105[P, X].—SOLOMON LEFSCHETZ, *Stability of Nonlinear Control Systems*, Academic Press, New York, 1965, xi + 150 pp. Price $7.50.

This monograph gives an up-to-date, essentially self-contained, treatment of the problem of absolute stability of closed-loop control systems. It discusses in detail the sufficient conditions based on the construction of suitable Lyapunov functions as well as Popov's sufficient conditions utilizing Fourier-transform techniques. It is the first such monograph written outside the Soviet Union, by an author who has been for more than two decades the main force in making Lyapunov's approach to stability theory widely known and used in this country.

The book consists of nine chapters and two appendices. The first chapter is introductory, the last contains supplements on Jordan canonical forms, Lyapunov's matrix equation and the basic stability theorems. The construction of a Lyapunov function is discussed in Chapters 2, 3 for the case of indirect controls, in Chapter 4 for direct controls and in Chapter 5 for systems represented by a single equation. Discontinuous characteristics are briefly taken up in Chapter 6. The theorems of Popov are stated and proved in Chapter 7, and compared with the preceding results. Chapter 8 concerns essentially a strengthened version of a lemma of Yacubovich from which a somewhat less general necessary and sufficient condition than Kalman's is deduced very simply. The appendices give an application of multiple feedback control and an example from the theory of nuclear power reactors. The book closes with a bibliography of the most important papers and texts on the subject.

H. A. ANTOSIEWICZ

University of Southern California
Los Angeles, California

106[P, X].—C. T. LEONDES, Editor, *Advances in Control Systems*, Vol. 2, Academic Press, New York, 1965, x + 313 pp., 24 cm. Price $13.00.

The present volume consists of five contributions.

The first article, "The Generation of Lyapunov Functions" by D. G. Schultz summarizes the methods of constructing Lyapunov functions for autonomous systems as proposed by Aizerman, Szegö, the author and Gibson. The usefulness and relative merits of these methods are discussed in detail and illustrated by numerous examples. A brief discussion of generating Lyapunov functions for nonautonomous systems is also included.

The paper by F. T. Smith, entitled "The Application of Dynamic Programming to Satellite Intercept and Rendezvous Problems," discusses the use of dynamic programming in synthesizing the optimal control and optimal estimation problem. A wealth of numerical data is presented for comparison purposes.

The article "Synthesis of Adaptive Control Systems by Function Space Methods" by the late H. C. Hsieh describes various control problems such as final value and minimum effort problems in the setting of functional analysis. It includes a general discussion of the minimization problem in Hilbert space, the steepest-descent method and its variants, and the least square estimation problem.

The paper "Singular Solutions in Problems of Optimal Control" by C. D. Johnson is essentially concerned with the solution of two-point boundary value problems for systems of ordinary differential equations containing a discontinuity