

measurements. A large amount of data on laser plasma reflectivities, particle densities and particle temperatures is presented as a function of either space or time, with the experiments done at all the different high-power laser wavelengths.

An extensive treatment of plasma formation by laser light incident on solid surfaces parallels that described for gases. The section on spherical implosions is good but needs supplementing due to the great deal of recent effort in this area.

This unique and useful book is almost a must for those interested in lasers coupled to plasmas; it is a single source to pick up whenever an unfamiliar or forgotten aspect comes to mind. The monetary blow associated with buying *Plasmas and Laser Light* will be soon forgotten as you find it interesting reading and rereading through the years.

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Big Ear

J. Kraus

228 pp. Cygnus-Quasar, P.O. Box 85,
Powell, Ohio 43065, 1976. \$3.25

Anyone who is so fortunate as to live through the birth of a new branch of science usually has an interesting story to tell, and in our non-memoir-oriented age it is a pity that these stories are frequently never told. Fortunately John Kraus has been able to write this very personal account of his career, which spans the growth of radio technology and the birth and development of radio astronomy. His book is written in a casual style close to that of *Popular Science* or *QST* and could be enjoyed by a reader of any age, although some might be put off a bit by its chattiness.

For a young boy growing up in the midwest, such as Kraus, the urge to master technology was powerful indeed. If he needed an earphone to go with his crystal receiver he could steal it from the telephone, hanging a hammer on the hook so Central would never know. Somehow he would always get wind of the newest gadgets at a very early stage and master their use very quickly. As Kraus progressed through the development of ham radio and a college education that trained him both as a physicist and an electrical engineer, he had to make do with what he found, and he did so very well. The stories he tells of his early jobs show a lack of concern for security that might appear remarkable to students of today. Even after he became a professor, not much was provided. For example, when he invented the helical antenna, he had no laboratory space and carried out the pattern measurements in his basement. In recognition of this success, he was

granted a plank-covered space in the loft of an old airplane hangar, above the campus radio station. No chance for Parkinson's Law to act in those days!

Kraus is one of the few radio astronomers in the world today who knew Carl Jansky when the first discoveries that founded the science of radio astronomy were made at Bell Laboratories. I do wish that he could have told us a few more anecdotes of the 1930's when he interacted with both Jansky and Grote Reber. Nevertheless, his stories of how he progressed from tiny model antennas to the construction of great radio telescopes is told in detail, with all the troubles as well as the successes.

Our students usually acquire a cosmetic version of how a project is conceived and developed. This seldom coincides with reality, and Kraus's account is a welcome corrective. The wind can blow your antennas down, government funding agencies can stop your funding money at a crucial time, and all these griefs and heartaches never appear in the publications on glossy paper. Kraus's whole life has been marked by ingenuity and persistence, and the examples that he gives should serve as inspiration to any young scientist. His account never flags, his attitude seems to have always been open and optimistic, and he must surely take pleasure in the spectacular quasar discoveries that have been made possible by his Ohio State catalog of radio sources. His textbooks on antennas, electromagnetic theory and radio astronomy are well known, and we can all be grateful that this indefatigable writer has taken the time to write this entertaining contribution to history.

BERNARD F. BURKE
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Introduction to Mathematical Physics

C. Harper

301 pp. Prentice-Hall, Englewood Cliffs,
N.J., 1976. \$16.50

Charlie Harper has written a useful introduction to the mathematics that is most likely to be encountered in advanced-undergraduate physics courses. The topics have been judiciously chosen so that the book can be comfortably covered in a one-semester undergraduate course. Included are chapters on vector calculus, operator and matrix analysis, complex variables, special functions and Fourier analysis, as well as an excellent chapter on tensor analysis.

The book is mathematically sound, at least as far as I can determine as a physicist by training. Although the proofs would not delight a mathematician, the approach is clear, straightforward and

intuitive. Harper tries to relate the mathematics to physics mainly in the examples and problems. Advanced concepts such as vector space and Hilbert space are used in an elementary manner in order to prepare the way for future studies. Several helpful flow diagrams that illustrate the solution of various partial differential equations are included.

