er's generalization of Rayleigh's perturbation theory and, most unfortunately, the occasion of his first use of the term "wave mechanics."

It does appear that *Wave Mechanics* would have been more valuable if its reprinted papers had been left intact and if its introductory chapters had been less esoteric. As things stand undergraduates probably will not get through the advanced classical and quantum mechanics in the introduction, and the historically minded will probably reject the unexplained editing. The book might, however, serve profitably as abbreviated history for some readers.

° ° °

Garrison Sposito is an associate professor of physics and mathematics at Sonoma State College, Rohnert Park, California.

Math with referents in reality

PARTIAL DIFFERENTIAL EQUATIONS OF MATHEMATICAL PHYSICS, VOL. 2. By A. N. Tychonov, A. A. Samarski. Trans. by S. B. Radding. 621 pp. Holden–Day, San Francisco, 1967. $10.75

by JOSEPH GILLIS

The second volume of this excellent textbook very properly continues from where the first volume ended. Whereas volume 1 was devoted largely to problems involving only one or two space variables, most of the work in this new volume is on three-dimensional problems.

The theoretical work presented is mainly standard and covers most of what anyone could require in a book of this type. Elliptic, parabolic and hyperbolic equations are dealt with and all of the usual methods are explained. A notable feature of the book is that problems are always shown against their specific physical backgrounds. No equation is presented out of the blue. Not only is the physical meaning of the equations always kept in the forefront, but the authors also make a point of emphasizing the intuitive physical content of the solutions. In this way the mathematics is never allowed to stray far from intuition, and, moreover, this control is never achieved at the expense of mathematical rigor. Indeed the manner in which exact and careful mathematics is combined with physical insight recalls some of the great classics of applied mathematics.

Another noteworthy feature is the selection of examples. Here again, as in the first volume, the authors have managed to illustrate the work with problems of live and actual interest.

The last section contains a reasonably broad presentation of some of the more commonly met special functions. This section contains nothing terribly new—except to those who have yet to learn of Tchebycheff–Hermite and Tchebycheff–Laguerre polynomials, Buniakowsky's Inequality, and so forth.

Taking everything together the two volumes constitute as good a textbook as one could wish of basic "mathematical methods of classical physics," and it can certainly be extremely useful to both teacher and student. Nevertheless I am mildly puzzled by an incidental problem. The entire book (both volumes) was translated into English by Robson and Basu and published in a single volume by Pergamon in 1963. The book under review now completes an almost identical translation of the same work. We have learned to accept the population explosion of scientific textbooks, but do such secondary detonations really serve any useful scientific purpose?

° ° °

Joseph Gillis is professor of applied mathematics at the Weizmann Institute of Science, Rehovoth, Israel.

Operational thermodynamics

THERMODYNAMICS: AN INTRODUCTION. By Rubin Battino, Scott E. Wood. 330 pp. Academic Press, New York, 1968. $5.95

by JAMES B. KELLEY

Although the authors of this new text in thermodynamics disclaim any intention to relate to a particular discipline, it is obvious that their own interests quite clearly make the book of particular interest to the chemist. This is not to say that it would not be useful to the physics or mathematics student, but rather that it has special relevance to chemistry and chemical-engineering students. The book, written when both authors were at the Illinois Institute of Technology, is to be used at the "second year of physics" level.

In keeping with a trend started some time ago by authors of mechanics, electricity and magnetism texts,

New from HRW . . .

MECHANICS

Wallace Arthur and Saul K. Fenster, both of Fairleigh Dickinson University

This intermediate approach for students of physics and engineering features a systematic development from a single particle to a collection of particles and rigid and deformable continua. To illustrate the universality of mechanics and the unity of science, the authors apply the laws of mechanics to a variety of systems (atomic, electromagnetic, nuclear). They emphasize the recurrence of certain formulations such as the wave equation, the differential equation of the linear oscillator, and the differential equation that describes first order processes. March 1969 / 640 pages / $12.95 (tent.)

EXPLORATION OF THE UNIVERSE, Second Edition

George O. Abell, University of California, Los Angeles

This descriptive account of both astronomy and the methods by which astronomical information is obtained is designed for the liberal arts student. More than 30 pages of full-color photographs are in this edition. April 1969 / 736 pages / $12.95 (tent.)

EXPLORATION OF THE UNIVERSE, Brief Edition

George O. Abell

Technical and highly specialized sections have been eliminated from this shortened version of **Exploration of the Universe.** May 1969 / 480 pages / $9.95 (tent.)

THERMAL PHYSICS

Edward A. Desloge, Florida State University

The author combines the postulational approach to thermodynamics with the more standard historical approach by first using a molecular picture to obtain a set of postulates and then reexamining these postulates from a historical point of view. 1968 / 384 pages / $9.95

INTRODUCTION TO MODERN OPTICS

Grant R. Fowles, University of Utah

The first part of the book covers physical optics; the second half treats the quantum aspects. 1968 / 320 pages / $11.95

Holt, Rinehart and Winston, Inc.

