



D. Reidel Publishing Company

SOLAR MAGNETOHYDRODYNAMICS

Eric R. Priest, *St. Andrews University, U.K.*
Geophysics and Astrophysics Monographs 21

This book which introduces the theory for the interaction between the solar atmosphere and its magnetic field begins with two introductory chapters on solar observations and the basic equations of magnetohydrodynamics. Then the fundamentals of MHD are developed in chapters on magnetostatics, wave motions, shock waves, and instabilities. Finally, the theory is applied to the specific solar phenomena of atmospheric heating and loop structure, sunspots and magnetoconvection, dynamo generation, solar flares, prominences, coronal transients and the solar wind.

ISBN 90-277-1374-X Cloth
1982 496 pp. \$99.00/Dfl. 235.

MAGNETOSPHERIC PLASMA PHYSICS

Edited by A. Nishida, *Institute of Space and Aeronautical Science, University of Tokyo, Japan*

Developments in Earth and Planetary Sciences 4

This book reviews important aspects of our knowledge of the Earth's magnetosphere and also refers to those of other planets in the solar system.

The origin of magnetospheric plasma, the mechanisms which account for the energies involved and the energy exchanges which take place, and the physical processes associated with the aurora are comprehensively discussed.

ISBN 90-277-1345-6 Cloth
1982 364 pp. \$49.50/Dfl. 130.

GENERAL RELATIVITY AND MATTER

M. Sachs, *State University of New York at Buffalo, U.S.A.*

Fundamental Theories of Physics 1

This book is concerned with unifying the logical and mathematical aspects of the theory of general relativity. Einstein's field equations are derived in standard tensor form. Their physical implications, and solutions dealing with the "crucial tests" of the theory, are presented. This theory is generalized to yield a fundamentally deterministic continuum field theory of matter applicable to all domains, from fermions to light-years.

ISBN 90-277-1381-2 Cloth
1982 232 pp. \$39.00/Dfl. 90.



D. Reidel
Publishing Company

P.O. Box 17
3300 AA Dordrecht
Holland

190 Old Derby Street
Hingham, MA 02043
U.S.A.

graduate courses in optical waveguides—including classes for practical engineers," and "it is intended to serve readers with some background in electromagnetic theory." After a survey of the background material on electromagnetic theory and its application to wave propagation, Owyang analyzes (in rectangular coordinates) the behavior of guided and radiation modes for the transverse electric and transverse magnetic waves in slab dielectric waveguides. He then discusses the properties of eigenvalues and eigenfunctions as related to the solutions of homogeneous second-order partial differential equations with homogeneous boundary conditions, analyzes the nonhomogeneous problems and then examines the solution of nonhomogeneous equations using Green's function techniques. The second half of the book concentrates on more practical problems—dielectric slab waveguides, cylindrical waveguides—and includes discussions of two methods of approximation and of inhomogeneous cylindrical waveguides with radial variation in the dielectric constant.

On the whole, the book does present a systematic treatment on both the slab and cylindrical optical waveguides, thus fulfilling its objective of providing a foundation on the subject. On the other hand, there are a number of areas in which improvements could be made. First, the chapter on the methods of approximation treats only very briefly—on nine pages—the perturbation and WKB methods. This chapter could have been expanded to include such other methods as the staircase approximation, the variational method and the linearly-polarized-field approximation, which are as important as the perturbation and WKB methods. Second, in discussing the dispersion characteristics, Owyang makes no distinction between chromatic dispersion and modal dispersion. As a consequence, he fails to compare the magnitudes of modal dispersion for step-index and graded-index waveguides and fails to consider the differences in chromatic dispersion for different excitation sources, notably laser diodes and light-emitting diodes. It is not clear what he means by saying that "especially useful in optical-fiber communications are the effects of dispersion." Third, the book would be more suitable as a textbook if selected exercises or problems had been included for each chapter. It would also be more useful for graduate students if references to the more important research papers had been given, particularly in the area of inhomogeneous cylindrical waveguides.

In summary, this book could be used as a reference for a university course on optical waveguides. On the other hand, its relatively high price makes it diffi-

cult for every student to own a copy. Furthermore, an engineer wishing to design a practical optical-fiber communication system may not find the book very useful because it does not provide information on systems design. For example, the book does not analyze the problems of coupling between two fibers or between a fiber and a light source (or a photodetector).

