principle in quantum mechanics.

Through the use of the variational principle based on the so-called Euler equations, the third chapter develops the Lagrangian and Hamiltonian formulations of the general field equations of physics, and then considers particular applications to the equations of wave motion in classical dynamics, to the electromagnetic field equations, to the diffusion equation and to the miscellaneous equations of wave mechanics. A brief discussion of Schwinger's dynamical principle in the theory of quantized mechanics concludes the part of the book with the field equations of mathematical physics.

The remaining part of the book is concerned with discrete and continuous eigenvalue problem. At the beginning of the fourth chapter is presented the summary of the small oscillation theory, and Rayleigh's principle is then proved and the Ritz variational method is developed for the Sturm-Liouville equation. The more general problem of the eigenenergies of a quantum mechanical system is discussed, upper bounds to the eigenenergies and lower bounds to the ground state eigenenergies derived. The problem of determining the eigenenergies of an atomic system is then investigated and the special case of the two electron system is treated in considerable detail. Much emphasis is given to the fact that, by using the Ritz variational method, remarkable accuracy has been obtained with which the energy of such systems has been calculated.

The last chapter deals with the use of variational principles in the theory of scattering, a subject which has received much attention by Hulthén, Kohn and Schwinger, and others. The special case of scattering of particles having vanishing energy is treated rather in detail, upper bounds to the scattering length being derived and application being made to the elastic scattering of electrons and positrons by hydrogen atoms and to the elastic scattering of neutrons by deuterons.

Owing to the very large number of different applications of variational principles which have been carried out recently, it is inevitable, in order to remain within the confine of such a volume, to omit much material from the present work, but the present reviewer does not hesitate to conclude that the author successfully provides physicists with the fairly broad view of the way in which variational principles have been and will be applied in various fundamental problems in theoretical physics.

T. Okubo, McGill University

<u>Mathematical Methods for Physicists,</u> by G. Arfken. Academic Press, New York, 1966. xvi + 654 pages. $12.75.

The book's seventeen chapters can be grouped as follows: vectors, tensors, matrices and coordinate systems (4 chapters); complex variables (2 chapters); differential equations and Sturm-Liouville theory (2 chapters); special functions (4 chapters), and single chapters on infinite series, Fourier series, integral transforms, integral equations, and calculus of of variations. The material is intended for physics students at the advanced undergraduate or beginning graduate level. Written by a physicist, one of the more attractive features is the use of relevant physical examples, many of which are taken from electromagnetic theory and quantum mechanics. The book appears eminently suitable for its intended purpose, and should be given serious consideration by instructors planning courses of this nature.

The format is especially attractive (see for example the handsome picture of toroidal coordinates, p.104). One question: shouldn't prospective physicists be exposed to the concept of a linear space and some of its consequences?

H. Kaufman, McGill University

Nonlocal Problems of the Theory of Oscillations, by V.A. Pliss. Academic Press, New York, 1966. Translation edited by H. Herman. xii + 306 pages. $13.50.

In recent years, the study of nonlocal problems in the theory of differential equations has been intensively cultivated. One of the distinguished contributors is the author of the present book; fortunately for the mathematical world, men of his stature are willing to devote considerable effort to the production of monographs incorporating in a systematic way the results of this research. The problems here considered center on the existence of periodic solutions and their stability in the large. The book comprises three chapters: the first on multi-dimensional periodic systems includes general properties of dissipative systems, sufficient conditions that certain specific systems be dissipative, multidimensional nondissipative periodic systems, systems with convergence (i.e., with a periodic solution which is stable in the large). The second chapter treats first- and second-order periodic systems; most of the theorems proved do not generalize to higher order systems. The third chapter on autonomous systems includes general theorems on periodic solutions, a detailed study of a third-order equation with a nonlinearity satisfying a generalized Hurwitz criterion, and sufficient conditions for the existence of periodic solutions. The author is careful to point out that an exposition of all topics was not intended; for example, no discussion is given of two-dimensional autonomous systems, these being thoroughly treated in the book by Andronov, Witt and Chaikin.

The specialist in differential equations, with interests in nonlocal problems, will be amply rewarded by the close and painstaking study demanded by a work of this nature.

H. Kaufman, McGill University