

amount of unpleasant labor to pass from the second to the first group. Most members of the second group feel that as everything that can be done with Feynman diagrams can probably be accomplished by more straightforward and civilized methods, one should devote the time and labor to something more useful. Mattuck's answer to the last charge is that it is, in principle, possible to do many-body perturbation theory without diagrams, just as it is possible to go through the jungles of the Amazon without a map. However, the probability of survival is much greater if we use them.

The book is divided into three parts: kindergarten (104 pages), elementary (126 pages) and intermediate (27 pages). In chapters 1-6 a clear introduction is given to the major concepts such as Feynman diagrams, elementary excitations, quasi-particles, Green's functions or propagators, the ground-state energy and the vacuum amplitude. The level is that of tutorials written for the *American Journal of Physics*. In chapters 7-16 the standard topics of other books on the PMBP such as occupation-number formalism, Dyson's equation, renormalization, random phase approximation and ladder approximation, the ground-state energy of the electron gas and nuclear matter, self-consistent per-

turbation theory and the existence of the Fermi surface, collective excitations and the two-particle propagator, Fermi systems at finite temperature and superconductivity are covered at a restricted and physically interesting level. Appendices A through J are devoted to a brief summary of Dirac's formalism and a more rigorous derivation of the rules for the diagrammatic technique that were assumed in the text. Problems are provided at the end of each chapter, and solutions are given at the end of the book. The necessary background for reading this book is a graduate course in quantum mechanics (Schiff, 3rd edition) and in electromagnetic theory (Jackson). Mattuck's fine sense of humor makes his book, which is a labor of love, a great delight to read. Additionally he knows the subject and literature very well and is a trustworthy and reliable Baedeker. A gifted expositor, he never allows the mathematics to obscure the physics. The reader is always given the grand view first; so one sees both the forest and the individual trees.

* * *

H. Chang is Senior Mathematical Physicist, Stanford Research Institute. He says he learned PMBP the hard way "by reading the literature and the pre-Mattuck books."

For accelerator users

PARTICLE ACCELERATION. By J. Rosenblatt. 183 pp. Barnes & Noble, New York, 1968. \$5.50

by NORMAN A. BAILY

The development and increasing availability of high-energy charged-particle accelerators has provided a valuable tool not only for nuclear physics, but also biology and medicine, space science and nuclear engineering. Accelerator users cover the spectrum of basic scientists and also include the engineer faced with producing hardware that must survive in nuclear and space environments. In addition cancer patients have been treated for many years with Van de Graaff generators, linear accelerators and even synchrocyclotrons; now there is interest in fast-neutron generators using the d,t reaction.

Although this book purports to serve not only the intermediate undergraduate student of physics but also

accelerator users, it is, in my opinion, deficient from this second point of view. To provide insight into the operation and design, the author discusses principles, but they require more background in physics than the average nonphysicist user is likely to have. The book reviews the basic principles of particle physics and nuclear interactions and scattering; the author introduces the particles of high-energy physics and includes a chapter on the fundamental physics associated with particle acceleration. The book includes chapters on static machines, linear and circular accelerators, strong focusing, alternating gradients and azimuthally varying fields. The final chapter discusses recent and anticipated developments and some new principles for machine designs. The book would make an excellent text for a section of an undergraduate nuclear-physics course or can serve admirably

