Prelude to Analysis, by Paul C. Rosenbloom and Seymour Schuster. Prentice Hall, Inc. Publ., 1966. xix + 473 pages. $8.25.

This book represents an attempt to bridge the gap between a three year high school course in mathematics and a modern approach to the calculus. The chapter headings indicate the choice of material made by the authors: Introduction; The Real Number Line; Algebraic Structures; Coordinates in the Plane; Functions; Vectors; Numerical Solution of Equations; Estimation of Errors; Convergence; Mathematical Induction.

The style is informal with considerable effort to motivate the student reader. There are sections of programmed material and many of the exercises should be considered as an integral part of the exposition. This choice or style no doubt makes the book easier for a beginner to learn from, but it makes it less useful as a reference afterwards since key ideas are often hidden in the exercises or programmes.

The material in general is interesting and well handled. There are many teaching techniques that instructors at various levels could profitably copy.

But the book does not seem to fit into the Canadian scene as a text since our universities are not usually concerned with giving a full course at the pre-calculus level to students of the calibre that this book requires.

George C. Bush, Queen's University

Variational Principles, by B.L. Moiseiwitsch. Interscience Monographs, Vol. XX. Wiley, New York, 1966. x + 310 pages. $14.00.

This book contains two objectives, one showing how the equations of the various branches of mathematical physics can be expressed in the plain form of variational principles, and the other demonstrating how such variational principles may be employed for the determination of the discrete eigenvalues which occur in the stationary state problems.

The first chapter is devoted to the variational formulation of classical as well as relativistic mechanics. Hamilton's principle and the principle of least action, which are apt to be believed as the independent postulates for the formulation of classical dynamics, are shown to be equivalent to the equations of Lagrange and Hamilton, if and only if one utilizes the notion of variational principle. This leads to a variational treatment of geodesics in a Riemannian space and of the motion of a particle in a gravitational field in the natural fashion.

In the second chapter the author turns to optical subjects and deals with Fermat's principle of least time. This being done, he reveals the analogy between dynamics and geometrical optics in a successful way. It is evolved with the wave equations of Schrödinger, Klein-Gordon and Dirac, and is followed by an examination of the role of Hamilton's

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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

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