BOOK REVIEWS

Electrodynamics. Lectures on Theoretical Physics, Vol. III. By Arnold Sommerfeld. Translated by Edward G. Ramberg. Academic Press, Inc., New York, 1952. xiii + 371 pp. $6.80.

Following a well written historical review, the author introduces the integral form of Maxwell's equations on an axiomatic basis and obtains the transition equations at a boundary between two different media. After Maxwell's equations have been put into differential form the effect of the properties of the media are considered and with the concepts of energy flow the author introduces Poynting's vector. While the rationalized MKSQ system is used there are long discussions on the choice and number of fundamental units. This is supplemented by an excellent table at the end of the book giving the dimensions of symbols used and numerical values of certain constants in a logical presentation, i.e., c = velocity of light, (measurement); μ_0 = permeability of vacuum, (definition); ϵ_0 = dielectric const. of vacuum, (consequence).

In Part II, which comprises half of the book, the usual complement of subjects of classical electrodynamics is treated with the welcome addition of remarks on ferromagnetism. Here the author comments on the Weiss domains, electron spin as an elementary magnet and emphasizes that "...ferromagnetism is not based on Maxwell's phenomenological theory, but on the more profound laws of atomic physics and on the statistical behavior of the electron."

In Part III the theories of relativity and electrons are covered and numerous references are given to the original papers on these subjects. The author clearly points out the limitations of the electrodynamic theory of the electron and restates that, at present, quantum theory is the only way in which a definite electron spin and magnetic moment can be defined for the electron.

The last portion of the book, Part IV, considers Maxwell's theory for moving bodies and brief comments are made concerning the general theory of relativity on the unified theory of gravitation.

This volume, a valuable reference for those more experienced with the material, would be well-suited for use as a text in an advanced course in electrodynamics. It does have the disadvantage that all the problems are worked out, requiring an additional source of problem material.

SHELDON L. LEVY

Advanced statistical methods in biometric research. By C. Radhakrishna Rao. John Wiley & Sons, Inc., New York and Chapman & Hall, Ltd., London, 1952. xvii + 390 pp. $7.50.

This is a thorough account of the methods and the theory of the analysis of variance, multivariate analysis and related topics. The first two chapters collect the necessary mathematical background. The first, the elements of matrix algebra and the second, distribution theory with particular emphasis on the normal distribution and the distributions arising in the analysis of variance and in multivariate analysis. The next chapter deals with linear estimation and tests of linear hypothesis. This is followed by a discussion of estimation in general and in particular the theory of the maximum likelihood estimate. Fisher's scoring method on iterative procedure for solving the maximum likelihood equations in more complicated cases is explained and exemplified but the question when this procedure converges is not discussed. After a discussion of large sample theory there follow three chapters on multivariate analysis, starting with tests for homogeneity of variances and correlation coefficients. After a discussion of discriminant functions and of Wilks' criterion the author devotes a chapter to the application of discriminate functions to classificatory problems. The last chapter discusses measurements of racial difference, in particular Mahalanobis' generalized distance and Karl Pearson's coefficient of racial likeness.

The applications and examples are drawn from biology and related fields but the book does not overemphasize these applications and will be of equal value in every field of research, where the need for the use of statistical methods arises.

H. B. MANN

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Simultaneous linear equations and the determination of eigenvalues. Edited by L. J. Paige and Olga Taussky. Issued by the National Bureau of Standards, Applied Mathematics Series 29, 1953. iv + 126 pp. $1.50.

