## ChE book reviews

*Dynamic Behavior of Processes,* John C. Friedly, Prentice Hall, 1972. Morton M. Denn, University of Delaware.

The basic premise of Friedly's "Dynamic Behavior of Processes" is that process dynamics is an area of fundamental importance in chemical engineering which transcends specific applications. Thus, he believes, process dynamics should be studied with an eye towards its broad application, rather than within the usual restrictive context of process control. One need not accept this viewpoint to appreciate the virtues of the book. Freed from the need to provide an adequate treatment of process control, Friedly has utilized the space to cover a significantly wider range of approaches to studying dynamical behavior than can be found in any presently available text.

The book is divided into three parts. The first is a sketchy discussion of process modelling and some basic analytical tools. It is an unfortunate beginning, for the section is the weakest part of the book. The treatment of energy balances is incorrect, as it so often is in books on process dynamics. Thus, for example, Eqs. (2.3-9) — (2.3-12) on page 31 erroneously contain derivatives of the heat capacities, and the discussion on page 52 is totally wrong. Eq. (2.6-19) on that page is the proper formulation even when the heat capacity is temperature dependent. This error is repeated elsewhere in the text, though the assumption of constant heat capacity is always made at some point and incorrect solutions are not obtained.

The major part of the book consists of parallel sections on the dynamical behavior of lumped and distributed parameter systems. This covers input-output representation and the use of transfer functions, state space representation and some of the ideas of modern control theory, approximate representations, and analytical methods for nonlinear systems. While most of the material on lumped parameter systems is available in other texts, the coverage here is complete and generally well done.

The real strength of the book is in the treatment of the dynamics of distributed-parameter processes. Friedly nicely illustrates the significance of wave-like and diffusive responses, and the chapter on construction of approximate transfer functions is particularly instructive. Here, unfortunately, there is no discussion of the weighted-residual methods which have achieved prominence in recent years.

Overall, this reviewer is impressed with the content of the book, but sees no way in which he could use it as a course text. The material is not suitable for most undergraduates. Few schools can afford the luxury of separate first graduate courses in dynamics and control, and a control course based on the book would require too much supplementary material. Finally, there are no homework problems. The book should be available as supplementary reading in graduate and undergraduate courses, however, particularly the chapters on distributed parameter systems, and every graduate student in chemical engineering should be aware of its contents for use as a possible reference. □

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*Staged Cascades in Chemical Processing,* P. L. Thibaut Brian, Prentice-Hall, Englewood Cliffs, N. J., 1972. Joseph D. Henry, Jr., West Virginia University.

The primary goal of this text is to introduce the concepts of staged cascades to beginning chemical engineering students. It is intended for a first course in chemical engineering taught to freshmen or first semester sophomores. Three separation processes are discussed: washing of finely divided solids, liquid-liquid extraction and distillation. Numerous discussions and problems introduce the student to economic concepts as well as the analysis of equilibrium staged processes.

The chapter on simple linear cascades, which discusses the washing of finely divided solids (alumina mud), presents an analysis based on steady state material balances of both cross flow and countercurrent cascades. The washing problem provides a very effective first example of an equilibrium cascade because the equilibrium expression is very simple, i.e., the dissolved solute concentration in the overflow and underflow are equal. The familiar Kremser equation is the result of the analysis for the countercurrent cascade. The optimum allocation of wash water is discussed and cross flow and countercurrent configurations are compared with respect to wash water consumption.

The chapter on liquid-liquid extraction while maintaining the simplicity of constant distribu-