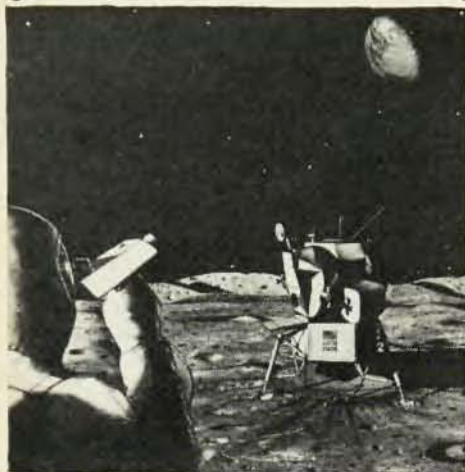


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phenomenological viewpoint of creep in metals and alloys, basing the discussion on experimental results. Time dependence of creep deformation; stress relaxation; strain recovery; the effect on the creep curve of grain size, of alloying environment, and of mechanical-thermal treatments; and experimental observations on the stress dependence of creep are covered. The temperature dependence of creep and the apparent activation energy for creep are given over to another chapter. The modes of deformation are described and an effort is made to relate them to creep-controlling processes and creep strength.

A separate chapter exposes the reader to a host of theories, among which are transient creep theories, steady state creep theories, theories of grain boundary sliding, etc. Included are the currently most popular theories based on dislocation motion, as well as others which have gained little acceptance. The final chapter discusses creep-rupture, its relation to creep deformation, the nucleation and growth of cavities at grain boundaries, and the mechanisms of intergranular fracture.

Throughout the book discussion is limited to deformations produced by simple tensile, compressive, or shearing forces; deformations produced by complex states of stress receive little comment. The author has reviewed the literature exceedingly well and the data are unbiasedly reported. His writing is intelligible and concise and supplemented with considerable data and occasional schematic diagrams and micrographs. Additionally, the bibliographic collection should make the book decidedly useful as a reference volume. Periodic revisions to keep abreast of future developments will maintain the value of the book.

If one were to find fault with this contribution of Garofalo's, it would be the absence of his critical and authoritative comments on some of the subject matter. Some readers will question the utility of the alphabetically arranged references since the book lacks an author index and the two-page subject index is all too brief for the wealth of material contained therein. However, these admittedly are very minor faults and detract little from

the book's worth when one considers it as a whole. This paperback is a creditable addition to the metallurgical literature and is recommended reading for the metallurgist and solid state scientist.

* * *

The reviewer is a metal physicist with the metallurgy division of the National Bureau of Standards in Washington.

Theory and Practice

FUNDAMENTALS OF SEMICONDUCTOR DEVICES. By Joseph Lindmayer and Charles Y. Wrigley. 486 pp. Van Nostrand, Princeton, N. J., 1965. \$11.95.

by H. J. Hagger

A great number of books have been and will be published whose titles state that they deal with "fundamentals." Different people mean quite different things when they use this word. In most cases such a book could have been published under the title "Basic Principles of . . .", but not the book by Lindmayer and Wrigley. The authors have succeeded in writing a text joining solid-state physics and electronics and explaining the operation of semiconductor devices, including even the most modern designs.

Chapter 1 is a very short qualitative discussion of semiconductor properties. It just contains the minimum understanding for most modern and future semiconductor work. In chapter 2 on semiconductor junctions and in chapter 3 on transistors the reader enters the primary field of solid-state electronics and learns gradually the reasons for the electrical behavior of junctions, their low- and high-frequency characteristics, equivalent circuits, etc. Chapter 4 is on inhomogeneous impurity distributions, which lead to transistors with better performance than the homogeneously doped devices explained in chapter 3. The properties of inhomogeneously doped crystals enable one to manufacture drift, mesa and planar transistors. A very helpful table compares the transistor param-

* * *

H. J. Hagger, who is associated with Albiwerk/Zürich, is a specialist in electricity and electronics.

MODERN COLLEGE PHYSICS, Fifth Edition

By Harvey E. White, *University of California, Berkeley*

This popular introductory physics text, which unites the elementary principles of classical physics with branches of modern physics, has been extensively revised in this new edition. New and expanded material is included on mechanical energy levels, Kepler's laws and space mechanics, rocket engines, electric and magnetic dipole moments, atomic energy levels, lasers, theory of relativity, alpha, beta, and gamma rays, elementary particles, field theory and world lines, and special atomic and nuclear effects. Problem sets are included, with answers to selected problems. A background knowledge of algebra and trigonometry is the only mathematical prerequisite.