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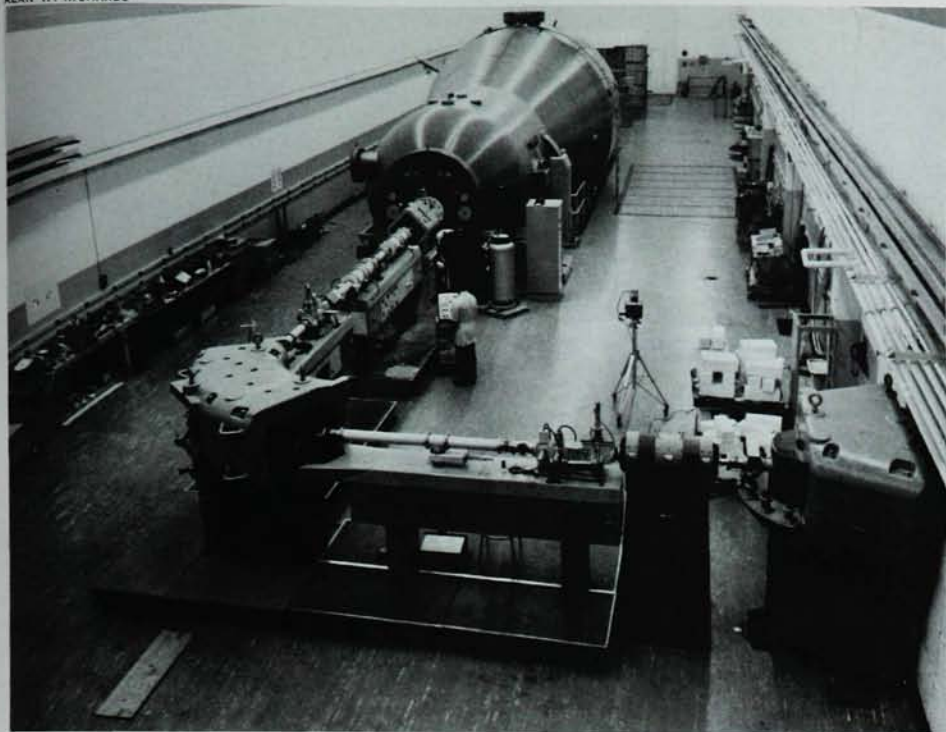


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EMPEROR TANDEM Van de Graaff at Yale with magnets and beam piping.

as a detailed reference for an intermediate general-physics course. It is clear and concise and covers the subject matter treated extremely well. The book, however, is deficient in its coverage of applications, and the author fails to point out in a specific manner the importance of applications. However, he does point out quite clearly the limitations of each type of accelerator and the difficulties that have been overcome in the time sequence of machine development. He also treats, in a remarkably clear manner, the way in which each of the original restrictions were overcome.

* * *

Norman A. Bailey is a radiological physicist and professor of radiology at the University of California, San Diego.

Shock-wave technique

RELAXATION IN SHOCK WAVES.
By Ye. V. Stupochenko, S. A. Losev,
A. I. Osipov. (Trans. from Russian)
394 pp. Springer-Verlag, New York,
1967. \$18.00

by EUGENE WIGNER

Shock waves are of considerable interest to the physicist, the physical chemist and also to the chemist. The gradual deformation of the front of a pressure wave, until its leading edge becomes so sharp as to represent a discontinuity in pressure, temperature

and velocity, is in itself a surprising phenomenon. It occurs if the initial amplitude of the pressure wave is so high that the second-order terms in the hydrodynamic equation are more effective than those due to viscosity and heat conductivity. The original explanation of the phenomenon by Bernhard Riemann went hand in hand with his discovery of the method of characteristics to solve differential equations.

The theory of shock waves is of great importance for gauging the effect of explosions, and much of what we know about them originates in weapons laboratories. The present volume, however, describes their use for physical measurements, such as the measurement of the rate at which translational energy is converted into rotational and vibrational energy in gases or causes dissociation and ionization. The term "relaxation" in the title of the book refers to the establishment of equilibrium between the energy contents of the translational, rotational and vibrational degrees of freedom. Shock waves are particularly suited for the measurement of rapid processes, because the period during which the shock passes through any part of the material—and hence the period during which this is exposed to the shock's elevated temperature—can be made very short, even as compared with the time of equilibration of rather fast processes.



The Calculus of Physics

McAllister H. Hull, Jr.
Oregon State University

128 Pages \$8.50 Cloth/\$2.95 Paper

This supplement was written for beginning physics students who encounter numerous mathematical techniques and concepts before this material is covered in corresponding mathematics courses. The topics in this book that are normally covered in courses in elementary university mathematics include differential and integral calculus of one variable, vectors, partial differentiation and multiple integrals, complex algebras, matrices, and linear differential equations of first and second order with constant coefficients. In his "Note to the Student," the author keys each section of the book to the widely used physics texts, *The Berkeley Physics Course* and *Physics* (Resnick and Halliday).

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