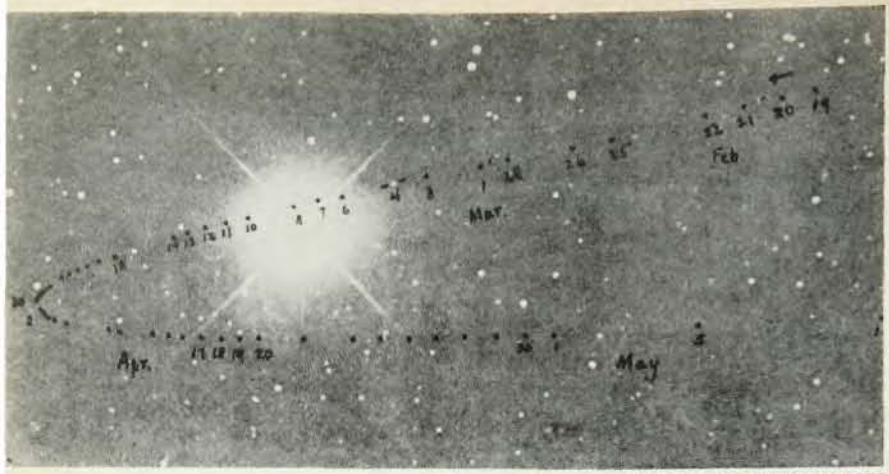

LOWELL OBSERVATORY PHOTO

APPARENT PATH OF PLUTO. The planet itself is the white dot above 4 Mar. From: CONCEPTS IN PHYSICAL SCIENCE

The topics covered are taken from physics, chemistry, geology, hydrology and astronomy. The general presentation is elementary but decidedly modern. Moreover, such nonelementary topics as planet reversals, fuel cells and polymers are included. Supplemented as it is by a glossary and a detailed index, the volume is a valuable reading and reference book for young students and for grown-ups.

The authors have a knack for fascinating story telling and for explicit dramatic pictures, of which there are plenty of excellent quality. They put modern knowledge in its historical background, they include anecdotes and they take pains to bring to light the experimental origin of present concepts and their purport in everyday life. He who could read this vivid and refreshing book and remain uninterested would be far more blasé than any young reader may be expected to be. Each chapter is provided with a summary and a list of readings (the latter mostly rather elementary), and the text is interspersed with exercises. A commendable feature is the inclusion of questions, answerable from the text, about some features or consequences of the properties studied (for example, why should a liquid-column thermometer be sealed?). This device should focus the reader's attention on particular points that otherwise might remain inconspicuous in the text. The contributions of the authors are well integrated and cross-referenced. Due stress is laid on key principles, for example the need for operational definitions of physical quantities and the "principle of uniformitarianism" in geology. The mks system of units is adequately used.

If this book is to meet with the success its conception deserves, a few mistakes should be corrected. The author must have been absentminded when he wrote (page 32): "when both planets [earth and Mars] are in line with the sun, Mars appears to stand still," an error that is fortunately contradicted by the accompanying figure 2-12. It is unfortunate that figures 4-4 and 4-5 (page 78) represent two apparently identical spring balances of which the first is marked in kiloponds (a unit not used in the text) and the second in newtons, although this difference is not stated anywhere; this is bound to confuse the lay reader. In figure 6-26, page 152, the minus charges should be plus charges for the direction of the force to be correct. Figure 7-34 (page 184) is a very poor analogy; I wonder how many trained physicists would guess what the author had in mind without referring to the text (I did not). Few specialists will approve of the definition of "work" in the glossary (page 568) as "a force exerted through a distance". Finally, there is a misprint in table 13-3, page 255 (*C1 for Cl*), and the word "gabbro," used several times in the text, is missing in the index and glossary.

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EMPHASIS ON METHODS

LINEAR SYSTEMS. By Ralph J. Schwarz and Bernard Friedland. 521 pages. McGraw-Hill, New York, 1965. $12.50.

by Bernhard Gross

The theory of linear systems has exercised a strong fascination on scientists and engineers. Many reasons might be given: the practical importance of these systems in modern science and technology; the variety of possible analytical methods in this field, many of which stem from Heaviside's unorthodox but powerful treatment; the possibility of developing a complete self-contained theory for such systems in which only a few areas are still unexplored.

Many books on the subject have appeared in recent years, and any new work must justify itself by some special feature. This volume does so by the choice of topics and their presentation.

Emphasis is on methods rather than system theory. As stated in the preface, the authors aim to provide a unified treatment of the main analytical techniques. In this they have succeeded. Fundamental concepts—linearity, causality, classification of systems—are set out in an introductory chapter. This chapter includes an item on flow diagrams, which are used extensively throughout the work. The authors' exposition of time-domain methods includes a very well presented treatment of the differential-equation method using matrix notations. This treatment, hardly touched on these days by other authors, is important in view of its possible extension to nonlinear systems. Continuous-time and discrete-time systems receive an analogous treatment, and the expressions for the superposition integral and fundamental matrix given for both show the parallelism between these systems.

The next three chapters deal with integral transform methods: Fourier integrals, the Laplace transform and the inverse transform, and the *Z*-transform for discrete-time systems. Although this material is found in many textbooks, its inclusion is, of course, necessary for any unified treatment of the subject.

Random signal problems are treated

in two chapters, as are stability and stability criteria. These pages appear particularly instructive and well presented. The chapter on the filtering properties of linear systems is preceded by a comprehensive discussion of the kinetics of random processes in general. Similarly, the chapter on stability criteria for fixed systems is preceded by a discussion of the stability of linear systems in general.

In the concluding chapter, the authors illustrate how the different techniques of analysis discussed earlier in the book apply to various types of systems, finite and infinite, with continuously distributed parameters. Infinite systems with lumped parameters (cascade networks) are not included.

Some familiarity with the elements of matrix algebra is taken for granted, as is some knowledge of the theory of analytical functions, complex integration and such subjects as the calculus of residues, which is used in evaluating integrals and in connection with the complex Laplace inversion integral and the Nyquist criterion. The positive-real-function approach is not used. Altogether the book does not deal with system theory proper and could equally well be entitled "Linear System Analysis." For a course on this subject, bridging undergraduate and graduate levels, as well as for self study, it can be well recommended. The excellent presentation customary in a McGraw-Hill production, and the relatively low price, make it even more attractive.

* * *

Bernhard Gross, director of the Division of Scientific and Technical Information for the International Atomic Energy Agency, is the author of a number of publications on linear systems.

DEFINITE INTEGRALS

ASYMPTOTIC EXPANSIONS. By E. T. Copson. 120 pp. Cambridge University Press, Cambridge, England, 1965. $6.00.

by J. Gillis

The kernel of this excellent little book was a short monograph written by the author for the Admiralty Computing Service in 1943. The new version covers essentially the same ground as the