. . . the authors

Most of the books written by Laboratories authors are published by D. Van Nostrand Company. Other publishers include John Wiley & Sons and McGraw-Hill. Subjects include speech and hearing, mathematics, transmission and switching circuits, networks and wave filters, quality control, transducers, servomechanisms, quartz crystals, capacitors, visible speech, earth conduction, radar, electron beams, microwaves, waveguides, antennas, traveling-wave tubes, semiconductors, ferromagnetism.

Harold S. Black, B.S. in E.E., Worcester Polytechnic Inst., author of "Modulation Theory."

John R. Pierce, Ph.D., California Inst. of Tech., author of "Traveling-Wave Tubes."

Richard M. Bozorth, Ph.D., California Inst. of Tech., author of "Ferromagnetism."

W. Thornton Read, M.S., Brown University, author of "Dislocations in Crystals."

Hendrik W. Bode, Ph.D., Columbia University, author of "Network Analysis and Feedback Amplifier Design."

Walter A. Shewhart, Ph.D., University of California, author of "Economic Control of Quality of Manufactured Product."

Books

Currents, Fields, and Particles. By Francis Bitter. 599 pp. The Technology Press of Massachusetts Inst. of Technology & John Wiley & Sons, Inc., New York, 1956. $8.50. *Reviewed by R. B. Lindsay, Brown University.*

The preparation of books in introductory college physics is a never ending business and rightly so, since the learning of physics is a difficult and challenging task, and the student needs all the help he can get not only from his teacher but from a clear, accurate, up-to-date and stimulating text. Many have striven to supply the ideal book, but unfortunately the results have by and large fallen short of what was hoped for. Perhaps the expectations have been unreasonable anyway, since different types of students need different sorts of treatment and the book aimed at the potential physical scientist or technologist will presumably not suit the person who studies physics as a part of general education. But even if we restrict attention to the more thorough books for the embryonic physicist, they in general appear to represent far too much rehash of the same old stuff and far too little imaginative emphasis on fundamental and all embracing concepts and principles. It is small wonder that the general nonscientific public looks on physics as simply an ever increasing multitude of facts whose marvelous and mysterious character is rivaled only by their complexity.

The book under review represents an attempt to found the second year (electricity and optics) of a general college or university physics course for specialists on the basic principles of atomic theory. The result is a generally well-written and challenging volume which provides plenty for sophomores to chew on and leans very heavily on freshman mechanics and calculus. The book contains far more material than can be covered adequately in the standard year course and therefore might be exposed to the criticism of unrealistic size. However, the author has guarded himself rather ingeniously against this objection by putting many sections in fine print to provide extra material for the extra competent student, but so arranged as not to interfere with the main thread of the story.

The chief merit of the work is its careful and thorough emphasis on fundamental concepts, e.g. that of the field with all its ramifications in electricity and optics. The treatment of the equations of the electromagnetic field on an elementary level is particularly skillful. It is true that surface and line integrals are

rather stout stuff for sophomores, and the mathematical background of the latter must be extensive to avoid putting an extra heavy burden on the teacher of the book. The use of the dot and cross products of vectors also raises some problems for the instructor. But in general it may be said that the basic physical explanation is well done and illustrated by a great variety of carefully made diagrams and worked out problems.

It is always easy to find something to criticize. The reviewer would have liked to see a more thorough introduction of the wave concept: it is brought into the text too casually for students who have not already had a good preliminary treatment of the mechanics of deformable media. Justice is not done to the fundamental character of the *ideas* which Bohr introduced into atomic physics, and the all too common mistake of confusing the Bohr *theory* with the Bohr *model* of the hydrogen atom is unfortunately perpetuated. Nevertheless the discussion of wave mechanics is appealing.

In most colleges the book will doubtless find its greatest use in junior and senior courses. Many of the problems are tough enough to try the mettle of the average graduate student of physics. If the book really succeeds in providing a new direction for undergraduate instruction in physics, as may well be the case, physicists in general will owe the author a debt of gratitude for his pains.

The Principles of Mechanics. By Heinrich Hertz. Edited by P. Lenard. Translated by D. E. Jones. J. T. Waley. 274 pp. Dover Publications, Inc., New York. 1956. Clothbound $3.50; paperbound $1.75. *Reviewed by P. Morrison, Cornell University.*

Ernst Mach's *Science of Mechanics* is familiar to the American physicist and his students as an analytical and persuasive account of the foundations of mechanics, and as an example to illustrate the positivist theory of knowledge which flows out of the Mach analysis. Here is a book of related date, kind, and intent, much less well known. No doubt it is a difficult book to read; its axiomatic formulation and its compact and mathematical form—definition, proposition, corollary—guarantee that. But the much easier prose introduction partly eases that complaint. It ought to be as widely known, if not as widely studied, as Mach's work.

Hertz's geometrization of dynamics, replacing all forces by geometrical constraints, if need be connecting visible and invisible particles, and reducing the laws of motion to the minimization of curvature of path, is cold and clear. Even more interesting for modern readers is his foundation of dynamics on the definition of mass, the concept taken by the Mach school to flow out of the third law. Hertz believed, as we do today, both in atoms and in fields, and he doubted the universality of the third law of Newton. Hertz therefore took mass as prior, and defined it in the way which seems most attractive, as a simple count of the fundamental particles within a body. In the nonrelativistic limit, at least, this seems to me deeper than any purely