

MELLER MEANS THE MOST



Crystals of all types and sizes, guaranteed to laser!

In stock, hundreds of single crystals. All configurations (plain flat and parallel ends, TIR configuration, Brewster's angle). Optically corrected for lowest threshold, narrowest beam divergence. Extra slow grown and annealed for minimum strain. **Guaranteed to laser!**

- NEW glass crystals w/neodymium³⁺ 2.0% — finest quality, no bubbles, striae, strains.
- New NPS1 super-uniform ruby crystals.
- Ruby rods up to 12"
- Calcium tungstate crystals w/neodymium³⁺ 0.5% up to 5" long.
- Strontium fluoride crystals w/samarium²⁺ 0.1%, neodymium³⁺ 0.5%.
- Barium fluoride crystals w/neodymium³⁺ 0.5%, uranium³⁺ 0.1%.
- Calcium fluoride crystals w/neodymium³⁺ 0.5%, samarium²⁺ 0.1% dysprosium²⁺ .05%, or uranium³⁺ 0.1%.

For full specifications and prices, write or call Adolf Meller Company, Box 6001, Providence 1, R. I. Telephone: DEXter 1-3717 (Area Code 401).

MELLER

**SAPPHIRE
PRODUCTS**

physical understanding of how the proposed formalisms were actually derived. Quite a few solutions to equations or particular formalisms are stated and can be checked, but that does not teach the student how to find the solution or the way out of a difficulty by himself when he handles a problem of his own. Moreover, a few unfortunate (explicit or implicit) "of courses" introduce conclusions or analogies that are by no means as obvious as they seem to the superficial observer (e.g., p. 36, p. 326), and might easily cause the student to develop poor habits of sweeping generalization.

This reviewer was puzzled by the definition of "resonance" (p. 25). He also was astounded to find, at the conclusion of the section on Lagrange's equations, a brief discussion of the "finality" expressed in Hamilton's integral principle. Is it really advisable to mix up the students' minds with dubious and highly controversial metaphysical affirmations, instead of simply telling them the sober mathematical fact that Lagrange's differential formalism and Hamilton's integral formalism are mathematically equivalent (this much the author says), and that therefore neither can involve any metaphysical implication that is not in agreement with the other formalism. Such a statement would induce the reader to be wary of metaphysical interpretations, and it would be so much the better as far as physics is concerned!

To summarize, the book displays several valuable features that make it a good text for study under a capable teacher. It is not commendable for self study, all the more as there are no answers to the (numerous and varied) problems, and hardly any bibliographic references.

Encyclopedia of Physics, Volume XI/I, Acoustics I. Edited by S. Flügge. 441 pp. Springer-Verlag, Berlin, 1961. Reviewed by Hans Jaffe, Clevite Corporation.

THE longest article (128 pages) in this volume, entitled Linear Acoustic Theory, by Philip M. Morse and K. Uno Ingard, starts from the classical relations for low-amplitude sound to develop a modern mathematical theory of sound propagation. The treatment is carried to considerable detail for such problems as Transmission Through Ducts (17 pages) and Coupled Motion in Ducts (11 pages).

The following contributions deal with physical acoustics: H. O. Kneser's article (in German) on sound adsorption and dispersion in gases gives a most lucid treatment of this field, to which Kneser made decisive contributions beginning about 1930. Konrad Tamm (in German) discusses sound adsorption and dispersion in aqueous electrolytes which are dominated by relaxation phenomena of ionic interactions. Daniele Sette treats pure liquids and nonelectrolytic mixtures. The concluding article by Warren P. Mason on high polymers reports on a field to which his own group at Bell Telephone Laboratories has made the major contributions. The publication date of this volume is



A new text by **FRANZO H. CRAWFORD**
for junior and senior courses—

HEAT, THERMODYNAMICS, AND STATISTICAL PHYSICS

■ For January 2nd publication. In this new text designed for one-year courses, but adaptable to one-semester use, Professor Crawford of Williams College utilizes his 30 years' teaching experience to give students a sound background in the experimental and theoretical growth of the study of the thermal properties of matter. The book thus incorporates—with the 14 chapters on thermodynamics—some 5 chapters that examine the statistical study of matter. Among the topics given special attention are the role of entropy, the question of independent variables and their proper selection, and the use of curve differentials in connection with heat and work. In treating systems of two or more variables, Professor Crawford develops and uses extensively a Jacobian scheme. Contains problems at the end of each chapter, footnotes, suggestions for further reading, and over 325 charts, diagrams, and tables that illustrate important principles. Prob. 704 pages, \$10.00.

■ Please reserve your examination copy now. Additional information and a Table of Contents will be supplied upon request.

Harcourt, Brace & World, Inc.

