



Foundations of Mechanics

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450 Pages.

\$14.75 Cloth/\$11.80 Prepaid

This text and reference volume is a complete treatment of classical mechanics in the language of modern differential geometry. It is based on a series of lectures given by R. Abraham in 1966 at Princeton University, and directed primarily to graduate students and theoretical physicists.

CONTENTS:

Differential Theory.
Calculus on Manifolds.
Conservative Mechanics.
Time Dependent Mechanics.
Qualitative Theory of Vectorfields.
Qualitative Theory of Hamiltonian Systems.
The Three Body Problem.
Conclusion.
Appendix A: Topics from Topology.
Appendix B: Stability of the Center-Stable Manifold, by A. Kelley.
Appendix C: On the Liapounov Sub-Center Manifold, by A. Kelley.
Appendix D: The General Theory of Dynamical Systems and Classical Mechanics, by A. N. Kolmogorov.
Bibliography.
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Glossary of Symbols.

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region is dealt with. The origin of space charge at the surface, space-charge density and the shape of the potential barrier are investigated. Excess surface-carriers and deep-trap characteristics for wide-gap semiconductors are under consideration. In chapter 5, localized states and Tamm and Shockley states at the surface are dealt with, together with the interaction of these surface states with a single band and complex models of surface recombination. The next two chapters are devoted to experimental methods, chapter 6 to the field effect at dc, low and high frequencies and under pulsed conditions, and chapter 7 to measurement of surface recombination velocity, to contact potential, photoelectric emission, high-field effects, optical and magnetic measurements and to noise effects. Chapter 8 deals with a review on existing theoretical and experimental work on surface transport phenomena. From a solution of the Boltzmann transport equation the authors calculated the average and surface mobilities as functions of the scattering conditions at the

surface and despite simplifications introduced into the theory they found their results in good agreement with experimental data. In chapter 9 the electronic structure of the surface is discussed and the authors consider also real germanium and silicon surface and clean surfaces. Further they discuss the role of the surface states in chemisorption (oxygen adsorption that reduces the surface-state density drastically when considering a real surface instead of a clean surface).

Even when the authors state in the preface that this book may serve as a text for graduate students with a general background of solid-state physics, the reviewer's opinion would not support that. The book is written for the specialist in the field and he will gain a lot for his work, for he will not only be guided through the surface-state research of the last 10 years, but he will find an excellent and competent review of both theory and practice of semiconductor-surface problems. The book can therefore be highly recommended for research workers in the field.

Some crystal constants

LANDOLT-BÖRNSTEIN, NUMERICAL DATA AND FUNCTIONAL RELATIONSHIPS IN SCIENCE AND TECHNOLOGY. New Series, Group 3, Volume 1: Elastic, Piezoelectric, Piezoöptic and Electroöptic Constants of Crystals. By R. Bechmann, R. F. S. Hearmon. 160 pp. Springer-Verlag, Berlin, 1966. DM 68

by Herbert Malamud

This is another in the justly renowned series of Landolt-Börnstein's collections of numerical and physical data. Group III of the New Series covers crystal and solid-state physics. The present volume, the first, is to be followed by a volume on structural data of crystals and a third on magnetic and other properties of oxide systems.

Volume 1 opens with a 39-page chapter by R.F.S. Hearmon, on the elastic constants of nonpiezoelectric crystals. After an explanatory section, the material covered is organized into sections containing elastic constants, temperature coefficients, pressure coefficients, variation with temperature (which gives the variations of the con-

stants over a wide temperature range, generally from 0°K to the melting point, in graphical form), and references. Materials discussed include cubic materials, (elements, alloys, binary compounds, alums and miscellaneous cubic materials), hexagonal, trigonal, tetragonal, orthorhombic and monoclinic materials.

Chapter 2, by R. Bechmann, is on the elastic, piezoelectric, and dielectric constants of piezoelectric crystals. After an introduction, the elastic constants are given, including elastic compliances and elastic stiffnesses, with their temperature coefficients, and pressure coefficients of the stiffnesses. Electromechanical-coupling factors are given for the few substances for which they are known. Piezoelectric stress and strain constants with their temperature coefficients are given, and dielectric permittivities with accompanying temperature coefficients.

Chapter 3, also by Bechmann, covers piezoöptic and electroöptic constants of crystals. After the now

familiar introduction, one finds the piezoöptic and elastoöptic constants, followed by the three electroöptic constants. Explanations of the symbols are consistently given in the introductions, always complete and always succinct.

Clearly, the book is suitable neither for browsing nor for textbook use. On the other hand, any library associated with a solid-state research effort cannot do without it.

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The reviewer is director of physics research for the Radiation Research Corporation in Westbury, N. Y.

