

AICHE JOURNAL

JANUARY, 1971 • VOL. 17, NO. 1

The AIChE Journal, an official publication of the American Institute of Chemical Engineers, is devoted in the main to theoretical developments and research in chemical engineering and allied branches of engineering and science.

PUBLISHER

F. J. Van Antwerpen

EDITOR

Robert C. Reid

MANAGING EDITOR

Sylvia Fourdrinier

MANUSCRIPT EDITOR

June N. Safir

EDITORIAL BOARD

Richard R. Bannister
Elisabeth M. Drake
Claiborne A. Duval, Jr.
Gordon A. Hughmark
William B. Isaacs
Leon Lapidus
Henry A. McGee
John M. Prausnitz
Dale F. Rudd

Publication Office, 215 Canal street, Manchester, New Hampshire. Published in January, March, May, July, September, and November by the American Institute of Chemical Engineers, 345 East 47 Street, New York, New York 10017. All manuscripts should be submitted only to R. C. Reid, Massachusetts Institute of Technology, Room 12-190, Cambridge, Mass. 02139. Correspondence with the editor may be addressed to him at 345 East 47 Street, New York, New York 10017. Statements and opinions in the *AIChE Journal* are those of the contributors, and the American Institute of Chemical Engineers assumes no responsibility for them. Subscription: one year, member \$8.00; non-member \$35.00; additional yearly postage, Canada \$1.00, Pan American Union \$1.50, other foreign \$2.00 (foreign subscriptions payable in advance). Single copies: \$10.00. Application pending for second-class mail. Postage paid at New York, N. Y. and additional mailing offices. Copyright 1971 by the American Institute of Chemical Engineers. National headquarters of AIChE is concerned about nondelivery of copies of the *AIChE Journal* and urgently requests subscribers to give prompt notification of any change of address. Sixty days must be allowed for changes to be made in the records.

Postmaster: Please send form 3579 to *AIChE Journal*, 345 East 47 Street, New York, N. Y. 10017.

BOOKS

Control and Dynamic Systems, Y. Takahashi, M. J. Rubins, and D. A. Auslander, Addison-Wesley Publishing Co. (1970). 800 pages, \$17.50.

This is a well-thought-out and well-executed book. However, as the preface indicates, "this is a book for mechanical engineers, although it is also applicable for electrical and chemical engineers." Thus, most of the examples and discussions deal with systems and problems that are not, except from a conceptual point of view, of direct interest to chemical engineers. Nevertheless, there are sufficient ideas and developments in this work to suggest that the chemical engineer would find the book worthwhile, at least as an excellent secondary reference.

The book is divided into four main sections. These are (1) linear system theory, (2) formulation of dynamic systems, (3) control of linear systems, and (4) nonlinear, stochastic, optimal control and logic systems. Section (1) is really a state vector approach to the representation of lumped-parameter systems. It includes material on signal-flow diagrams, Laplace- and z-transforms, diagonalization method, difference equations, the matrix exponential, controllability and observability, and all aspects of stability of linear systems including Liapunov theory. All in all, this is an excellent section on most aspects of linear systems and their analysis.

Section (2) then proceeds to the development or identification of models

of lumped- and distributed-parameter systems via many physical processes. Of specific interest to the chemical engineer is the material on heat exchanger and percolation systems. The latter, in particular, has application to flow in packed beds and is extremely well done. The whole chapter on distributed-parameter systems is, in fact, well developed and of more than passing interest.

Section (3) deals with linear control systems and includes many aspects of classical process control and frequency response techniques. It also develops the theory of feed-forward control, of decoupling techniques for linear systems, and of computer directed control. Special interest lies in model control of distributed-parameter systems and of linear-quadratic control as developed through the Liapunov formulation rather than standard minimum principle techniques.

Section (4) covers a variety of topics such as the analysis of oscillating nonlinear systems (limit cycles), nonlinear stability via the Liapunov formulation, minimum time control and dynamic programming, Kalman filtering, and switching algebra.

It is apparent from this brief analysis of the contents that the book contains a wealth of information. Coupled with excellent examples and problems (a solution manual is available) and the comparatively nonrigorous mathematical developments is a very large set of excellent drawings and flow diagrams.

(Continued on page 2)