750 Third Avenue, New York 17, New York
1855 Rollins Road, Burlingame, California

LIQUID HELIUM

ECONOMICALLY PRODUCED BY
GARDNER CRYOGENICS

A constant inventory of at least 2,000 liters of liquid helium assures prompt and reliable delivery . . . air transport for overnight service anywhere in the U.S.A.

A staff of highly experienced cryogenic engineers is capable of solving your low temperature problems. Call or write us regarding our consulting service on Cryogenic Systems Design.

In addition to liquid helium . . . helium gas and liquid hydrogen are also available.

Dewars with large apertures are available on a rental basis for low temperature experiments.



**GARDNER CRYOGENICS
CORPORATION**

142 William Street, Hightstown, N. J.
Phone 448-3373 • Area Code 609

PLASMA HYDROMAGNETICS

THE SIXTH LOCKHEED SYMPOSIUM
ON MAGNETOHYDRODYNAMICS

Edited by Daniel Bershader

Eight papers giving both experimental and theoretical results in molecular and macroscopic aspects of the dynamics of plasma behavior presented at the sixth Lockheed-sponsored symposium on magnetohydrodynamics, held in December, 1961. \$4.50

Order from your bookstore, please

STANFORD UNIVERSITY PRESS

Physicists

At the Bendix Research Laboratories Division a new fundamental program has been started in the Quantum Physics Department. The following positions are open in our expanding Research Division:

(1) Physicist with excellent theoretical training for pioneer work in the field of induced transitions (masers). A challenging opportunity to lead a group in the design and study of materials and new pumping schemes. Prerequisite: PhD in Physics. Some experience, but not necessarily in the above field.

(2) Semiconductor Materials Specialist to head group working on crystal growth, perfection and doping problems of III-V compounds and maser (laser) crystals. Prerequisite: PhD with good theoretical background in crystallography and experience in crystal growth and structural research.

(3) Solid State Physicist to lead a group conducting basic investigations of quantum effects in solids (tunnelling phenomena, hot carriers, microplasmas, etc.), and to ultimately indicate new device principles for transfer to our Solid State Development Department. Prerequisite: PhD in Solid State or Physics, special knowledge in the theory of electrical properties of metals and semiconductors.

Our laboratory facilities include the latest X-ray equipment, electron microscope, laser research equipment, infrared-optical spectroscopic equipment, maser equipment, also usable for paramagnetic studies.

Write or wire in confidence to:

A. Capsalis
Director of Personnel
The Bendix Corporation
Research Laboratories Division
Southfield, Michigan

**Research Laboratories
 Division**



An equal opportunity employer

1961; nevertheless the word "phonon" is missing from the index, an indication of how rapidly emphasis and point of view have changed in physical acoustics.

Thermophysics. By Allen L. King. 369 pp. W. H. Freeman & Co., San Francisco, 1962. \$9.50. *Reviewed by Stuart A. Rice, University of Chicago.*

THERMODYNAMICS seems to be a subject capable of generating an indefinite number of books. Few authors seem to feel that the available texts satisfy the need even though, in the reviewer's opinion, few innovations have been made in the long history of publication of such books. The book considered in this review, in my opinion, does not attain the objective set by the author in the preface. It is not, I believe, "suitable as a text or reference book for serious students who have had excellent courses in college physics including calculus, and who wish to learn more about the thermophysical foundations of modern science". One fundamental mistake made by the author consists of treating many subjects superficially rather than a few subjects in great detail. The inclusion of chapters on kinetic theory, superfluidity, irreversible flow processes, quantum statistics, etc. does not make the text suitable for a course which would include a treatment of these subjects at any level which would be useful for the student. It is amusing to see an appeal to popular opinion in an undergraduate text. This occurs in the author's treatment of plasma phenomena.

The preceding conclusions are derived from the observation of numerous classical ambiguities in the treatment. For example, although at the University of Chicago we teach in freshman chemistry the definition of heat in terms of purely mechanical quantities (as presented by Born in 1920), in this text heat seems to appear as some mysterious energy necessary to balance an equation. The internal energy is introduced without definition. The simplicity which results from a careful treatment of the First Law of Thermodynamics, including the definition of internal energy and heat in terms of mechanical work, is never made apparent to the student. The qualitative statements about internal energy which appear on page 5 do not appear clear to me. With regard to the chapter on thermometry and other chapters in the book, much of the text is constructed along lines very similar to the book by Zemansky. Unfortunately, this book lacks the clarity and elegance of Zemansky's presentation. There is no discussion of chemical thermodynamics and therefore the student really never learns to understand the importance of Gibbs' contributions and the power of thermodynamics based upon the use of the chemical potential. On pages 343-346 there is presented an incorrect derivation of the law of mass action based upon the use of reaction rates. This is the argument used by Goldberg and Wagge about one hundred years ago. It was superseded by an argument due to Gibbs in the 1870's. The author had best examine a modern