19.95

CHEMICAL PHYSICS

Applied Spectroscopy Reviews, Vol. 5. E. G. Brame Jr, ed. 360 pp. Marcel Dekker, New York, 1972. $19.50

Electron Spin Resonance: Elementary Theory and Practical Applications. By J. E. Wertz, J. R. Bolton. 497 pp. McGraw-Hill, New York, 1972. $22.50

FLUIDS, PLASMAS

Modern Fluid Mechanics, Vol. 2. By S. N. Curle, H. J. Davies. 292 pp. Van Nostrand Reinhold, New York, 1971. $19.95

Momentum, Energy and Mass Transfer in Continua. By J. C. Slattery. 679 pp. McGraw-Hill, New York, 1972. $19.50

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