This volume contains the majority of the reports presented at a Symposium which was held August 23-25, 1951, in Los Angeles, under the sponsorship of the National Bureau of Standards, in cooperation with the Office of Naval Research. The principal topic is that of approximate and numerical methods of solution and of the determination of eigenvalues. The volume contains the following papers: Tentative classification of methods and bibliography on solving systems of linear equations, by George E. Forsythe; Simultaneous systems of equations, by A. M. Ostrowski; The geometry of some iterative methods of solving linear systems, by Alston S. Householder; Solutions of linear systems of equations on a relay machine, by Carl-Erik Fröberg; Some special methods of relaxation technique, by Eduard Stiefel; Errors of matrix computations, by Paul S. Dwyer; Rapidly converging iterative methods for solving linear equations, by J. Barkley Rosser; Some problems in aerodynamics and structural engineering related to eigenvalues, by R. A. Frazer; Inclusion theorems for eigenvalues, by H. Wielandt; On general computation methods for eigenvalues and eigenfunctions, by Gaetano Fichera; Variational methods for the approximation and exact computation of eigenvalues, by Alexander Weinstein; Determination of eigenvalues and eigenvectors of matrices, by Magnus R. Hestenes; New results in the perturbation theory of eigenvalue problems, by F. Rellich; Bounds for characteristic roots of matrices, by Alfred Brauer; Matrix inversion and solution of simultaneous linear algebraic equations with the IBM 604 electronic calculating punch, by George W. Petrie, III; Experiments on the inversion of a 16 × 16 matrix, by John Todd; A method of computing eigenvalues and eigenvectors suggested by classical results on symmetric matrices, by Wallace Givens; Computations relating to inverse matrices, by Jack Sherman; Results of recent experiments in the analysis of periods carried out in the Istituto Nazionale per le Applicazioni del Calcolo, by Gaetano Fichera.

G. W. MORGAN

Handbook of probability and statistics with tables. By Richard S. Burington and Donald C. May, Jr. Handbook Publishers, Inc., Sandusky, Ohio, 1953. ix + 332 pp. $4.50.

"It is the purpose of this book to provide a small convenient size pocket handbook of probability and statistics sufficiently comprehensive to fill a wide variety of needs, . . .". This statement of the authors seems to the reviewer to be a modest statement of the book's accomplishments. The summaries of frequency and probability distributions, generating and characteristic functions, regression theory and time series, sampling distributions, statistical inference, analysis of variance, finite differences and interpolation, sequential analysis and quality control constitute the bulk of this handbook. In addition there are various tables of special distributions as well as a rather complete reference list. While this book claims only to be a handbook it could be used as a text as well.

ROHN TRUELL

Partial differential equations in engineering problems. By Kenneth S. Miller. Prentice-Hall, Inc., New York, 1953. viii + 254 pp. $4.75.

This text presents in a simple and straightforward manner the classical techniques of Fourier series, integrals, and transforms and applies them to find solutions of boundary value problems associated with the common partial differential equations of mathematical physics. It is written on the level of a student who has an elementary knowledge of partial differentiation and ordinary differential equations. Every significant concept and technique is illustrated by a specific problem worked out in complete detail and each chapter ends with an extensive set of problems.

P. CHIARULLI

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Some basic problems of the mathematical theory of elasticity. By N. I. Muskhelishvili. Third, revised and augmented edition, Moscow and Leningrad, 1949. Translated from the Russian by J. R. M. Radok. P. Noordhoff, Ltd., Groningen—Holland, 1953. xxxi + 704 pp. $10.05.

The first Russian edition of this work appeared in 1933. Though the essentials of the author's method of solving two-dimensional elastostatic problems have been repeatedly presented in the Western literature, no comprehensive treatment of this method has so far been available in any but the Russian language. While the number of Western scientists capable of working their way through a scientific note or short paper in Russian is fortunately increasing, a work of over 700 pages on a highly specialized subject is practically inaccessible to almost all. The Translator and the Publishers have therefore rendered a significant service to science by making this material available to Western scholars.

