

physics today

SHOW ISSUE JANUARY

- Highlights of the APS-AAPT Meeting Including topics of special sessions, titles & authors of invited papers, award winners and general information on the meeting

- Exhibit guide to the **PHYSICS SHOW**
Listing of product descriptions for the more than 100 booths at the Show.

Closing date for advertising orders, December 1

Advertising Dept.
335 East 45th Street
New York, New York 10017
(212) 685-1940

work initiated by F. N. M. Brown at Notre Dame that the flash boiling of kerosene provides the most reliable source of smoke. Additional discussions are also presented concerning surface measurements, streamlines and temperature and the ability of particles to accurately track the fluid flow—an item which is of considerable importance in laser velocimetry.

The latter portions of the book are concerned with measurement techniques that would be normally employed in compressible flow. Density variations are readily visualized through the use of interferometric, schlieren and shadowgraph systems. The author carefully discusses each system with regard to the technique and the quantitative data that may be recovered. He presents a useful discussion of Abel inversions as applied to axisymmetric flow. Application of the laser as a light source permits the measurement of the flow velocity, the determination of density and temperature, and the subsequent reconstruction of the flow field. Merzkirch elucidates each of these possibilities, although rapid developments in these fields have led to the generation of considerable additional information. Spark tracing, electron-beam excitation, and chemiluminescence methods are also discussed. In that data recording must frequently occur in an extremely short period of time the book closes with a brief introduction to the methods of high-speed photography.

Flow Visualization should prove to be a useful book to the graduate student initiating his research, to the student in an experimental-methods course, and to the researcher initiating a literature survey. The book is well written, and it has been carefully researched. It is the first time in the general literature that all of the information has been consolidated.

CHARLES W. KAUFFMAN
University of Cincinnati
Cincinnati, Ohio

Dual Resonance Models

P. H. Frampton
451 pp. W. A. Benjamin, Reading, Mass.,
1974. \$22.50 hardcover, \$14.50 paperback

Dual resonance models are a fascinating and delightful chapter in the story of elementary-particle theory. They began as a simple approximate idea inspired by data. This idea was developed into a bootstrap scheme that could be approximately solved in terms of known particles. An elegant exact solution was proposed by Gabrielle Veneziano; this involved introducing infinitely

COMPUTER PLOTTER



Model 1653

A high speed, 22 inch recorder designed to operate on-line to scientific and general purpose computers in graphic output applications.

- Plug-to-plug compatibility (hardware and software) with all standard 300 steps/sec. plotters used in the computer field (CALCOMP and COMLOT).
- Z-fold paper (367 ft. long) folding conveniently into notebook size.
- 0.01 inch step (0.25 mm optional) with 300 steps/sec. operation.
- Single step resolution with one step repeatability.
- Pen point exposure for manually setting origin.
- Simple control panel layout with single function switch.
- Integral chromed steel stand with paper storage.

Price: \$3,300.00

artronix

INSTRUMENTATION

1314 Hanley Industrial Court, St. Louis, Mo. 63144
(314) 968-4740

Circle No. 36 on Reader Service Card

QUANTUM ELECTRONICS

A Treatise

VOLUME 1: NONLINEAR OPTICS, Parts A and B

edited by HERBERT RABIN and C. L. TANG

This multivolume treatise will present unified discussions of major topics in quantum electronics, which in the years since the advent of the laser has emerged as a multidisciplinary subject of great breadth and richness, involving both pure and applied research.

CONTENTS OF PART A: *N. Bloembergen*, General Introduction. **Nonlinear Optical Susceptibilities:** *C. Flytzanis*, Theory of Nonlinear Optical Susceptibilities. *S. K. Kurtz*, Measurement of Nonlinear Optical Susceptibilities. **Nonlinear Optical Processes:** *H. Mahr*, Two-Photon Absorption Spectroscopy. *I. L. Fabelinskii*, Stimulated Mandelstam-

Brillouin Process. *C. L. Tang*, Spontaneous and Stimulated Parametric Processes. *C.-S. Wang*, The Stimulated Raman Process.

CONTENTS OF PART B: **Applications:** *S. A. Akhmanov*, *A. I. Kovrygin*, and *A. P. Sukhorukov*, Optical Harmonic Generation and Optical Frequency Multipliers. *R. L. Byer*, Optical Parametric Oscillators. *J. Warner*, Difference Frequency Generation and Up-Conversion.

