back drastically, and attempts to introduce the phonon theory of solids from scratch, commencing with second quantization of the harmonic oscillator. The Debye theory is presented with very little discussion, but one actual graph of C_v versus T. After which there appears a discussion of the effective mass of electrons in a crystal, which leads into a final brief discussion of the Boltzmann transport equation for electrical conductivity.

Regretfully, I cannot see any likely American market for such a book for any typical audience. I would hazard the guess that it originated as a brief set of lectures to a very special audience, but I find it hard to imagine that audience.

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Many-Body Problems

G. E. Brown
232 pp. Elsevier, New York, 1972. $13.75

The Many-Body Problems in Quantum Mechanics

N. H. March, W. H. Young and S. Sampanthar
459 pp. Cambridge U. P., New York, 1967. $7.50

The quantum-mechanical many-body problem and the physical concepts that emerge from its mathematical methods certainly are central to modern physics. Several proceedings, survey articles and many monographs on this topic have appeared over the last ten to twelve years, but few, if any, of these could really serve as a course text. It is, therefore, with great anticipation that the physics teacher opens each new treatise on the many-body problem, hoping to find a text that can guide the graduate student wanting to learn the techniques and language of many-body physics.

Both of the books reviewed here give accounts in varying detail and of different scope of such topics as Fermi fluids, many-body perturbation theory, superconductivity and Green's function theory. While the two texts cover the same topics, they are sufficiently different in style, aim and origin to warrant separate reviews.

There is a tendency in books on many-body theory to emphasize the treatment of extended systems as the electron gas and nuclear matter and almost exclusively work in a plane-wave basis. The books reviewed here are no exception in this regard and therefore do no attempt to fill the need for texts emphasizing many-body techniques applied to finite systems as atoms, molecules and atomic nuclei.

The Many-Body Problem in Quantum Mechanics by N. H. March, W. H. Young, and S. Sampanthar, published in 1967 by Cambridge University Press, is a deliberate treatise giving considerable detail in both formalism and physical arguments. Its pedagogical style and illustrative problems in each chapter make it highly suitable as a text for an advanced graduate course. *Many-Body Problems* by G. E. Brown, published by North-Holland/American Elsevier in 1972, follows closely from lectures given by the author at Copenhagen, Princeton and Stony Brook over a period of several years. The style of presentation has the captivating flavor of the immediacy of the classroom lecture, but the transcription of the lectures into a text seems to have left out many of the clarifying side remarks of the lecturer. The effort necessary to follow many of the mathematical steps in detail is unduly great for the many-body novice, and makes the book less suitable for a course text. Parts of this book still are enjoyable reading for the physicist who has already some familiarity with the ideas of many-body theory.

The authors have outstanding qualifications to write about the many-body problem both with insight and engagement. Norman H. March, presently professor of physics at Imperial College, London, has written numerous research papers in the field of many-electron physics, some together with W. H. Young and S. Sampanthar. Gerald E. Brown is professor at the State University of New York at Stony Brook and has made distinguished contributions to the field of many-body theory, particularly in nuclear physics.

The Many-Body Problem in Quantum Mechanics contains ten chapters with the material divided about half and half between mathematical methods on the one hand and applications to physical systems on the other.

The ideas of the Fermi hole and the correlation hole are introduced in a brief chapter on atoms and molecules, which also presents the Hartree–Fock method and the Fermi–Thomas theory. The only molecular system considered is the hydrogen molecule, and the treatment is more qualitative than quantitative.

