Academy of Sciences is already outdated.

Despite the book's overall excellence, the two chapters that treat nonmedical topics are weak. Beijerinck's contributions are certainly given inadequate treatment, and not a single line of Kluyver's work is quoted. The development of knowledge of alcoholic fermentation subsequent to Buchner's contribution, the key problem from which modern microbial biochemistry developed, is completely ignored. The prehistory of modern microbial genetics, starting with the controversy between pleomorphists and monomorphists and passing through the argument between the Darwinians and Lamarkians among the bacteriologists, is unmentioned. The names of important figures in general microbiology —T. W. Engelmann, Marjorie Stephenson, S. Orla-Jensen, C. B. van Niel, and E. G. Pringsheim, among others— are missing from the index. This criticism is not aimed at omissions; in my opinion the book would have been improved by more omissions— the two chapters in point. Though perhaps it is better as is, because some general microbiologist with damaged ego may feel compelled to repair the hiatus and present us with a companion volume.

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Science Surveys Series

Analysis and Synthesis of Linear Time-Variable Systems. Allen R. Stubberud. University of California Press, Berkeley, 1964. viii + 108 pp. Illus. $4.75.

This book, the first in a series called *Science Surveys* prepared under the general editorship of Edwin F. Beckenbach (University of California, Los Angeles), is based on the Ph.D. dissertation of Allen R. Stubberud at the University. The principal results reported in the book appeared in 1962 and 1963 in journal articles by Stubberud. However the book is an integrated treatment and includes some background material.

The book is clearly written and easy to follow. The reader is presumed to have a working knowledge of elementary differential equations, which most engineering and science undergraduates do have. However, the actual application of the methods developed involves a substantial amount of arithmetic and calculations.

The emphasis is on preliminary synthesis, which in this instance consists of obtaining the analog computer diagram corresponding to a differential equation or weighting function. All initial conditions are assumed to be zero so that input-output relationships of systems are of primary concern. A key to the development of analysis and synthesis of linear systems is an algebra for treating arbitrary interconnections of such systems. Such an algebra is developed by the author. Among the possible subsystem or component representations, the author chose the single nth order differential equation relating input and output variables. Owing to the noncommutativity of linear time-varying differential operators, the problem of obtaining the overall, single differential equation relating the system input to the system output is computationally involved. The author's algebra systematizes manipulations of systems of equations corresponding to the subsystems. However, the arithmetic is still enormous.

In this book Stubberud does not consider the algebra for system interconnections when each subsystem is represented by a set of first-order, linear differential equations rather than a single high order linear differential equation. Using the alternative representation (W. R. Perkins, "Synthesis of interconnected linear time-varying systems," to be presented at the National Electronics Conferences, October 1965, Chicago, Ill.) results in a vast simplification of the algebra and arithmetic over the one used by Stubberud.

If one is forced to use the single nth order representation, then Stubberud's algebra is quite helpful, but if there is no pressing reason for this choice, the n first-order representation should be used because much less computation is involved. Because the book contains other background material it should be worthwhile reading for students of system theory.

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Astrophysics

Dynamics of Stellar Systems. K. F. Ogorodnikov. Translated from the Russian edition (Moscow, 1958) by J. B. Sykes. Arthur Beer, Translation Ed. Pergamon, New York, 1965. xii + 359 pp. Illus. $15.

The first half of *Dynamics of Stellar Systems* presents the classical material dealing with kinematics (velocity ellipsoids, velocity centroids, and the like), the Oort-Lindblad theory of galactic rotation, irregular forces, and integrals of the motion (with a discussion of isolating integrals). Students will find that this is a valuable treatment which complements other books on stellar dynamics. The second half is concerned wihh a number of dynamic problems and strongly reflects the author's approach to an understanding of the present structure of stellar systems. The book is not highly mathematical, and emphasis is placed on discussion of the physical concepts.

The so-called synthetic method is the foundation of Ogorodnikov's theory, and this begins with the assumption that there are strong relaxation mechanisms working in galaxies which lead to a statistically unique quasi-steady state. This mixing is assumed to be the result of the existence of a large number of star clouds in the mass range 10^5 to 10^6 suns, which constitute about 10 percent of the total mass of a galaxy. The author uses the hydrodynamic equations for a description of the dense inner regions of galaxies, with velocity dispersions obtained from the single-valued integrals of the motion. In this way closure of the hydrodynamic equations is formally obtained. The synthetic method combines the continuum and statistical approach to the problem.

Not all of those who work in the field of stellar dynamics will agree with some of the author's ideas and techniques—for example, some will be worried by such a large number of postulated massive star groups (and massive clouds). Others will express some concern over the use of the hydrodynamic equations without an examination of the magnitude of the next higher order moments of the Boltzmann equation. And it is not a strong test of any theory that agreement can be obtained with some observed luminosity profiles of galaxies.

If this book is used as a textbook,