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tory explanations that should be helpful even to the mature readers for whom the book is intended.

Accordingly, the phase-space concept is presented at the beginning, illustrated by the pendulum with Newtonian damping, probably the most effective elementary example of the transition from linear to nonlinear behavior. The phase plane is given considerable attention throughout, although not as much as the engineer or scientist might desire. Background is provided by early chapters on linear equations and existence and uniqueness theorems. Although only one chapter is entitled "Stability in Nonlinear Systems," the last half of the book is devoted primarily to this centrally important topic. It is good to see that Dr. Struble presents Lyapunov's "second method", the principal analytical tool for studying nonlinear stability problems in the Soviet Union, now being introduced in the United States. He also gives considerable attention to Poincaré stability and mentions Laplace stability.

There is now no general approach to nonlinear problems, and the variety of nonlinearities makes a single unifying method seem unlikely. There is much need for mathematical treatments like Dr. Struble's, as well as for important approximating techniques like the describing function (which he does not mention). And this will remain true even as simulation of nonlinear systems by analog and digital computers obviates the necessity for complete analysis.

Eigenfunction Expansions Associated with Second-order Differential Equations, Part 1 (2nd ed.). By E. C. Titchmarsh. 203 pp. Oxford U. Press, New York, 1962. $6.75. *Reviewed by George Weiss, University of Maryland.*

THIS is the second edition of a mathematical treatise of some interest to physicists. Several chapters have been rewritten and there is now some reference to the work of Levitan. Unfortunately the work still remains forbiddingly difficult to read and only analysts of a high order will be able to appreciate it.

Singularities of Linear System Functions. By Bernhard Gross and Elde Pires Braga. 90 pp. American Elsevier Publishing Co., Inc., New York, 1961. Paperbound $4.00. *Reviewed by Robert J. Rubin, National Bureau of Standards.*

ALTHOUGH this little book is written in the language of electrical network theory, it is of interest to students and specialists in the fields of dispersion-relation theory, crystal-lattice dynamics, dielectric relaxation, and viscoelastic behavior, where the underlying mathematical structures are identical. The properties of linear networks can be characterized in terms of the singularities in the complex frequency plane of functions such as the driving-point impedance, which in turn is related to the diagonal element of a Green function for the network. In this book several specific examples of linear networks are examined in detail.

The examples include uniform and nonuniform networks composed of either discrete or continuous elements. Particular attention is devoted to the behavior of the singularities of the driving-point impedance of finite sections of these networks as the infinite-section limit is approached. In this limit, branch cuts replace lines of densely distributed poles. An interesting question is raised, and answered, concerning the uniqueness of the network associated with a given driving-point impedance function (diagonal element of a Green function). It is shown that the driving-point impedance of an infinite discrete ladder network and a semi-infinite cable are identical. I will not spoil the mystery by telling how the uniqueness relation is re-established.

Scientific Foundations of Vacuum Technique (2nd ed.). By Saul Dushman. Edited by J. M. Lafferty. 806 pp. John Wiley & Sons, Inc., New York, 1962. $19.50. *Reviewed by R. A. Pasternak, Stanford Research Institute.*

VACUUM technology has made tremendous strides since Dushman's authoritative treatise *Scientific Foundations of Vacuum Technique* was first published (1949). Hence a revised edition has been awaited, rather impatiently, by workers in the field. The new edition constitutes a valuable addition to the pertinent literature. However, it is somewhat disappointing to this reviewer, who feels it suffers from its uncritical loyalty to Dushman's subject matter and material. More extensive deletion of outdated material would have given firmer guidance to newcomers in the high-vacuum field and would have allowed more space for discussion of new developments.

For example, in Chapter 5 much of the eighty-page discussion of manometers (excluding ion gauges) is now only of historical interest. The same can be said for the lengthy sections on sorption of gases on charcoal and cellulose in Chapter 7; in contrast, only three pages are devoted to the increasingly important polymers. No reference is made to the turbomolecular pump, a very promising design for ultrahigh vacuum applications. Chapter 8 (Gases and Metals) does not even mention the important new data on zirconium and titanium, accumulated particularly at the Westinghouse Research Laboratories and at Battelle. However, a good amount of new material and fresh outlooks are presented, particularly in areas which were not pre-empted by Dushman (see for example Chapter 9, Chemical and Electrical Clean-up of Gases, and Ultrahigh Vacuum).

In the revised edition some of the contributors perhaps have been overzealous in their justifiable pride in the achievement of the General Electric Research Laboratory by mentioning it (or other divisions of the company) at frequent intervals. In the section on leak detectors (16 pages), General Electric is mentioned at least ten times (not counting the numerous quotations from papers originating in the laboratory), and photographs of two of GE's commercial leak detectors are reproduced.

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