Books

Mathematical Methods of Physics

by Jon Mathews and R. L. Walker

W. A. Benjamin, Inc. $12.50

Reviewed by Charles H. Papas, professor of electrical engineering

This book is a delightful exposition on the mathematical methods of physics. It is written in a charmingly informal style and covers a remarkably large number of topics. Throughout the text, carefully selected examples are worked out in detail to illustrate the principal points of the subject, and at the end of each chapter an abundance of original problems is provided to test and train the reader.

As is evident from the approach the authors have used, the main purpose of the book is a pedagogical one — to teach physics students how to use the mathematical tools of physics. It is this reviewer's opinion that the authors have succeeded admirably in writing a book that not only meets the didactic needs of the first-year graduate student, but also satisfies the practicing physicist who for some time has been hungry for a readable book on mathematical methods written for physicists by physicists.

Although there are other books on the subject, none of them seems to come as close to the mark as this one does. They are either too mathematical in the sense that they are preoccupied with questions of uniqueness, existence, and pathological behavior, or they are overly detailed and hence too unwieldy to cover in a one-year course. What makes this book stand out for the physicist is the fact that it covers so much so well, and does it all in the lively jargon of mathematical physics.

Some idea of the scope of the book can be got by examining the following list of chapter headings: Ordinary Differential Equations; Infinite Series; Evaluation of Integrals; Integral Transforms; Further Applications of Complex Variables; Vectors and Matrices; Special Functions; Partial Differential Equations; Eigenfunctions, Eigenvalues and Green's Functions; Perturbation Theory; Integral Equations; Calculus of Variations; Numerical Methods; Probability and Statistics; Tensor Analysis and Differential Geometry; Introduction to Groups and Group Representations. Clearly, the scope of the book is very broad and includes most of the useful mathematical methods of modern physics. To present all this material in a book that has less than 500 pages and to do so with sufficient depth to satisfy the practical needs of the physicist is an enviable achievement.

I offer my congratulations to the authors — Jon Mathews, associate professor of theoretical physics; and R. L. Walker, professor of physics at Caltech.

I recommend this outstanding book not only to physicists but also to electrical engineers whose bread and butter all too often depends on how well they can calculate.

Quantitative Chemistry (Revised Edition)

by Jurg Waser

W. A. Benjamin, Inc.....Paper $3.95, Cloth $6

Reviewed by W. P. Schaefer, assistant professor of chemistry

The revised edition of this book puts between hard covers the laboratory manual used by freshman chemistry students at Caltech for the past six years. The preliminary edition of the text was issued in 1961 for use in fresh-

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man laboratory work in the new chemistry program (new, that is, in 1957). The new program revised many of the established courses of the division, but the biggest change was in the laboratory part of the freshman course. All of the material formerly covered in the first part of the year — simple inorganic preparations and semiquantitative "tests" of elementary chemical principles — was replaced by the traditional work of the sophomore year, i.e., quantitative analysis. No textbook was available for a quantitative analysis course at the freshman level; Dr. Waser (who is professor of chemistry at Caltech) has remedied this lack.

Since the book was written for a specific freshman course, it should be evaluated in terms of its intended use. Preliminary instructions and directions for weighing are unusually complete; no presumption is made that the student will be familiar with laboratory work. Each assignment which follows consists of a thorough, detailed description of the principles underlying the experiment, and a briefer section containing specific directions. The theoretical sections for the experiments represent the major difference between this book and conventional introductory analytical texts; they are undoubtedly its greatest strength. The essential chemistry and calculations are explained in depth here and an effort has been made to cover every detail. No apologies are made for rigorous, accurate descriptions; Caltech students appreciate not being talked-down-to.

The freshman course was designed to introduce the students to as many different kinds of quantitative measurements made on chemical systems as possible and the assignments in the text reflect this decision. They include one gravimetric, one colorimetric, one gasometric, one coulometric, and seven volumetric determinations, plus an example of the use of the method of "Continuous Variations" for finding the formula of a complex ion. The volumetric determinations cover acid-base, precipitation, complexometric, and oxidation-reduction titrations; thus most of the techniques of analytical chemistry are presented, but with at most two examples. Teachers in conventional courses, still (subconsciously?) training chemical analysts, may object to the absence of repetition but the coverage seems just right for the freshman course at the Institute, where even the mathematicians must now learn to read a buret accurately.

The book is well set-out and adequately illustrated; in its paperback version, it is remarkably low-priced for a college textbook. As a rigorous introduction to chemical measurements, *Quantitative Chemistry* is probably the best book presently available. It is a pleasure to teach from such a text.

Ancient Ruins and Archaeology

By L. Sprague de Camp and Catherine C. de Camp

Doubleday $5.95

The prolific L. Sprague de Camp '30 (who has now written more than 40 books) has collaborated with his wife on this lively volume dealing with 12 famous mysteries of the ancient world — including the lost continent of Atlantis, the pyramids, Stonehenge, Troy and Mycenae, King Solomon's mines, King Arthur's court, Angkor Wat, and Easter Island. The De Camps write about these ancient ruins and riddles with spirit and vigor, as well as with scientific accuracy.

Student Solutions Manual for Mathematical Methods for Physics and Engineering, third edition. Mathematical Methods for Physics and Engineering, third edition, is a highly ac-claimed undergraduate textbook that teaches all the mathematics needed for an undergraduate course in any of the physical sciences. As well as lucid descriptions of the topics and many worked examples, it contains over 800 exercises. New stand-alone chapters give a systematic account of the â€˜special functionsâ€™ of physical science, cover an extended range of practical applica-tions of complex variables, and give an introduc...Â K e n R i l e y read mathematics at the University of Cambridge and proceeded to a Ph.D. there in theoretical and experimental nuclear physics. 2.2.5 Orthonormal bases, 85. Mathematical Methods of Theoretical Physics v. 2.3 Tensor as multilinear form 85 2.4 Covariant tensors 86. 2.4.1 Transformation of covariant tensor components, 86.Â I suppose all workers in mathematical physics have noticed how the mathe-matics seems made for the physics, the latter suggesting the former, and that practical ways of working arise naturally. . . . But then the rigorous logic of the matter is not plain! Well, what of that? Mathematical Methods for Physics PHYS 30672. by Niels Walet with additions by Mike Godfrey, and based on work by Graham Shaw. Spring 2015 edition.Â There are many different ways to remember mathematics and much of physics. One that is generally useful is to understand a number of the key principles underlying the work, so that you can derive most results quickly. Combined with practice from both the example sheets and additional material as can be found in the textbooks, should prepare you quite well for this course. 1.1 Prerequisites. PHYS 20171, Mathematics of Waves and Fields, is a prerequisite for this course. Most students will also have taken PHYS 30201, Mathematical Fundamentals of Quantum Mechanics. Methods of Mathematical Physics I. A set of lecture notes by. Michael Stone. PIMANDER-CASAUBON Alexandria â€¢ Florence â€¢ London.Â These notes were prepared for PHYCS-498MMA, a fairly traditional one-semester mathematical methods course for begining graduate students in physics. The emphasis is on linear operators and stresses the analogy between such operators acting on function spaces and matrices acting on nite dimen-sional spaces. Mathematical methods of Physics is a book on common techniques of applied mathematics that are often used in theoretical physics. It may be accessible to anyone with beginning undergraduate training in mathematics and physics. It is hoped that the book will be useful for anyone wishing to study advanced Physics.