Part A/1975, 502 pp., \$35.00/£ 17.50

Part B/1975, 296 pp., \$22.50/£ 11.25

Subscription price for both parts of Volume 1: \$48.75

ADVANCES IN QUANTUM ELECTRONICS, Volume 3

edited by D. W. GOODWIN

This series provides detailed and comprehensive reviews of value to graduate students, research workers, technical managers and others wishing to survey a specific research field with a view to understanding and applying the laser. This, the third volume, contains two major articles. The first reviews theoretical and experimental work undertaken

in the field of optical pumping, with particular reference to the orientation of paramagnetic atoms in their ground state. The second article examines gaseous ion lasers; here the emphasis is on the noble gas and metal vapor ion lasers, which are of marked technological significance.

1975, 486 pp., \$46.00/£ 17.40

FILMS ON SOLID SURFACES

The Physics and Chemistry of Physical Adsorption

by J. G. DASH

This book describes the current state of research on surfaces and adsorbed gas films. The subject is introduced by chapters on the atomic properties of adsorption and the states of single adsorbed atoms. There is a review of experimental methods for studying solid surfaces and films, and a discussion of substrate preparation. The equilibrium

thermodynamics of surface films is given an extensive treatment and is developed from general statistical principles. Four chapters are given over to the various states of films and their phase transitions. Finally, there is a review of thin film superfluidity.

1975, 288 pp., \$26.00/£ 13.00

THE HEAT EQUATION

by D. V. WIDDER

A Volume in the PURE AND APPLIED MATHEMATICS Series

This book presents a self-contained exposition of the heat equation, its solutions, and its role in the development of the theory of partial differential equations. It summarizes and unifies classical approaches to the equation and covers the most recent research in this area. The early chapters develop a theory of the integral transforms which are needed for the integral representations of solutions of the heat

equation. Much of the material in later chapters is based on the author's own research, but is presented in simplified form, with emphasis on the expansion of solutions of the heat equation into infinite series. The final chapter presents simplified proof of the essential results from four research papers.

1975, 256 pp., \$22.50/£ 11.25

THERMAL CONDUCTIVITY OF SOLIDS

by J. E. PARROTT and AUDREY D. STUCKES

The aim of this book is to provide in a compact and accessible form a sound introduction to the subject. It reviews the underlying principles, systematically surveys the different measurement techniques, introduces the necessary theoretical concepts, analyzes theoretically experimental data, and provides a guide to the behavior of practical materials, with some insight into the possibility of "tailoring" thermal conductivity. The bibliography at the end of each chapter enables readers to follow up any points of individual interest.

Published by Pion, Ltd. Distributed by Academic Press.

1975, 163 pp., \$10.50/£ 4.00

CRYSTAL GROWTH FROM HIGH-TEMPERATURE SOLUTIONS

by D. ELWELL and H. J. SCHEEL

This work will be welcomed as the first to cover in detail all aspects of this technique for crystal growth. The authors close the gap between the theory of crystal growth from solutions and the practice of "flux growth", and give a comprehensive description of the experimental aspects such as crucibles, thermocouples and temperature control. An important feature is the list of crystals grown from high-

temperature solutions, together with experimental data and about 2,500 references, which forms a valuable literature source for both crystal growers and crystal consumers. The often neglected subject of crystal characterization is treated in depth.

1975, 664 pp., \$52.25/£ 19.80

N.B.: Postage plus 50¢ handling charge on all orders not accompanied by payment.

Prices subject to change without notice.

ACADEMIC PRESS, INC.

A Subsidiary of Harcourt Brace Jovanovich, Publishers

111 FIFTH AVENUE NEW YORK, N.Y. 10003

24-28 OVAL ROAD, LONDON NW1 7DX

AN INTRODUCTION TO GROUP REPRESENTATION THEORY

by R. KEOWN

A Volume in the MATHEMATICS IN SCIENCE AND ENGINEERING Series

This book is specifically designed for the mathematician or scientist approaching representation theory for the first time. Eminently suited for an introductory course at the senior or first-year graduate level, this book is a prerequisite to, rather than a competitor with, most of the books on representation theory which have appeared during the last decade.

