

the old-line English philosophy of giving the student a great variety of problems, both in the text and in the exercises. By this method the student is expected to master the subject. Most of the book is devoted to electrostatics, magnetostatics, and steady-state circuitry. About 25% of the material treats Maxwell's equations and the special theory of relativity. The vector and tensor methods which are utilized are sufficiently elementary so that even a student whose background is weak in these subjects would probably not experience too much difficulty. One may expect that juniors would probably be able to use this book with a little help from the instructor in vector and tensor manipulations.

Because of the way the subject matter is now channeled in the American universities, one can only recommend this book as a text for those being exposed to this subject for the first time after the initial general physics course. However, it would make a useful supplement in a course where the major text emphasizes methods of solutions of Maxwell's equations for the electromagnetic field and treats electro- and magnetostatics very lightly.

Basic Mathematics for the Physical Sciences. By Haym Kruglak and John T. Moore. 354 pp. McGraw-Hill, New York, 1963. Paper \$3.95.
Reviewed by Robert L. Weber, The Pennsylvania State University.

With complementary skills, authors and publisher have succeeded in displaying in an especially attractive and useful form basic mathematics needed by high-school students taking a college preparatory curriculum or, for review, by college students in typical freshman courses in physical science. The scope is indicated by this listing of chapter titles: Arithmetic, Algebra, Geometry, Trigonometry, Intuitive calculus, Graphical analysis of experimental data. Mathematical tables, physical constants, and conversion factors are given in an Appendix.

Each of the first four chapters is introduced by a diagnostic pretest several pages in length. By working out the exercises in a pretest, the student can ascertain his weaknesses. The answer key tells him on what pages he

will find relevant help. He can check the success of his study by answering the post-test at the end of the chapter. Such tests are not used in the last three chapters, but they, too, contain an adequate number of exercises.

I should be inclined to make the 32 pages of the chapter on measurement required reading for students in any introductory college-level laboratory course in physics. The meanings of measurement, types of errors, expression of accuracy, and proper use of significant figures are presented in conventional manner. The treatment of simple error analysis, including both algebraic and calculus methods and the normal curve, is the best I have seen for beginning students. The final chapter on graphical analysis of experimental data includes helpful exercises on empirical equations and the use of logarithmic papers.

This is a good book to recommend to your students; several copies should be available to them in the physics laboratory.

Multilinear Analysis for Students in Engineering and Science. By G. A. Hawkins. 219 pp. Wiley, New York, 1963. Paper \$2.95, cloth \$6.50.
Reviewed by Peter L. Balise, University of Washington.

Vector, tensor, and matrix analysis were encountered mostly at the graduate level until quite recently, but now the availability of digital computers has led scientists and engineers commonly to use matrix techniques for the efficient and systematic solution of problems. Vector representation is becoming standard in undergraduate courses, rather than being a special approach. And the appropriateness of the mathematicians' view of vectors as ordered n -tuples, rather than as arrows, is increasingly recognized.

Many recent books reflect this progress, but the circumstances of the present volume particularly emphasize the change in engineering education. It was written by a dean of engineering who had previously written thermodynamics texts. As Dean Hawkins describes in the preface, in order to continue his work in applying the theory of the continuum to heat and mass transfer problems he found it

necessary to reinforce his knowledge of vector and tensor analysis; so he wrote this book to assist students in self-study of the subject.

These circumstances, and Dean Hawkins' proven writing ability, would lead one to expect an outstandingly lucid presentation for beginners. That the volume did not fully meet my expectations probably is more an indication of my own opinion of how best to present the subject than it is a measure of Dean Hawkins' success in his latest writing venture. I prefer at first to emphasize physical interpretation, with less initial attention to analytical or manipulative techniques than is given by Dean Hawkins and many other teachers. For example, I like to consider transformations of the inertia tensor in matrix form before presenting the summation convention, although of course index notation is essential to tensor analysis.

The book is logical, beginning with a review of vectors, determinants, and matrices, then considering the summation convention and transformations, and presenting the major aspects of tensor analysis. The last chapter outlines vector quantities in tensor form, which should help the student appreciate what he has learned. An example of the coherence of the work is that i , j , and k are never used for Cartesian unit vectors; instead the use of i_1 , i_2 , and i_3 anticipates the idea of n -dimensional space.

The work is well illustrated (with some good shaded drawings), and problems are included. It is not intended as a text, apparently, because rigor is not emphasized. Nevertheless, it could well be considered as a text or supplementary reading for engineering courses in tensor analysis.

Physique générale. By Jean Rossel. 480 pp. Editions du Griffon, Neuchâtel, Switzerland, 1963. Fr. Suisses 48.
Reviewed by Jacques Romain, Centre de Recherches Routières, Sterrebeek, Brussels, Belgium.

Prof. Rossel's purpose in preparing this book was to write an intermediate book, midway between rather qualitative elementary books and highly technical advanced books. To achieve this goal in less than 500 pages without