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eters of diffusion and drift types. The high-frequency behavior of transistors is the subject of chapter 5, where the alpha-cutoff frequency is explained from the frequency-dependent transistor parameters. A simplified rf equivalent circuit is given and the power gain is computed. Chapter 6 is more theoretical, dealing with the physical model of the band structure in semiconductor physics. The seventh chapter, on high current densities, discusses the interdependence of parameters and typical high-current effects, such as avalanche multiplication, recombination and thermal effects. In the next chapter transient phenomena are dealt with. In chapter 9 the authors discuss surface-recombination effects, field-effect transistors, metal-semiconductor contacts, point contacts and compound transistors, both theoretically and by using very illustrative drawings. The scope of the material discussed in the preceding chapters is extended in chapter 10 by a compendium of additional phenomena, such as transit-time effects, parametric amplification, photo effects, laser diodes, thermoelectricity and the Hall effect. Four-layer devices, tunnel diodes and integrated circuits are the subject of discussion in the eleventh chapter. In the last section combinations of metals, semiconductors and insulators, that is, some newer devices still under research, are described. Metal-base transistors and metal-gate transistors are examples of such devices.

Quadrupole parameters in different notations, methods for combining two quadrupoles, equivalent circuits, a table of the error function and its properties, remarks on Fermi-Dirac statistics and a table of physical constants are given as appendices. The book also contains problems for each chapter, a list of references and an index.

As an effort to combine solid-state physics and electronics, the book can be considered very successful. It is well written and illustrated, and it shows a well balanced combination of theoretical explanations and outlook to practice. It can be recommended both as a reference and as a textbook, even if the material given is more than what can be covered in a semester course. It does not assume that the reader has a prior

acquaintance with semiconductors; the introduction into solid-state theory is gradual. Even a reader with quite a good knowledge of transistor theory can gain from reading the book.

Green light traps

LIGHT: PHYSICAL AND BIOLOGICAL ACTION. By H. H. Siliger and W. D. McElroy. 417 pp. Academic Press, New York, 1965. Price \$12.00

by Robert L. Weber

"The whole of nature is a trillion, trillion chemical machines, squirming, twisting, swimming, crawling, floating, flying, and sometimes walking—in the image of Man. What a spectacle is that vast proliferation of green light-traps. . . ."

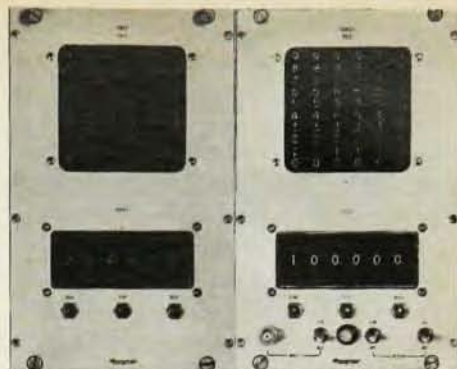
So begins this monograph prepared under the direction of the American Institute of Biological Sciences for the Division of Technical Information of the US Atomic Energy Commission. Although the writing is less pedestrian than in some monographs, it is informative and quantitative. In the first dozen pages the reader reviews evidence for the nature of light and the terminology of photometry. He is ready to face the difficulties inherent in photometric units in biology.

The first two chapters deal with material familiar to physicists: measurement and characterization of light, excitation of molecules by light. Using the molecular mechanism approach to the absorption of light, the remaining two-thirds of the book deals with chemiluminescence, present knowledge of the biochemistry of bioluminescent reactions and colors of emitted light, and finally a chapter summarizing all of the effects of light in biological systems.

Data are up to date, references extensive. The text is nicely organized and should be welcome to all who are studying problems in photobiology, where the processes initiated by light are quantum phenomena but may experience enzymatic amplification.

* * *

The reviewer is a professor of physics at The Pennsylvania State University.



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