Shedding light on the subject

LUMINESCENCE: L'ELECTRON ET LA LUMIERE, MATIERE ET PHOTOLUMINESCENCE. By G. Monod-Herzen. 277 pp. Dunod, Paris, 1966. Paper 39 F.

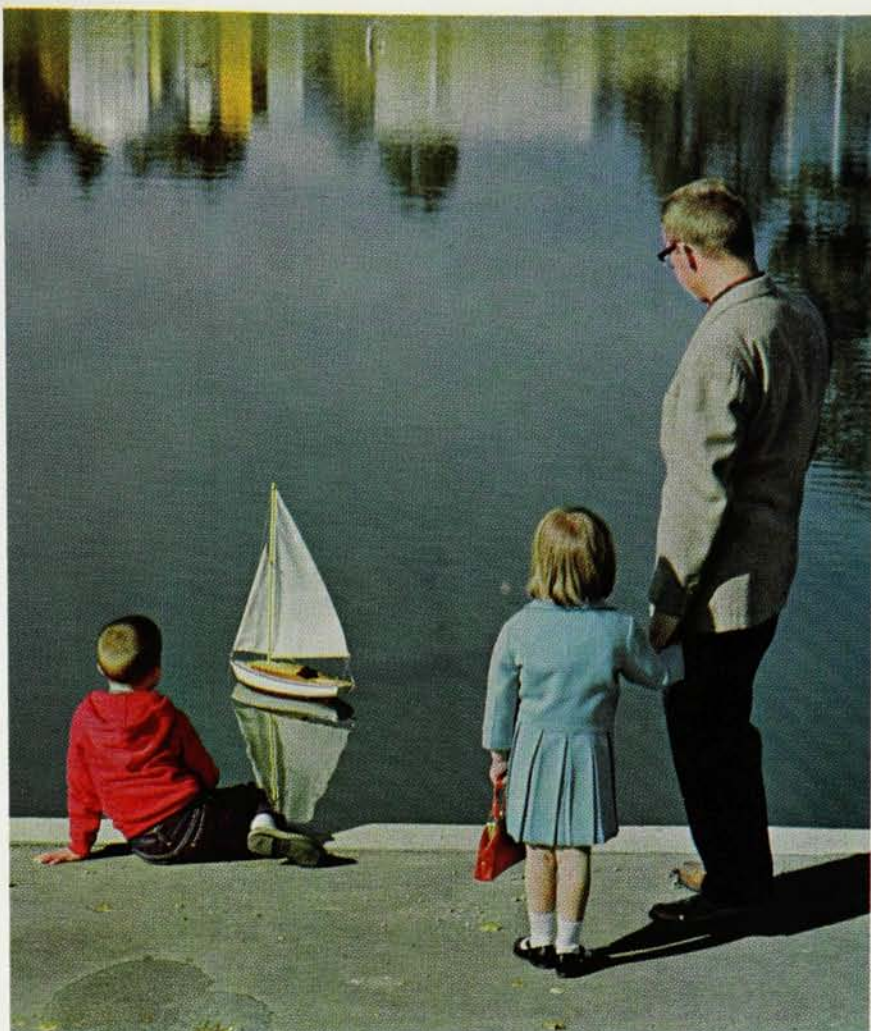
by L. Marton

It is a pleasure to report on an excellent book. In fact, the book is so readable that I would like to recommend its translation into English.

As its title indicates, the book is divided into two parts. The first part is entitled "The Electron and Light," and the second part is "Matter and Photoluminescence." The first part is divided into three chapters: "The Free Electron and Light," "The Bound Electron and Light" and "Notions of Spectroscopy." The second part is divided equally into several chapters: "Elements of Luminescence"; "Atomic Luminescences"; "Molecular Luminescences" "Crystalline Luminescences."

The first chapter is one of the most lucid discussions of the nature of the electron I have seen for a long time. For instance, the description and discussion of the energy of the electron not only describes very neatly the existing models, but it gives a very timely warning to the reader on how to avoid misinterpretations of these models. The treatment is of the kind that I would like to recommend very warmly, not only to students for self use, but also for their teachers in presenting this type of material.

Generally speaking, the presentation



LASL Photograph by Bill Jack Rodgers

A View of the Pond

Randall Yoakum, a mathematician in the Test Division, watches his children set sail on Los Alamos' Ashley Pond. Randy is a member of a research group working on the physics of the ionosphere and auroral phenomena. These studies are related to anti-missile defense problems and also to the development of sensitive methods for the detection of explosions in space. Interaction of the various forms of energy released by a nuclear device with the upper atmosphere and geomagnetic field pose problems of great interest in physics and astrophysics. If you would like to share in this type of creative venture, send your resume to:

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