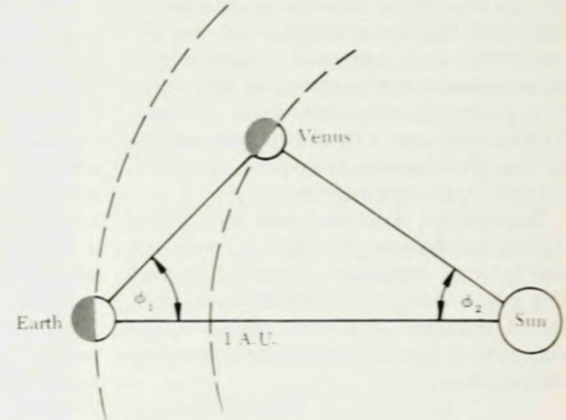
The formalism developed includes

ROBERT SAAR

Marion & Davidson: **MATHEMATICAL PREPARATION FOR THE PHYSICAL SCIENCES**

Here's help for the student who stumbles through physical sciences courses because of his own inability to perform the necessary mathematical procedures. Designed for use by the student on his own time, the book offers a comprehensive review of elementary mathematical topics covering basic addition, subtraction, multiplication and division, and working up to algebra, geometry, graphs and vectors. Numerous problems are provided so that the student can test his understanding of each new idea and technique.

By Jerry B. Marion *and* Ronald C. Davidson, *both of the University of Maryland.*
About 145 pages. Illustrated. Soft Cover. About $4.50. Ready March. Order code 6076.



Marion & Davidson: **MATHEMATICAL PREPARATION FOR GENERAL PHYSICS**

Writing for non-physics majors, the authors confine their discussions to non-calculus topics; the most advanced material is concerned with the basic concepts of trigonometry and vector algebra.
230 pages. Illustrated. Soft Cover. $4.75. February 1972. Order code 6070.

Davidson & Marion: **MATHEMATICAL PREPARATION FOR GENERAL PHYSICS WITH CALCULUS**

The authors offer a presentation of basic mathematics similar to that in the previous volume, but now add coverage of calculus. They discuss differential and integral calculus, exponential functions, natural (as well as common) logarithms, log-log plots, semilog plots, vectors that change with time, etc.
263 pages. Illustrated. SoftCover. $4.95. April 1973. Order code 2818.

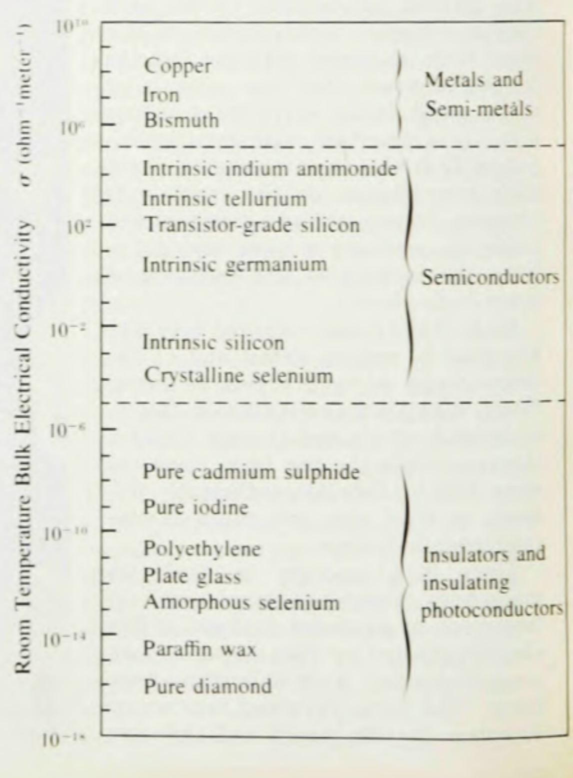
Blakemore: **SOLID STATE PHYSICS** *New Second Edition*

Designed to serve as a text for one-semester courses in the physics of solids, this new edition is primarily concerned with the theories of solid state physics and of experimental data which relate to these theories. Primary emphasis is devoted to the periodic structure of a crystalline solid, the effects periodicity has on the motion of electrons and the allowed spectrum of lattice vibrations.

By John S. Blakemore, *Florida Atlantic University, Boca Raton.*
About 400 pages, 200 illustrations. About $15.00. Ready March. Order code 1701.

