



New from Addison-Wesley Advanced Book Program

LECTURE NOTES AND SUPPLEMENTS IN
PHYSICS SERIES No. 14
David Pines, Editor

NUCLEAR AND PARTICLE PHYSICS

A: Background and Symmetries*

Hans FRAUENFELDER and

ERNEST M. HENLEY

The first part of a graduate-level introduction to particle and nuclear physics, stressing concepts and symmetry laws. Most of the necessary background is briefly developed; however, a knowledge of quantum mechanics and electrodynamics is assumed. The authors have selected topics that fill a gap between an introductory text and research reviews.

Contents: Historical Survey and Introduction. Classical Concepts and Conservation Laws. Particles, Antiparticles and Fields. Nonclassical Conservation Laws. Superposition and Interference. Appendices. Index.

1975, xviii, 572 pp., illus., hardbd., \$21.50;
paperbd., \$13.50

FRONTIERS IN PHYSICS SERIES

David Pines, Editor

No. 47

HYDRODYNAMIC FLUCTUATIONS, BROKEN SYMMETRY, AND CORRELATION FUNCTIONS*

Dieter FORSTER

Presents the theory of fluctuations and linear response in many-body systems and their description in terms of response functions. The emphasis is to formulate the theory in a simple and unified fashion to allow the reader to appreciate and exploit the many analogies which exist between, for example, superfluids and liquid crystals. The level of the text is deliberately held very simple. It will be easily accessible to physics and chemistry students in their first or second year of graduate school, particularly because the emphasis is on the physical principles rather than on mathematical completeness and detail.

Contents: Introduction. A Simple Example — Spin Diffusion. Formal Properties of Correlation Functions. The Normal Fluid. The Memory Function Formalism. Brownian Motion. Broken Symmetry. Hydrodynamic Spin Waves in Ferromagnets. Hydrodynamic Spin Waves in Antiferromagnets. Superfluids. Nematic Liquid Crystals. Superconductors. Appendix. References. Index.

1975, xx, 326 pp., hardbd., \$19.50;
paperbd., \$13.50

*W.A. Benjamin, Inc. title

DUAL RESONANCE MODELS

No. 45

P. H. Frampton

"Frampton has been involved with the dual model almost since its inception and has produced a book that gives a satisfactory account of the development and present state of the subject . . . Elementary-particle theorists and experimentalists will be able to learn much from this book."

— E. J. Squires, *Physics Today*
1974, xviii, 451 pp., hardbd., \$22.50;
paperbd., \$14.50

Addison-Wesley Publishing Company
Advanced Book Program, Reading, Mass. 01867

Booth #88-89, Physics Show
Circle No. 66 on Reader Service Card

PHYSICS TODAY / JANUARY 1976 71

resulting descriptions represent relatively crude approximations, suitable for an introductory presentation. A more accurate picture could have been presented in the space available if some of the rather trivial details of certain derivations had been spared.

Although the author is a sophisticated writer of papers on quantum-mechanical topics, the book is most suitable as an elementary introduction for chemistry students to some major aspects of quantum chemistry.

ROBERT S. MULLIKEN
University of Chicago
Illinois

An Introduction to Gas Lasers: Population Inversion Mechanisms

C. S. Willett

528 pp. Pergamon, New York, 1974.
\$45.00

As its title implies, this book emphasizes the basic atomic and molecular collision processes occurring in gas discharges that result in selective electronic or vibrational state excitation and lead to population inversions and lasing. The number of lasers that have been successfully operated using gas-discharge excitation is extremely large, and there is a vast literature on their characteristics. Many of these lasers have been discovered in an Edisonian style, with little attention given to understanding of the specific excitation processes that generate the inversions.

An exhaustive effort is made in this book to review the literature on gas-discharge lasers up through early 1973, classify them according to their excitation mechanisms and, as far as possible, give detailed accounts of the specific mechanisms for each class. The fields of atomic and molecular physics, discharge physics and laser physics are combined here to provide a unified and basic understanding of the behavior and characteristics of gas-discharge lasers.

The book begins with a short chronology of the major events and breakthroughs in the discharge laser field since the discovery of the helium-neon laser. This is followed by a very brief discussion of the basic concepts of collisions, discharges and laser physics. A chapter on specific atomic and molecular excitation processes touches on the several important collision processes, such as excitation transfer, charge transfer, Penning ionization and electron impact. A descriptive chapter on classical discharge physics discusses glow, radio frequency, hollow-cathode, and pulsed discharges. The application of electron-beam sustained and photo-

initiated discharges is not included, presumably because of its recent development.

With this brief but reasonably well documented introduction to basic discharge processes, the book launches into its major task of describing and explaining the characteristics of specific laser systems with particular emphasis on the excitation processes. Chapters are devoted, respectively, to lasers operating on neutral transitions, ionized systems and molecular systems. In each of these chapters, the specific lasers are classified according to their excitation mechanisms, and several examples are discussed in each category. Finally, an extensive appendix gives curves of electron temperature in noble-gas mixtures, a useful set of energy-level and laser-transition diagrams and a comprehensive listing of laser transitions giving the wavelength, identification of transition and references.

Because of its comprehensive coverage of the field of discharge lasers, this book should be an important source for laser technologists for some time to come. As such, it will also be useful to students desiring to understand and use gas-discharge lasers and improve upon their performance. As a convenient source of references to the literature itself, the book will be extremely useful to laser practitioners.

The author, Colin Willett, has been concerned with the problems of understanding discharge-excited lasers since his student days in London. Since that period, he has pursued this effort at the Harry Diamond Laboratories of the Department of the Army. He is to be commended for the exhaustive and often tedious effort that must have been necessary to assemble this useful book.

DONALD C. LORENTS
Stanford Research Institute
Stanford, California

Image Science: Principles, Analysis and Evaluation of Photographic-type Imaging Processes

J. C. Dainty, R. Shaw

402 pp. Academic, New York, 1974.
\$26.00

The book *Image Science: Principles, Analysis and Evaluation of Photographic-Type Imaging Processes* by J. C. Dainty and Rodney Shaw gives a very useful treatment of the properties of photographic materials with respect to information storage and processing configurations.

The authors derive input-output relations for photographic film (and