edition to one of the major themes of the book. This is the classification of prototype flows into "shear flows" ($v = (ky, 0, 0)$) and "shearfree flows," [an example being $v = (kx, -ky, 0)$]. The latter terminology is a break with customary usage. Such changes are warranted if the new name offers a clear advantage to the prior art. I believe that the adjective "shearfree" is destined to be confusing, not only because it is not widely used (and there are other alternatives that are) but because the flow is "shearfree" only for some coordinate systems. A 45-degree rotation of coordinates turns the flow into (a variant of) a "shear flow." It is the presence or absence of vorticity that is the true distinguishing feature of the two flows in question, but this point is not made clear. In a later section (Section 3.7) some of the confusion is eliminated by discussing the two types of flows in terms of material lines. This might have been profitably blended with the initial discussion of the two types of flows.

Theoretical concepts are an important part of the exposition throughout the book, but the authors have gone to extraordinary lengths to include tabular and graphical representations of data. For example, the chapter on material functions is 67 pages long and contains approximately 58 different graphs of data taken from the literature!

In Part II the reader is introduced to the difficult subject of constitutive equations by an exposition of inelastic and linear viscoelastic fluid models. The treatment is thorough and readable.

Part III, in which nonlinear viscoelastic constitutive equations are treated, is surely the greatest challenge to the authors and readers alike. Any honest exposition of this material will be heavy going for the newcomer. The authors have used Chapters 6, 7 and 8 to cover retarded motion expansions, differential models, and single integral models, respectively. Of necessity, considerable artillery is employed from the arsenal of continuum mechanics, a subject which is not systematically developed until Chapter 9. Because of this organizational format it is necessary in Part III to present a number of results in an *ad hoc* manner. The reader is repeatedly told that rationales will be forthcoming in Chapter 9 and in Volume 2, in which molecular models are presented to form a basis for much that is in Part III of Volume 1. This choice of ordering may make holding a reader's attention difficult through the presentation of the various convected time derivatives and some comparisons of results from models of, for example, "FENE Dumbbells," "Multibead Rods," and "Freely-Jointed Bead-Rod Chains."

When one does arrive at Chapter 9 there is a 32-page introduction to continuum mechanics in which most of the concepts important for Volumes 1 and 2 are developed very successfully. The subject of convected coordinates is handled effectively with a number of helpful diagrams.

It is curious that the concept of material frame indifference receives scant explicit treatment. The index to the first edition contains several entries associated with material\objectivity. In the present edition three separate pages are found under the entry "admissibility," but I was unable to find anything under the usual keywords for this subject. That is puzzling, especially in view of the very clever example problem on the subject (p. 283). In the first edition, the same example was used to show the consequences of nonobjective rheological models. In the second edition no connection with objectivity is made at that point. There is a short, but revealing, hint at the problems associated with requirements of "admissibility" on pp. 482–483. A modest expansion would have been welcome.

Part IV concludes with an excellent chapter on rheometry.

Although the organization and the content of the book have been substantially changed, the intended function of it has not. This is not a book about polymer processing or about numerical methods for solving problems in non-Newtonian fluid mechanics, although the subject matter of the book is certainly relevant to those endeavors. At the end of each of the major topics, the authors give a realistic assessment of how the results can be used to solve problems of engineering interest. One must conclude that in most realistic cases only small extrapolations from known to unknown flow situations or from known to unknown rheological responses are warranted. First and foremost, this is a teaching book that will be rewarding to the serious teacher and the committed student. The book has been written and produced at a high level too seldom achieved in our current "quick-fix" environment. The student who persists through Volume 1 (and presumably Volume 2) will have a profound knowledge of polymer fluid dynamics. The constitutive equations he or she will have learned will have some, but limited, practical value. That, however, is a matter of secondary importance. The authors express their own view on the choice of presentation very clearly on p. 294. "In future years new constitutive equations will undoubtedly be developed, but it is hoped that the methodology taught in these chapters will prevail." I believe that is a well-founded hope.

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A review of Volume II will appear in a subsequent issue.

Transport Processes in Chemically Reacting Flow Systems

By Daniel E. Rosner, Butterworth Publishers, Stoneham, MA, 1986, 540 + xxvii pp., $52.95

Chemical engineers are supposed to be experts at dealing with chemical systems, but that ability is not obvious from a perusal of the standard textbooks on transport phenomena. The text by Rosner is a belated attempt to fill some of that void, and for that reason alone it should be considered an important work. Some may criticize the book for its emphasis on combustion, at the expense of other kinds of reacting flows, but that emphasis merely reflects the interest of the author; because it really is a book on transport processes, however, and not combustion, it is not a substitute for the more complete works on combustion by Williams, Toong, and Strehlow.

The book is aimed at advanced undergraduate and beginning graduate students in chemical engineering or related fields. It consists of eight chapters which fall into three groups: The first three chapters consist of an introduction and then development of the conservation laws and constitutive equations for transport in multicomponent systems. The fixed-control volume approach is used for presentation of the conservation laws, which leaves open the question of how to define internal energy in an open multicomponent system (cf. Slattery's treatment with a mass-averaged material volume). The next three chapters deal with the "mechanisms, rates, and coefficients" (or rather, applications) of—in turn—momentum, energy, and mass transport. These chapters contain most of the applications. Next is a chapter on similitude, dimensional analysis and modeling, with applications to chemically reacting flow systems. The last chapter is a rather extended example of an application to heat transfer in a furnace, which illustrates the author's approach to solving complex problems and suggests some problem-solving techniques. For a dozen of the assigned problems in the book there are detailed solutions in the back of the text, a feature that I like.

There is an unusual mix of advanced theoretical concepts and practical applications. For example, jump conditions are treated, yet so are jet flows and recirculating flows. In most cases the coverage is not very deep, and many more topics are introduced to the reader than can be dealt with in a very substantial way. For example, the author discusses phoretic phenomena, residence-time distributions, surface-renewal models, $k - \epsilon$ modeling, detonation waves, and so on. And unlike so many other chemical engineering texts on transport phenomena, this one actually contains the word "vorticity." So many topics are introduced, and the illustrations are so pleasing and clear, that I sometimes wondered if I was reading a Cliff's guide to transport phenomena. Despite the number of topics with which the author deals, there are some noticeable omissions for engineers who deal with reactions in liquid systems, such as interfacial tension effects and suspensions.

The text is laid out well for ease of use. For example, the table of nomenclature is inside the cover, and the index is very complete, comprising 12 pages at two columns per page. On the other hand, the text seems to be *over*organized, with up to three periods appearing in the section headings, e.g., Sect. 7.2.2.2. Also, the author is enamored with acronyms e.g., MWR, BC, IC, TCE, MIE, ACF, WSR (but he ran out of them on Figure 6.1-1), and he uses the trendy "/," "vs.," and (optional) parentheses (or parenthetical parentheses, I'm not sure which) to excess. An interesting notation he uses is "$\{\ \}$" to denote functional dependence. There is no section on tensor notation (and so the meaning of "div" is unclear, i.e., which index is contracted?), and there is need for a section that summarizes the basic equations for nonconstant physical properties and also summarizes useful vector and tensor expressions in the common coordinate systems.

In spite of these shortcomings, I think that this text fills a definite void in the literature of chemical engineering and will be useful as a reference as well. Rosner should be commended for his contribution.

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