Its aim is to teach the reader how to calculate irreducible representations rather than just to develop theorems about them.

1975, 346 pp., \$21.00/£ 10.50

Also of interest to physicists . . .

FLUID-BED HEAT TRANSFER

Gas-Fluidized Bed Behaviour and Its Influence on Bed Thermal Properties

by J. S. M. BOTTERILL

This volume, written from the background of the author's past and present work, describes the range of behavior encountered in gas-fluidized beds. Bubble generated particle circulation and the capacity of the circulating particles to transfer heat are both key factors in the process. Dr. Botterill stresses the importance of the behavior of beds adjacent to immersed surfaces and how this limits bed/surface

heat transfer. It is almost always possible to see what is wanted, but the need is to engineer the system to achieve it: particle characteristics, the scale of the equipment, details of distributor design and the form of the internals have particular influence on the relevant bed behavior.

1975, 310 pp., \$23.75/£ 9.00

TURBULENCE IN MIXING OPERATIONS

Theory and Application to Mixing and Reaction

edited by ROBERT S. BRODKEY

CONTENTS: R. S. Brodkey, Introduction. Nomenclature. E. E. O'Brien, Theoretical Aspects of Turbulent Mixing of Reactants. R. S. Brodkey, Mixing in Turbulent Fields. H. L. Toor, The Non-Premixed Reaction: $A + B \rightarrow \text{Products}$. S. N. B. Murthy, Turbulent Mixing in Chemically Reactive

Flows. G. K. Patterson, Simulating Turbulent-Field Mixers and Reactors—or—Taking the Art Out of the Design. L. L. Simpson, Industrial Turbulent Mixing.

1975, 352 pp., \$19.50/£ 9.75

THE EXCIPLEX

(Proceedings of a meeting held under the auspices of the Photochemistry Unit, University of Western Ontario, May 28–31, 1974)

edited by M. GORDON, W. R. WARE, D. R. ARNOLD, and P. de MAYO

From the Preface: "This book consists of the majority of the papers presented at the International Exciplex Conference held at the University of Western Ontario, May 28–31, 1974. . . . Since the discovery of excimer formation by Forster and Kasper in 1954, the realization of their importance and, subsequently, that of exciplexes, in photochem-

istry has become widespread. This volume is the first major compilation presenting the various aspects of exciplex behavior . . . it will provide researchers with a starting point in attempts to understand the present state of knowledge in the area."

1975, 388 pp., \$17.50/£ 8.75

SCANDIUM

Its Occurrence, Chemistry, Physics, Metallurgy, Biology and Technology

by C. T. HOROVITZ (editor), K. A. GSCHNEIDNER, JR., G. A. MELSON, D. H. YOUNGBLOOD, and H. H. SCHOCK

CONTENTS: C. T. Horovitz, Discovery and History. Distribution in Nature. H. H. Schock, Geochemistry and Mineralogy. K. A. Gschneidner, Jr., Derivation, Extraction and Preparation. Physical Metallurgy. G. A. Melson, Chemical Properties. D. H. Youngblood, Scandium Isotopes. K. A. Gschneidner, Jr., Inorganic Compounds. Alloys and Inter-

metallic Compounds. G. A. Melson, Organic Compounds. C. T. Horovitz, Analytical Chemistry. D. H. Youngblood and K. A. Gschneidner, Jr., Technology, Applications and Economy. C. T. Horovitz, Occurrence in Living Systems. Biological Significance. Toxicology.

1975, 614 pp., \$42.25/£ 16.00

TANTALUM THIN FILMS

by W. D. WESTWOOD, N. WATERHOUSE, and P. S. WILCOX

The last two decades have seen increased emphasis on the production of small, rugged, reliable and increasingly sophisticated electrical circuits. The result has been a great scientific effort devoted to the study of thin films and the appearance of a correspondingly large volume of literature on the subject. This book reviews the literature and collates

this mass of information in such a way as to provide objective comparisons between different authors' work and to highlight important advances, theories and discoveries in this field.

1975, 449 pp., \$39.75/£ 15.00

N.B.: Postage plus 50¢ handling charge on all orders not accompanied by payment.
Prices subject to change without notice.

ACADEMIC PRESS, INC.

