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or chemist. They are "The genetic control of cell surfaces" (G. H. Beale), "The physiology of pinocytosis" (R. C. Rustad), "Plastron respiration" (D. J. Crisp), "Preparation and properties of isolated cell surface membranes" (C. H. O'Neill) and "The cell membrane: image and interpretation" (P. F. Elbers). The book has an author index (on 20 pages) and a subject index (on 17 pages). All the articles are essentially review articles and are valuable as such. The outward appearance of the book is good.

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M. E. Straumanis is Research Professor of Materials at the University of Missouri at Rolla.

Nonlinear control

STABILITY OF NONLINEAR CONTROL SYSTEMS. By Solomon Lefschetz. 150 pp. Academic Press, New York, 1965. \$7.50.

by Peter L. Balise

Scientists and engineers working in control theory will generally recognize Solomon Lefschetz as the coauthor with Joseph LaSalle of the 1961 volume, *Stability by Liapunov's Direct Method* (No. 4 in the publisher's series on mathematics in science and engineering). That volume did much to give wider attention to Liapunov's method, which is certainly of major importance in control theory even though it is probably not the general answer to nonlinear stability problems. Indeed there appears to be no really general answer.

The present volume, No. 13 in the same series, is similar to the earlier volume in its concise and accurate exposition. It outlines some recent developments in stability theory that have come from Liapunov's method, developments to which the author has contributed in his work at the Research Institute for Advanced Studies. It does not seem so much a monograph as the earlier volume—its content is more diverse.

The first six chapters, beginning in an elementary way with the concept of system characterization by state variables, discuss various conditions

for stability in systems with "direct" and "indirect" control (distinguished by whether the feedback is direct or through a derivative). The seventh and eighth chapters are of major importance, presenting work of Popov and Kalman which makes it possible to replace a matrix by a number as a criterion for absolute stability. The last chapter reviews some material basic to the earlier work, including the Jordan canonical matrix and Liapunov's stability theorems.

Although the book presumes only a background in matrices and differential equations, the theory is difficult enough and the presentation concise enough that the book would not be considered as a text in the usual sense. It is however, an excellent reference (with well annotated bibliography), and the assiduous student could obtain from it valuable material on stability theory as well as enhanced appreciation of the use of system state vectors.

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The reviewer, a professor at the University of Washington in Seattle, has developed several courses in control, and is writing an introductory systems text.

Arithmetic of higher mathematics

METHODS OF MATRIX ALGEBRA. By Marshall C. Pease. 406 pp. Academic Press, New York, 1965. \$13.75.

by Thomas Kailath

Richard Bellman called matrix theory the arithmetic of higher mathematics and wrote a book on matrices (McGraw-Hill, 1960) to support his claim. Bellman's numerous and well chosen examples were drawn mainly from the mathematics literature. The present book is similar in its aims to Bellman's book, but the examples are drawn mainly from physics and electrical engineering (mostly classical electromagnetic and network theory). The contents include the standard material on matrix manipulation, eigenvalues and eigenvectors, diagonalization, dyads and projections and functions of a matrix. Some space is devoted to a "pet" concept of the