Unfortunately, the book has several shortcomings that will require clarification by an instructor. For example, the words "tensor," "tensor of rank zero" and "tensor of rank one" are used on pages 1 and 2, but the reader must refer to page 255 for the definitions of these terms. On page 45, the bra and ket vectors are introduced with no explanation of the bra vector. The term "eigenenergy" is used on page 171 but never defined. The sentence "Geometrically, axial vectors correspond to areas" appears on page 261 with no explanation. Although these are not fatal flaws, the book is not appropriate for self-study by undergraduates.

Harper has a conversational writing style that makes for easy reading. The book has 72 worked examples (more would be welcome) and 256 problems with no solutions or answers. Simple line drawings are used as illustrations. These drawings tend to be small and, in some cases, confusing. The general bibliography is short, as are the reference lists for each chapter. While the books by R. V. Churchill are all mentioned, the standard treatise by Philip Morse and Herman Feshbach is not.

The book can be used profitably as a text for a one-semester undergraduate course. However, it can not be recommended as a graduate text or reference book because of the limited breadth and depth of topics covered.

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Normal

book notes

The Second Law of Thermodynamics (Benchmark Papers on Energy, Vol. 5). J. Kestin, ed. 329 pp. Dowden, Hutchinson and Ross, Stroudsburg, Penna. (distributor: Halsted, New York), 1977. \$27.50

The Benchmark Papers on Energy are a series of volumes that make readily available important but sometimes hard-to-find articles on the concept of energy—its historical development, applications and role in civilization. This particular book traces the development of the Second Law from Nicolas Sadi Carnot ("Reflections on the Motive Power of Fire, and on Machines Fitted to Develop That Power," 1824), with papers by Max

Born, Constantin Carathéodory, Benoit-Paul-Émile Clapeyron, Rudolf Clausius, J. Willard Gibbs, Josef Meixner, Max Planck and William Thomson (Lord Kelvin). The editor, Joseph Kestin, has provided a seven-page introduction, together with comments on each of the 15 papers. This volume should prove useful for both thermal physicists and historians of science.

The Physics of Vibrations and Waves, 2nd edition. H. J. Pain. 357 pp. Wiley, New York, 1976. \$22.00 clothbound, \$10.95 paperback

An extra chapter, on wave mechanics, and additional problems distinguish the present volume from the 1968 first edition. The theme, that much of physics may be understood on the basis of classical wave concepts, remains unchanged. The author's starting point is that "a medium through which energy is transmitted via wave propagation behaves essentially as a continuum of coupled oscillators." From a discussion of simple and damped-simple harmonic motion and forced and coupled oscillations, he leads one naturally into the physics of transverse waves on strings, waves on transmission lines and electromagnetic waves in conductors and dielectrics. One also finds chapters on Fourier methods, interference and diffraction, and non-linear oscillations. The book requires little knowledge of mathematics beyond elementary calculus, and it is probably best used by beginning physics and engineering students. —FCB

new books

Particles, Nuclei and High-Energy Physics

A Unified Theory of the Nucleus (Clustering Phenomena in Nuclei, Vol. 1). K. Wildermuth, Y. C. Tang. 389 pp. Vieweg, Wiesbaden, West Germany, 1977. DM 92.00

High Energy Physics with Polarized Beams and Targets (Proc. of a Conf. held at Argonne National Laboratory, August 1976—AIP Conf. Proc., No. 35). M. L. Marshak, ed. 545 pp. American Institute of Physics, New York, 1976. \$21.50

Modern Three-Hadron Physics (Topics in Current Physics, Vol. 2). A. W. Thomas, ed. 250 pp. Springer-Verlag, New York, 1976. \$28.30

Atomic, Molecular and Chemical Physics

Polarized Electrons. J. Kessler. 223 pp. Springer-Verlag, New York, 1976. \$24.60

The HMO Model and Its Application, Vol. 3: Tables of Hückel Molecular Orbitals. E.

Twelve distinguished scientists report the latest news in the ever-changing world of astrophysics.

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Carl Sagan, Director of the Laboratory for Planetary Studies at Cornell University, called this book "A brilliant summary, at an accessible introductory quantitative level, of many of the most exciting areas of contemporary astrophysical research... I consider *Frontiers of Astrophysics* essential reading for upper class undergraduate astronomy majors and first year graduate students."

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