Table of Contents (Abridged)

1. **Crystallinity and the Form of Solids:** Forms of Interatomic Binding ▪ Symmetry Operations ▪ Crystal Diffraction ▪ Reciprocal Defects ▪ 2. **Lattice Dynamics:** Elastic Waves, Atomic Displacements and Phonons ▪ Vibrational Modes of a Monatomic Lattice ▪ Phonon Statistics and Lattice ▪ Thermal Conduction ▪ 3. **Electrons in Metals:** Some Features of Metallic State ▪ Classical Free Electron Theory ▪ The Band Theory of Solids ▪ Dynamics of Electron Motion ▪ Superconductivity ▪ 4. **Semiconductors:** Equilibrium Electron Statistics ▪ Electronic Transport in a Semiconductor ▪ Excess Carrier Phenomena ▪ 5. **Dielectric and Magnetic Properties of Solids:** Dielectric Properties ▪ Magnetic Properties of Solids ▪ Magnetic Resonance ▪ **Index**



Smith & Jacobs: **INTRODUCTORY ASTRONOMY AND ASTROPHYSICS**

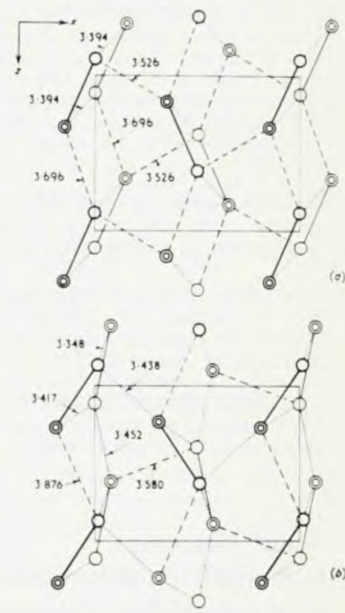
Earth, solar system, stellar astronomy, home galaxy, cosmology—here is a clearly written new text in astronomy and astrophysics geared to freshmen and sophomores with a solid grounding in high school geometry, algebra and trigonometry. The authors emphasize modern astronomy and elementary astrophysics without neglecting the heritage of classical astronomy. From atomic theory to cosmogony, from stellar evolution to quasars, students will find a complete, well-balanced storehouse of information.
By Elske V.P. Smith, *Univ. of Maryland, and* Kenneth C. Jacobs, *Univ. of Virginia.*
564 pages. 284 illustrations. $15.95. July 1973. Order code 8387.

Table of Contents (Abridged)

Part I: INTRODUCTION ▪ Astronomy and Astrophysics ▪ Aspects of the Celestial Sphere ▪ **Part II:** THE SOLAR SYSTEM ▪ Celestial Mechanics ▪ Motions of the Earth ▪ The Solar System in Perspective ▪ The Earth-Moon System ▪ Inferior and Superior Planets ▪ Electromagnetic Radiation and Matter ▪ **Part III:** BASIC STELLAR CHARACTERISTICS ▪ The Sun ▪ Stellar Distances and Magnitudes ▪ Binary Stars ▪ **Part IV:** THE STRUCTURE AND CONTENT OF OUR GALAXY ▪ Our Galaxy ▪ Stellar Motions ▪ The Structure and Evolution of Stars ▪ Variable and Unusual Stars ▪ **Part V:** THE UNIVERSE ▪ Contents of Extragalactic Space ▪ Our Universe and Cosmology ▪ **Appendices**

Megaw: **CRYSTAL STRUCTURES A Working Approach**

This new volume is both a text and reference concerned with crystal structures as resulting from the interplay of symmetry requirements on the one hand, and physical factors such as atomic size and interatomic forces on the other. Designed for the senior and graduate student, no knowledge of crystallography is assumed. The author uses an empirical approach. Geometrical ideas are constantly applied to actual structures so that the reader is building up a repertoire of technically important structures and their variations.
By Helen D. Megaw, *Univ. of Cambridge, England.*
563 pages. 208 illustrations. $19.50. July 1973. Order code 6260.



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1. Introduction
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10. Geometrical Transformations
11. Structures of Oxides
12. Families of Structures
13. Structures of Compounds Containing Hydrogen
14. The Effects of Temperature
15. Phase Transitions

References

Diefenderfer: **PRINCIPLES OF ELECTRONIC INSTRUMENTATION**

Discussing subjects ranging from the rudiments of ac and dc theory to the principles of circuit design, Professor Diefenderfer provides an easy-to-understand introduction to electronic instrumentation for students enrolled in a one-semester course. No prior knowledge of electronics is assumed. The principles behind the operation of semiconductors and transducers are fully developed. Throughout the text practical results and applications are emphasized. A laboratory manual, *Basic Techniques in Electronic Instrumentation,* is also offered.
By A. James Diefenderfer, *Lehigh University.*
Text: 675 pages. 750 illustrations. $14.95. April 1972. Order code 3075.
Manual: 375 pages. 257 illustrations. Soft Cover. $7.50. April 1972. Order code 3072.

