BOOKS

Fluid Flow for Chemical Engineers, F. A. Holland, Edward Arnold, London (1973). 269 pages. $5.25 (paper).

This book, available in either hard cover or paperback, is an introduction to fluid flow for the undergraduate chemical engineer. SI units are used throughout the book. An adequate list of problems and solutions is included and about twenty sample calculations as well.

Any author who titles a book simply "Fluid Flow" and issues something which is fewer than three volumes leaves himself open to criticism for treating lightly or omitting some pet topic of a reviewer. This book, however, contains most of the standard topics treated in a first course in fluid mechanics—units and dimensions, flow of incompressible Newtonian fluids, flow measurement, pressure drop in pipes, etc.—and has the additional advantage of introducing a number of topics which are often omitted in introductory fluid courses, for example, flow of incompressible non-Newtonian fluids in pipes, mixing of liquids in tanks (including scale-up), pump selection, and flow in the presence of solid particles. The treatment of some of these more specialized topics is necessarily not in great depth because of the length of the text. The great strength of the book is that the examples selected are usually very practical ones. For example, in the chapter "Introduction to Unsteady State Fluid Flow" the examples considered include (1) time to empty liquid from a tank, (2) time to empty an ideal gas from a tank, and (3) time to reach 99% of terminal velocity for a solid sphere falling in a Newtonian fluid, all of which are important problems in real-world situations. Emphasis on the practical is obvious throughout the book and probably comes from Professor Holland both having been a consultant and having offered this course to industrial personnel as well as to academic students.

The book falls into two divisions, the first approximately 186 of the 252 pages of text. This section is concerned primarily with the macroscopic description of flow processes and involves very little mathematics beyond algebra and elementary calculus. The second part of the book, only about 1/3 the length of the first part of the book, begins with an 11-page treatment of vector methods in fluid flow. This is followed by chapters on application of the modified Navier Stokes equation in rectangular coordinates, horizontal cylindrical coordinates, and vertical cylindrical coordinates. The presentation of the macroscopic approach before the microscopic is the soundest from a pedagogical point of view because the prior presentation of the macroscopic section gives the student motivation to study the more involved mathematics in the microscopic section.

Since the treatment is so abbreviated, many times the reader is referred to the literature for items which could perhaps have been included in the text—for example, a monograph of equivalent lengths for valve and fittings. The Reynolds number plot presented is also somewhat small to be useful, and occasionally symbols are introduced without adequate definition. The use of the symbol R for shear stress is somewhat confusing in a text which also has considerable occasion to talk about the radii of pipes. Chapter 7, "Flow of Two Phase Gas Liquid Mixtures in Pipes," is so abbreviated as hardly to be worthwhile. Only the Lockhart-Martinelli method is introduced and that method only for the turbulent-turbulent flow regime. The question of systems and control volumes is passed over with no discussion at all. It also seems unusual to find the transfer of momentum into a volume element by convection and molecular diffusion to be placed in the accumulation term. In fairness to the author, however, it must be noted that he characterizes the book in his introduction as a collection of lecture notes with the emphasis on brevity which he hopes will provide a framework for wider reading in the general field.

In summary, this seems a useful book for an undergraduate chemical engineering course in fluid flow providing some supplementing is done by the instructor, hardly an unreasonable requirement. The book's great strength is in its practical examples and applied flavor unusual in present day introductory treatments. Since it is available in paperback at about $5.25 (although the exchange price of the dollar is fluctuating rather rapidly at the time of this review) it should also find use as an inexpensive reference for students and practicing engineers to practical problems in the flow of fluids.

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Catalysis Reviews, Vol. 4, Heinz Heinemann (ed.), Marcel Dekker, Inc., New York (1970, 1971). 338 pages. $19.50.

Attempting to review a volume consisting of nine reviews is an interesting exercise. It is hardly feasible to comment on each of the reviews, except, perhaps, to note any particular review which is poorly written or lacking in other respects (and there are no such reviews in this volume). This review consists, therefore, of just two points.

First, the high standards set in earlier volumes of *Catalysis Reviews* are maintained in Volume 4. The reviews are well-written, authoritative, and concerned with timely topics in catalysis. They continue to be significant and helpful contributions to the literature on catalysis.

Second, the topics covered in this volume and the author(s) of each review are as follows: (1) Review of ammonia catalysis (Anders Nielsen); (2) The mechanism of the catalytic oxidation of some organic molecules (W. M. H. Sachtler); (3) Equilibrium oxygen transfer at metal oxide surfaces (G. Parravano); (4) Isotopic exchange of oxygen ^{18}O between the gas phase and oxide catalysts (J. Novakova); (5) The use of molecular beams in the study of catalytic surfaces (Robert P. Merrill); (6) Heterogeneous catalysis by electron donor-acceptor complexes of alkali metals (Kenzu Tamaru); (7) X-ray photoelectron spectroscopy: a tool for research in catalysis (W. Nicholas Delgass, Thomas R. Hughes, Charles S. Fadley); (8) Electrocatalysis and fuel cells (A. J. Appleby); and (9) Hydrodesulfurization (S. C. Schuman and H. Shalit).

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Transport Phenomena in Metallurgy. G. H. Geiger and D. R. Poirier, Addison-Wesley Publishing Company, Reading, Mass. (1973). 616 pages. $19.95.

This book was modeled after Bird, Stewart, and Lightfoot's *Transport Phenomena*, with emphasis on metallurgical applications. Although designed as an introductory undergraduate text, it can profitably be used in graduate courses and for self-instruction by practicing materials scientists. As a displaced chemical engineer who has