Diffusional Mass Transfer, A. H. P. Skelland, Wiley, New York (1974). 510 pages. $24.95.

The dominant theme in this book is the discussion and review of a representative selection of topics in the theory and practice of diffusional and convective mass transfer. Emphasis is placed on clear presentation of the derivation of important relationships and exemplification of their uses in solving a variety of practical problems. Topics and materials are selected so as to familiarize the reader with the fundamental concepts and equations of mass transfer, empirical correlations, useful mathematical techniques, and the principles and procedures of column design. The mathematical treatment of the subjects is generally made on the undergraduate level without using vector or tensor notations.

The book begins with a chapter containing introductory remarks on the nature and diversity of mass transfer processes which occur frequently in chemical, biological, and engineering practice. In Chapter 2, different ways of defining mass fluxes are presented. Mathematical solutions are then shown for typical steady and unsteady state molecular diffusions in stationary media. Chapter 3 discusses and contains a collection of various theoretical expressions and empirical correlations currently available for estimating molecular diffusivities in gas mixtures or liquid solutions.

The concepts of individual and overall mass transfer coefficients are introduced in Chapter 4, followed by a brief review of the existing theories on the mechanism of interfacial mass transfer. The topic of mass transfer in laminar or turbulent flow is treated in considerable detail in Chapters 5 and 6. The analysis covers both internal and external flows, including those with high mass fluxes where the velocity field is significantly affected by the high rate of mass transfer.

The final three chapters, Chapters 7, 8, and 9, are devoted to industrial column designs. Chapter 7 discusses the principles of continuous column design using the conception of NTU (number of transfer units) and HTU (height of a transfer unit). The materials presented in Chapter 8 are chosen largely based on the author's own approach (co-authored with A. R. H. Cornish) for designing perforated extraction columns. The subject of simultaneous heat and mass transfer is taken up in the final chapter, where the rate equations are applied to the design of cooling towers.

Throughout the book, brief literature surveys are often given in conjunction with discussions. The surveys, however, are not always complete and up to date. For example, the analysis of mass transfer in laminar flow through a circular tube follows the mathematical procedure published in the 1930's, although simpler and more precise ways of determining the eigenconstants for this problem have appeared in the literature during the past several years. It should also be pointed out that the book contains virtually no theoretical treatment on the important subject of mass transfer in a chemically reacting system or that of diffusions in multicomponent systems.

Apart from these shortcomings, the book is well written and organized. It would serve as a good introductory text for engineering students and a general reference book for practicing chemical and mechanical engineers.

Chia-Jung Hsu
Department of Applied Science
Brookhaven National Laboratory
Upton, New York 11973

The Elements of Chemical Kinetics and Reactor Calculations: A Self-Paced Approach, H. Scott Fogler, Prentice-Hall, Englewood Cliffs, N. J. (1974). 497 pages. $21.00.

Customarily in the teaching of chemical engineering courses, a significant portion of classroom time is utilized in transferring information from the course text to the chalkboard by the instructor and from chalkboard to notebooks by the students. This book by Fogler provides the basis for an alternate approach to the teaching (or learning) of chemical reaction engineering at the introductory level. The approach is a self-paced or programmed-learning one in which basic concepts are disseminated entirely through student readings from the book—readings which require the student to answer questions and derive, manipulate, or solve equations by actually filling in blanks as he reads the text. The instructor's role then, as taken on by Fogler himself at the University of Michigan, and by a number of others who have class-tested this text, is to conduct recitation-problem sessions and to meet with the students individually, or in very small groups, in informal conferences to discuss the material.

I used a preliminary edition of this text in a two-semester-hour senior course and found that all of the material in the ten chapters of the book could be covered in a two-semester-hour course. The credit, however, can easily be extended to three hours by making use of some of the open-ended guided-design problems which are given in an appendix. According to responses on questionnaires, most of the 66 students who took the course in two semesters regarded Fogler's book favorably. The most common complaint was that clarity was frequently lacking in text material as well as in the problems at the end of the chapters.

In my opinion, the book is generally well composed for self-paced instruction. The prose, not written in the usual terse style of textbooks, is very readable. The organization and perspective of the book are enhanced nicely by a topical flow chart shown in an introductory section and by duplication of the appropriate portions of that chart at the beginning of each chapter. Another very helpful feature is a succinct yet comprehensive listing at the end of each chapter of the essential topics covered and equations developed in that chapter. The text, assembled in a ring binder with soft covers, has a workbook appearance. Blank spaces (frames) are provided for answering the questions posed and for completing the exercises suggested. The text material is printed on just one side of a page with the solutions for the frames given on the back side.

Most of the topics usually covered in the first course on chemical reaction engineering are contained in this book, but unlike most others, it does not begin with a treatment of basic chemical kinetics and rate expressions. Instead, species material balances are first derived for a single reaction in batch, well-stirred, and plug-flow reactors. Then a number of elementary design problems are solved using graphical representations of rate-versus-conversion curves. Forms of the rate function are introduced in Chapter 3 when the student fully appreciates the need for an analytical rate expression in handling engineering applications.

Those using the text in course teaching will probably be annoyed by some of its shortcomings and some ambiguous or less-than-correct statements.