For examination copies write:

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density matrix theory, the Hartree–Fock method, second quantization, diagrammatic perturbation theory, and Green's-function theory. The mathematical manipulations have been subordinated to physical arguments, but the formalism is still given in sufficient detail that the reader can follow most of the development without tremendous effort.

The diagrammatic perturbation theory is treated in great detail and applied to many situations. Summation of ring diagrams yields the correlation energy for the dense electron gas and in the context of temperature-dependent perturbation theory it produces the grand partition function. Plasmons are arrived at by using the linearized equation-of-motion method of Sawada, Green's-function perturbation theory and summation of particle–hole bubble diagrams.

The electron gas is treated again in the chapter on Fermi fluids. Its properties at low densities and its momentum distribution as a function of gas density are discussed, as are magnetic properties. Landau's Fermi-liquid theory is applied to He^3 with an illuminating discussion of zero sound and compressibility at first sound. Nuclear matter is deferred to a separate chapter and discussed in terms of Brueckner's reaction-matrix theory.

Interacting bosons are presented in several ways; first through Feynman's variational theory and then by the canonical transformation of Bogoliubov and again in the chapter on Green's functions by the method of anomalous propagators according to Beliaev. The Bardeen–Cooper–Schrieffer theory of superconductivity is outlined with detailed physical motivations, and there is a brief discussion of hard superconductors and the Ginzburg–Landau theory.

This book is strongly recommended to the student who wants to learn the mathematical methods and physics of the many-body problem.

The emphasis of *Many-Body Problems* is on the development of the necessary formalism, but there are also some applications to physical systems.

Accounts in varying detail are given of the mathematical methods pertaining to the Hartree–Fock method, many-body perturbation theory, Green's-function theory, Landau's Fermi-liquid theory, and the random-phase approximation. The preliminaries about antisymmetry lack the introduction of spin variables and discussion of the occupation-number representation, and the discussion of second quantization suffers from awkward notation.

Perturbation theory is presented at some length and after a terse development of the time-independent methods of Brillouin–Wigner and Rayleigh–Schrödinger, a more detailed discussion follows of the time-dependent methods of Goldstone and Hugenholtz. Rules are outlined for the calculation of the single-particle Green's function and the two-body Green's function is obtained in the ladder approximation. This approximation is equated to the random phase approximation and to the linearization of the equation of motion.

The notion of quasiparticles is introduced via the single-particle Green's function and discussed in the interesting chapter on Fermi liquids as they apply to He^3, and the quasiparticle method of Bogoliubov–Valatin is developed in connection with the theory of superconductivity.

Electron–phonon interaction is introduced in the "rigid ion" approximation and further developed in a discussion of the electron–electron effective interaction in the "jellium" model. Arguments using graphical techniques are employed to develop the clothed-phonon propagator.

The author states somewhere in the text that there is no substitute for learning the subject in complete detail, and I guess that this means that the book is not intended as a course text but rather as a limited review of some of the topics of many-body theory.

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Physical Metallurgy, Techniques and Applications

K. W. Andrews
2 volumes: 340 pp., 347 pp. Halsted, New York, 1973. Volume 1, $22.50; volume 2, $24.00

The field of physical metallurgy includes the structure, properties, reactions and deformation of metallic materials. Thus, it is related to but broader than the subject of the physics of metals. Many of the techniques used in physical metallurgy are also of interest to the physicist, especially because these techniques can be adapted to the study of nonmetallic materials. Among the techniques considered in the present two-volume work are temperature measurement, thermal analysis, thermal expansion, thermal conductivity, growth of crystals, zone melting, x-ray and electron diffraction, electron microprobe, radioactive tracers, optical microscopy, quantitative microscopy, electron microscopy, electrical measurements, magnetic measurements, internal friction and internal stresses.

K. W. Andrews is well prepared by