T. K. LIM
NCR Canada Ltd.
Waterloo, Ontario

A Lie Group: Rotations in Quantum Mechanics

J.-M. Normand

486 pp. North-Holland, New York, 1980.
\$61.00

The use of Racah-Wigner angular momentum techniques to analyze rotational symmetry is now a familiar discipline used in essentially all branches of quantum physics; there is no lack of textbooks and monographs developing the subject to suit any taste. The present monograph is distinguished by two features:

- It uses the quantal rotation group as a simple and intuitive example to illustrate the general properties of (linear) representations of compact Lie groups
- It exploits the methods, and particularly the viewpoints, of the French school of mathematics, with its emphasis on intrinsic (coordinate-free) concepts, clarity and rigor

The book accomplishes these aims rather well, but it must be admitted that a less mathematically oriented physicist reader may find the presentation heavy going at times. Basic mathematical details (vector spaces, algebras, groups, ...) are relegated to eight long appendices; this does not make the text read any more easily. Normand takes great care to distinguish intrinsically defined objects; the pace is detailed but slow (only in Chapter 5 do we find the angular momentum commutation relations for the first time). This very precision becomes a difficulty, especially in Chapter 10 (on representations in various functional vector spaces) through a most unwieldy notation.

The viewpoint Normand has chosen is less successful when it comes to such constructs as tensor operators and the algebraic properties of the $3-j$ and $6-j$ symbols. This difficulty is only to be expected since these topics have not been fully categorized in the mathematics literature. It is also no surprise that the applications to quantum mechanics are quite limited in scope. The literature citations are rather haphazard (and incomplete); Normand has the unhappy tendency to cite tertiary (even unpublished) sources for well-

known results, often without primary references.

The book can be recommended to graduate students who have learned something about angular momentum theory (and groups) and would like to see how this knowledge fits into a modern mathematical setting. (The monograph is a useful antidote to the oversimplified "physicist's texts" on Lie groups.) But the beginning student should look elsewhere; this is not an introductory textbook. North-Holland has done a fine job of the format and printing (there are commendably few errors), but the price is a bit steep.

L. C. BIEDENHARN
Duke University

book notes

Jets of Hadrons

W. Hofmann

210 pp. Springer-Verlag, New York, 1981.
\$32.50

Jets of Hadrons is a thorough, well-written article that treats a subject currently of great interest. Werner Hofmann reviews the properties of hadronic final states in e^+e^- annihilation, lepton-hadron and hadron-hadron scattering in the regime where a parton (QCD-quantum chromodynamic) description is appropriate. He also covers the more speculative approaches to low transverse momentum processes. Although concentrating on final state properties, Hofmann also discusses the general QCD description of these reactions. The treatment of e^+e^- annihilation is deliberately brief in deference to Bjorn Wiik and Gunter Wolf's well-known article on this in the same Springer series. Hofmann takes an experimental point of view but within this context seems to present fairly the competing models, theories and data.

Hofmann's tract is in fact very similar in style and content to many reviews one will find in high-energy physics conference reports. This tract is more comprehensive but even by now does suffer a little from age in this rapidly moving field. I suspect that only high-energy physicists working directly in the areas covered will be interested in this book and even then most will be content to have it available in their library.

GEOFFREY C. FOX
California Institute of Technology

new books

Astronomy, Cosmology and Space Physics

Compendium in Astronomy. A Volume Dedicated to Professor John Xanthakis

on the Occasion of Completing Twenty-five Years of Scientific Activities as Fellow of Athens. E. Mariolopoulos, P. Theocaris, L. Mavridis, eds. 464 pp. Reidel (US dist. Kluwer, Hingham, Mass.), 1982. \$49.50. *compendium*

Extragalactic Astronomy. J. Sérsic. 245 pp. Reidel (US dist. Kluwer, Hingham, Mass.), 1982. \$49.50. *intermediate text*

The History of Modern Astronomy and Astrophysics: A Selected Annotated Bibliography. D. DeVorkin. 434 pp. Garland, New York, 1982. \$65.00

Amateur Astronomer's Handbook. Fourth Edition. J. Sidgwick. 568 pp. Enslow, Hillside, N.J., 1982. \$7.95

Astronomical Photometry. A. Henden, R. Kaitchuck. 392 pp. Van Nostrand Reinhold, New York, 1982. \$29.95. *reference*

Astronomy and Astrophysics for the 1980's Vol. 1. Report of the Astronomy Survey Committee. National Academy Press, Washington, DC, 1982. \$14.75

High-Precision Earth Rotation and Earth-Moon Dynamics. Lunar Distances

Physics International has the answers...

and we're looking
for people who have
the answers too!

...in Pulsed Power

Drivers for High Energy Lasers
Nuclear Fusion Research
Coherent Microwave Radiation
Charged Particle Beam Research
X-Ray Lithography Illuminators

...in Nuclear Radiation Effects

Intense Radiation Testing
Nuclear Hardness and Survivability
Electromagnetic Pulse (EMP) Testing
Blast and Shockwave Analysis
Ground Motion and Fireball Effects Studies

...in Advanced Ordnance Development

Shaped Charges
Self-Forging Fragments
Anti-Tank Devices

Physics International is dedicated to providing the answers to today's vital questions, today!

...Ask Us For The Answers!

Call or write Personnel Director:



Physics International Company

A Subsidiary of **ROCKCOR**

2700 Merced Street, San Leandro, California 94577 (415) 357-4610

An Equal Opportunity Employer

Circle number 54 on Reader Service Card