problems, are omitted completely, but the material which is covered is done superbly. This includes a thorough study of linear equations and systems (using results from linear algebra), existence and uniqueness theorems, including dependence on initial conditions and parameters, and a great deal of material on stability. The chapter on stability contains many topics seldom treated on this level, such as limit cycles, states of equilibrium of two-dimensional autonomous systems, and stability of periodic solutions. Many physical applications are given to illustrate the results. They are integrated with the theoretical material, rather than being collected in one place where a lazy reader can avoid them. The most interesting physical applications are the discussions of electrical circuits, vacuum tube oscillators, and centrifugal governors.

Because of the omission of several topics and because of the absence of problems and trivial examples, this book is probably not ideal as a text for an intermediate course in differential equations. This is not intended as a criticism, because presumably the author was not attempting to write a text for use in Canadian and American universities. He has, however, succeeded in writing a book which should be read by everyone who teaches differential equations or uses them in physical applications.

Fred Brauer, University of Wisconsin

Introduction to Nonlinear Differential and Integral Equations, by Harold T. Davis. Dover Publications, New York, 1962. ix + 566 pages. Paperbound $2.00.

This volume is an unaltered version of the work first published in 1960 by the United States Atomic Energy Commission. It appears to be directed toward engineers, physicists, and applied mathematicians who know little about the subject, but who are actually confronted with nonlinear problems. That is, the book consists largely of an attempt to define the field and a presentation of some of the methods and techniques which have proved useful in attacking certain nonlinear problems. In addition, the author usually tries to provide the reader with some of the background required for an understanding of the methods and techniques. For example, Chapter 6 is a 50 page digression on elliptic integrals, elliptic functions and theta functions (with short tables!), these being essential for a later discussion of the second order differential equation of polynomial class,

$$A(y)\,y'' + B(y)\,y' + C(y)\,(y')^2 + D(y) = 0$$

(where A, B, C, D are polynomials in y whose coefficients are functions of x).

Only one short chapter (25 pages) is devoted to nonlinear integral equations. This chapter contains existence theorems for nonlinear equations of both Volterra and Fredholm type, as well as a discussion of several particular equations including an integro-differential equation of Volterra concerned with the growth of populations.

The first four chapters deal with first order differential equations and contain classical material on methods of integration and existence theorems, as well as a detailed study of the Riccati equation. Chapter 5 discusses two particular nonlinear problems - Volterra's theory of the growth of conflicting populations, and the pursuit problem - graphical methods being illustrated for special cases. Chapters 7 and 8 deal with nonlinear differential equations of the second order, those of polynomial class being further sub-classified, and include a fairly detailed discussion of the first and second Painlevé transcendents. Chapter 9 is entitled "Continuous Analytic Continuation", and outlines a new iterative process for the numerical integration of differential equations, applying the method to several special equations including that of Van der Pol. In essence (for second order equations) the method consists of computing the first few (usually four or five) terms of the Taylor expansion of the solution function and of its derivative using the initial values, and continuing these values along a curve using small increments. The author claims that "the method was found to have astonishing efficiency" even in extreme cases, for example, continuation around a polar singularity of the solution.

Chapters 10 and 11 constitute a 90 page introduction to the classical theory of nonlinear mechanics, a detailed discussion of the system

$$\frac{dx}{dt} = P(x,y), \quad \frac{dy}{dt} = Q(x,y) ,$$

(where P, Q are polynomials of the second degree) being given. Application of some of the many methods, techniques and results introduced earlier are made in Chapter 12 to a number of classical nonlinear equations: Rayleigh's, Van der Pol's, Emden's, Duffing's, Blasius' and Langmuir's equations in particular.

The final two chapters deal with problems arising from the calculus of variations (with emphasis on the formal derivation of the Euler equation), and with an introduction to the calculus of finite differences leading to the classical numerical integration formulas of Runge-Kutta, Adams-Bashforth, and Milne.

The book abounds with worked examples illustrating the techniques; in addition there are 137 problems scattered through the work. There are four appendices listing: 50 types of equations with fixed critical points; elements of the linear fractional transformation (applied to a fairly general nonlinear equation of polynomial class); coefficients of the expansion of the first and second Painlevé transcendents. Forty pages of tables of values of these Painlevé transcendents (for the initial conditions $y(0) = 1$, $y'(0) = 0$), of solutions of Van der Pol's equation (with $y(0) = 2$, $y'(0) = 0$), and of solutions of a special Volterra equation, together with a bibliography of 350 items, complete the work.

Paul R. Beesack, Carleton University

Estimation from Grouped and Partially Grouped Samples, by Gunnar Kulldorf. John Wiley, New York; and Almqvist and Wiksell, Stockholm, 1961. 144 pages. $5.00.

This book, based on the author's Ph. D. dissertation, is a clearly written account of estimation of population parameters for sampling from untruncated and truncated exponential and normal populations, when the samples are either grouped or partially grouped. The latter is a generalization of the grouped case and can also be viewed as a generalization of "censored samples".

The so-called equidistant case, that is, when lengths of cell intervals are all taken to be equal, is discussed in detail. Maximum likelihood estimators and other types of estimation are exhibited, as well as a discussion of optimum grouping procedures.

Irwin Guttman, University of Wisconsin

Group Theory, The Application to Quantum Mechanics, by Paul M. E. Meyer and Edmond Bauer. North-Holland Publ. Co. Amsterdam. Interscience, New York, 1962. 288 pages. $9.75.

The book comes in eight chapters: 1. Vector spaces (a concept that is not properly defined in this book), 2. The principles of quantum mechanics, 3. Group theory, 4. General Applications to Quantum Mechanics; Wigner's theorem, 5, 6. Rotations in 3-dimensional space: Group D_3, 7. Space groups, 8. Finite groups. The mathematical treatment of group theoretical concepts and their applications to quantum theory given in this book is much inferior to the one given in the book by Van der Waerden, Die gruppen theoretische Methode in der Quantenmechanik (Springer, Berlin 1931) e.g., no proof for the uniqueness theorem in representation theory is given (see p. 81) and in the application of Schur's lemma (p. 85) it is tacitly assumed that a reducible representation of a group is fully reducible. The theory of Lie groups is not properly dealt with at all. On the other hand the principles of theoretical physics which suggest an application