The space available for this review does not permit detailed comments on the contents of the work or even reproduction of the table of contents which fills over ten pages. The following headings of the major parts (with summarized chapter headings added in parentheses) must therefore suffice to give an idea of the contents. I—Fundamental equations of the mechanics of an elastic body (analysis of stress and strain; basic equations of elasticity). II—General formulae of the plane theory of elasticity (basic equations and complex representation of solution; multi-valued displacements; thermal stresses). III—Solution of several problems of the plane theory of elasticity by means of power series (Fourier series; regions bounded by a circle; circular ring). IV—On Cauchy integrals. V—Application of Cauchy integrals to the solution of boundary problems in plane elasticity (regions bounded by a single contour, half-plane and other semi-infinite regions). VI—Solution of the boundary problem of the plane-theory of elasticity by reduction to the problem of linear relationship (sectionally holomorphic functions, half-plane and plane with straight and circular cuts). VII—Extension, torsion, and bending of homogeneous and compound bars (problem of Saint Venant, bars consisting of different materials).

W. PRAGER

Numerical mathematical analysis. By James B. Scarborough. The Johns Hopkins Press, Baltimore, and Oxford University Press, London, 1955. xix + 554 pp. $6.00.

This book is the third edition of a well-known elementary introduction to numerical analysis first published in 1930. The treatment presupposes only calculus and relies heavily on examples worked in the text. The most glaring omission in the second (1950) edition has been remedied by the inclusion of a chapter on the numerical solution of simultaneous linear equations in which several of the best methods of solving such systems are treated and illustrated by examples. A further addition to this edition is an article on errors in determinants. Only the barest reference is made to the usefulness of methods for automatic digital computers. There are chapters on accuracy (I), interpolation (II-VI), differentiation and integration (VII), quadrature (VIII), algebraic and transcendental equations (IX-X), ordinary (XI) and partial (XII) differential equations, integral equations (XIII), normal error law (XIV), precision of measurements (XV), empirical formulas (XVI), harmonic analysis (XVII) and simultaneous linear equations (XVIII).

The book is extremely well written and should be particularly useful because of its many examples and very valuable to students with only a moderate mathematical background.

WALTER FREIBERGER

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BOOK REVIEWS

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50–100 *Binomial tables.* By Harry G. Romig. John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London, 1953. xxvii + 172 pp. $4.00.

The value of the individual terms and the sum of the first x terms of "$[P + (1 - P)]$" are given for n in the range 50 to 100 in steps of 5 and p in the range 0.01 to 0.50 in steps of 0.01 to six decimal places although the last place is doubtful. The introduction, written in a clear and concise manner, describes the use of the tables, its application to quality control and its relation to the ratio of the incomplete β-function to the complete β-function. The tabulated data are easy to read but the nature of the entries prevents a more uniform tabulation.

S. L. Levy

Stress waves in solids. By H. Kolsky. At the Clarendon Press, Oxford, 1953. x + 211 pp. $5.00.

This book, the thirteenth in the Monographs on the Physics and Chemistry of Materials series, is a welcome addition for those interested in the propagation of stress waves in solids. The first part of the book treats the classical theory of stress waves in elastic materials and unites many topics which have only appeared in the literature. It is unfortunate that the author did not insert the the results for the reflection and refraction of a stress wave at a plane boundary between two anisotropic materials.

The second portion of the book treats "imperfectly elastic" materials and contains a well written account of the present state of affairs of internal friction in solids. Chapter VI, Experimental Investigation of Dynamic Elastic Properties, presents the various techniques used in the measurement of stress waves in solids and discusses the results of the several types of measurements. The last two chapters of the book treat plastic and shock waves in materials and the experimental results in this field—a large portion contributed by the author.

It is the reviewer's belief that the author has accomplished his aim stated in the introduction that the book should be easily read by anyone trained in mathematical physics.

S. L. Levy

French bibliographical digest. Science: Mathematics (Part I: Pure Mathematics). Cultural Division of the French Embassy, 972 Fifth Avenue, New York 21, N. Y. iv + 128 pp.

This publication contains abstracts or reviews of the most significant contributions made by French mathematicians between 1949 and 1954, and aims at making French mathematical work better known in the United States.

The present volume is devoted to pure mathematics; a separate volume on applied mathematics is to follow.

Copies of these publications will be available, on request, without charge to libraries, university departments, and individual scientists.

W. Prager