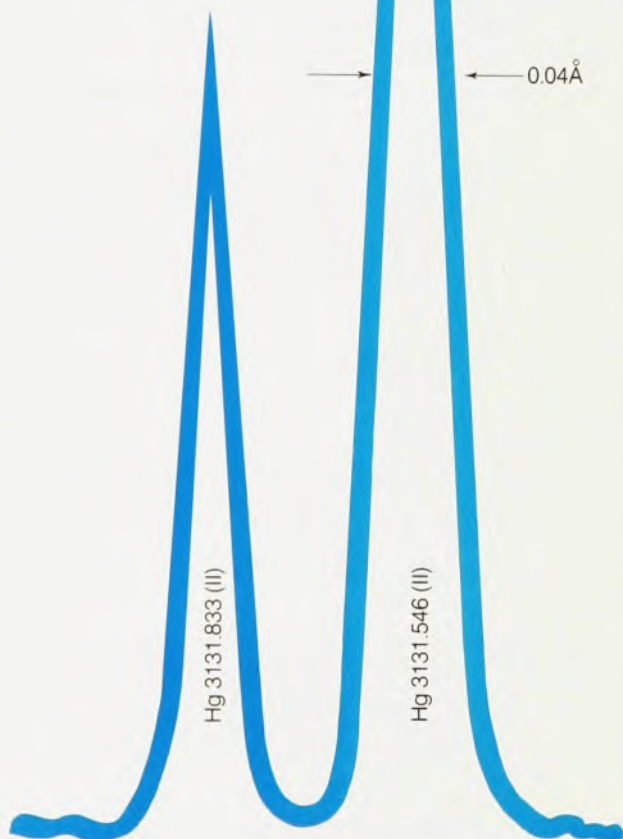
A Subsidiary of Harcourt Brace Jovanovich, Publishers
111 FIFTH AVENUE, NEW YORK, N.Y. 10003
24-28 OVAL ROAD, LONDON NW1 7DX

Circle No. 37 on Reader Service Card

The more you need accuracy in transmission and absorbance spectroscopy, reflectance, fluorescence, laser transition determinations, temperature studies in plasmas, quality control of color TV phosphors, Stark shifts or line broadening... the more you'll want a GCA/McPherson Model 2051 One-Meter Scanning Monochromator.



The Model 2051 Monochromator is designed for a wide range of applications in high accuracy spectrophotometry where a combination of symmetrical line profiles and optimum resolution are essential. Send for our 2051 brochure. Write 530 Main Street, Acton, MA 01720. Phone: 617-263-7733.



GCA/McPHERSON INSTRUMENT ● ● ▲

THE SPECTROSCOPY PEOPLE

Circle No. 38 on Reader Service Card

many new particles and led to the model being increasingly divorced from experiment. With this new freedom explicit amplitudes were developed and shown to possess remarkable and in some cases desirable mathematical properties. These properties encouraged belief that dual models may constitute a complete theory, and much work was done on the calculation of higher-order (loop) terms and on improvements to the Born approximation. After some initial successes, in particular the discovery of a Pomeron-like object, in both these directions, progress has almost stopped; so this is a good time for a book on the subject to be published.

Paul 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. Prejudices in this field tend to be strong (some are revealed in Frampton's selection of topics) so he will, no doubt, have critics—they can try to write a better book. To someone with my prejudices, the first part on duality is rather superficial and the part on phenomenological applications is too uncritical. Also, it is a pity that the calculation of loop corrections and the introduction of the Pomeron is not discussed.

Elementary-particle theorists and experimentalists will be able to learn much from this book. Many, especially experimentalists, will skip much of the mathematical details, but the careful presentation of these will make the book very useful to theorists who wish to join the game. Its present lack of progress may only be temporary!

E. J. SQUIRES
University of Durham
Durham, UK

Atmospheric Waves

T. Beer

300 pp. Halsted, New York, 1974. \$47.50

In the last twenty-five years or so our knowledge of tropospheric, mesospheric and ionospheric dynamics has deepened; the study of atmospheric wave motions has correspondingly grown in importance. Indeed, it has become something of a jungle to which a guide of some sort is always welcome. Such is the purpose of *Atmospheric Waves* by Tom Beer. The author is a young lecturer from the University of Ghana. He must, at the very least, be commended for a good try.

Atmospheric Waves has some good features and some less good ones. It is interesting as a summary of observa-