383 Madison Avenue, New York, New York 10017

Blaisdell Publishing Company

a division of Ginn and Company

275 Wyman Street
Waltham, Massachusetts 02154

PHYSICS: ITS STRUCTURE AND EVOLUTION

William A. Blanpied, Case Western Reserve University.
This book surveys a few meaningful ideas about physics to college students who do not anticipate being directly concerned with the subject during their professional careers. It presents physics from a physicist's point of view, showing that physics is an exciting, living discipline which represents one of the most profound achievements of the human intellect. May 1969

MECHANICS

O. R. Skinner, University of Saskatchewan.
This text presents a thorough discussion of the fundamental concepts of mechanics from a modern viewpoint and demonstrates the applications of these concepts. A previous or concurrent course in Calculus is essential. Ample problems follow each subsection and chapter.
1969 744 pages illus. $14.50

BASIC PHYSICS

Kenneth W. Ford, University of California, Irvine.
Basic Physics is intended for a one-year course in physics for students who are intelligent and curious about science, but not necessarily proficient in mathematics. The book is organized in the main about the great theories of physics—mechanics, thermodynamics, relativity, electromagnetism, and quantum mechanics.
1968 968 pp. illus. $11.75

there is an introductory chapter in mathematics—in this case, the second chapter. However, it is not vector analysis that is treated but partial derivatives, line integrals and so forth. The chapter can easily be skipped and used solely as an appendix or reference source if the student's mathematical background is sufficient. After chapter two the usual topics found in textbooks written for this level are covered.

There is one difference that the authors explain in their first chapter, which deals with basic definitions. Battino and Wood use what they call the "operational" approach whereby "a word used to describe a phenomenon observed in nature has meaning only with reference to the phenomenon itself . . ." Whether or not this approach will have its full effect on the student will, to a great extent, depend on the teacher. Certainly it is an interesting and commendable modern method.

Although all the mathematics are present, there is a real and successful effort to devote time and space to physical discussions. This is particularly well done in the use of simple and clear diagrams and discussion of experiments. The chapters on heat and work serve as good foundations for the following chapter on the First Law. A brief chapter is devoted to the "porous-plug" (Joule–Thomson) experiment, and this coverage appears worthwhile. The succeeding chapters, on the Second Law, entropy, and so on, cover the material with considerable clarity. If the instructor would like to introduce the student to kinetic theory or a few concepts in statistical mechanics, the Battino–Wood book is not for him; as a text in what might be called classical thermodynamics with some chemical overtones, however, this is a worthwhile book to examine carefully. There are ample problems with answers supplied.

° ° °

James B. Kelley, professor of physics at Marquette University, specializes in electromagnetism and electrodynamics.

Revolution in analytical chemistry

PRACTICAL X-RAY SPECTROMETRY. By Ronald Jenkins, Johan L. de Vries. 182 pp. Springer-Verlag, New York, 1967. $7.80

by H. A. LIEBHAFSKY

Physics is revolutionizing analytical chemistry. Not the least important aspect of this revolution is the use of emitted x rays for the determination of all but the lightest elements. Shortly after World War II the precise measurement of x-ray intensity became an easy routine, and analytical chemists came to realize that they could turn to good use the simplicity of x-ray spectra. Applications of x-ray methods soon multiplied. They were accompanied by similar applications drawn from experimental nuclear physics and by the development of new equipment, of which the electron microprobe is perhaps the outstanding example. Now the computer is beginning to make itself felt, and the end is not in sight.

Among the many recent books that deal with x rays in analytical chemistry, *Practical X-Ray Spectrometry* distinguishes itself by the emphasis it puts on practical problems "as opposed to the multitude of success stories which regularly saturate the scientific press." The authors are on sound ground, and they no doubt arrived there because of their extensive experience. Associated with a major international manufacturer of x-ray equipment, Jenkins and de Vries have, over several years, trained newcomers to the field, and they have organized scientific meetings for those physicists who are more experienced. The book is based on their lecture notes.

The physicist will find some of the subjects familiar, and others new. The familiar: the physics of x rays, their dispersion and detection, pulse-height selection and the statistics of counting. The new: matrix effects, the determination of elements, sample preparation and trace analysis—topics that principally concern the analytical chemist. For an impression of the authors' approach, consider the treatment of x-ray dispersion by crystals (Bragg reflection). The usual treatment is augmented by three extensive and critical tables that deal with six geometric arrangements of spectrometers, with analyzing crystals, and with comparative intensities obtained with five crystals for x rays of long wave length; these crystals are useful in the (difficult but rapidly growing) determinations of elements as light as fluorine. In addition the effects of the general conditions of the crystals, of changing temperature, of the emission of characteristic lines by the crystals and of