An Introduction to Thermodynamics, R. S. Silver, Cambridge University Press, England (1971). 150 pages. $9.50.

Thermodynamics has so many faces that it provides an irresistible attraction to many to paint a new picture of its fascinations. Each such new representation adds some insight into the always elusive features of this science. But always there is a failure to capture the full meaning and character.

This brief monograph presents an excellent example of how a few partial insights produce an eagerness on the part of the author to make his contribution. Most of the discussions are conventional and the coverage is not particularly extensive. It might be a useful addition to a reference library and useful in broadening the outlook of the student.

The author endeavors to develop his analysis and formulation of mechanical work in such a manner that thermodynamic irreversibility is introduced fundamentally in the basic energy equations. He is partially successful in this and does broaden the base somewhat over many discussions of work. The treatment, however, is somewhat misleading in that it is easy to infer that irreversibility is to be generally understood in terms of mechanical work. In the same context of energy equations, the introduction of heat and internal energy are logically incomplete. Discussions of mixing and chemical reaction are conventional. Only the most incidental mention is made of the irreversibilities in these processes.

No bibliography is provided nor specific references to recent discussions of irreversible processes. Some casual mention in the introduction is made of some of the more imaginative recent treatments of thermodynamics. The goals which are initially set forth at the beginning of this monograph are scarcely glimpsed and not at all attained.

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Chemical Engineering Kinetics, J. M. Smith, 2nd Edit., McGraw-Hill, New York (1970). 612 pages. $15.50.

This second edition of one of the early books that considered chemical engineering reactor design and kinetics contains an extensive revision of the material based on developments in the interim 1956 to 1970. The author states that his objective of a "clear presentation and illustration of design procedures which are based upon scientific principles" hasn't changed and is based on the "viewpoint that the design of a chemical reactor requires, first, a laboratory study to establish the intrinsic rate of reaction, and subsequently a combination of the rate expression with a model of the commercial-scale reactor to predict performance."

Certainly the table of contents follows these guidelines: 1: Introduction, 2. Kinetics of Homogeneous Reactions, 3. Design Fundamentals, 4. Homogeneous Reactor Design: Isothermal Conditions, 5. Temperature Effects In Homogeneous Reactors, 6. Deviations from Ideal Reactor Performance, 7. Heterogeneous Reactors, 8. Heterogenous Catalysis, 9. Kinetics of Fluid-Solid Catalytic Reactions, 10. External Transport Processes in Heterogeneous Reactions, 11. Reaction and Diffusion Within Porous Catalysts: Internal Transport Processes, 12. The Global Rate and Laboratory Reactors, 13. Design of Heterogeneous Catalytic Reactors, 14. Fluid-Solid Noncatalytic Reactions.

To assess the success of the text in attaining its objectives, I will use the viewpoint of classroom use. The first term that comes to mind is comprehensive coverage, especially for a first course. This is both a strength and a weakness; the first because the contents can be used as a reference for many real-life problems, the second because the amount of material is somewhat overwhelming to students. Of course, one of the roles of the teacher is to highlight the important points, but the book is written essentially on the basis of reading everything, and this aspect does seem bothersome to (especially undergraduate) students.

Another strength of the text is the use of very many good examples, mostly considering real reactions. My opinion is that reading detailed examples and then working problems is one of the most effective learning procedures. There are adequate problems at the end of each chapter, and a solutions manual is available. However, the fundamental derivations and basis (assumptions) of some of the methods and formulas is sometimes weak, for example, the general treatment of a plug flow reactor with volume expansion. The basic definition of reaction rate in Chapter 2 could give the implication that this is different in batch and flow reactors, and because of possible confusion from earlier courses, a serious problem could result.

A reasonable discussion of catalysis, catalytic reaction rates, pore diffusion, and transport limitations important in heterogeneous reactions is given. Some of the more recent activities, such as catalyst deactivation and slurry reaction are discussed, but others such as stability, optimization, and fluidized beds are merely mentioned. Chapter 6 on nonideal flow patterns focuses primarily on idealized situations, although the important points could have been made in a more realistic manner. However, the specific topic of fixed bed reactors is described much better in Chapter 13. Virtually nothing is said about gas-liquid or liquid-liquid reactor design.

To summarize, the book contains an impressive coverage of many of the methods and results needed for reactor design in the chemical process industries. The extensive material can cause some pedagogical problems, and the instructor will need to take this into account; but if a student comprehends the contents he will be well on his way towards being able to design chemical reactors.

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Momentum, Energy, and Mass Transfer in Continua, John C. Slattery, McGraw-Hill Book Co., New York (1972). 704 pages. $19.50.

According to the publisher's description, this book is intended to serve as an "integrated" introduction to fluid mechanics, thermodynamics, heat transfer and mass transfer, and is based on class notes used by the author for a graduate course in transport phenomena at Northwestern University. The inclusion of thermodynamics in this description may well be misleading, however, as the thermodynamics is included only as it is pertinent to understanding the foundations of momentum and heat and mass transfer.

There is much to be said which is good about this book, particularly with regard to the care (though not with many of the details) with which the foundations of the subject are laid in Chapters 2, 5, and 8. This is especially true of chapters 5 and 8 which present the relationship between classical thermodynamics and transport processes. The lack of attempts to unify knowledge from the variety of subjects in chemical engineering is a major weakness of most texts and a matter for serious concern for educators who must help the student synthesize what often appear to be diverse and unrelated subjects. Hence, on this point the author is to be commended.

Also noteworthy is the attempt to provide a unified view of various integral averaging techniques in Chapters 4, 7, and 10, ranging from time-averaging in a mathematical description of turbulence to the by-now standard techniques of integral balances for approximate solutions of the transport equations. It is perhaps not surprising in view of the author's own research interests that the sections in Chapter 4 on flow through porous media and on the application of extremum principles to achieve bounds on macroscopic features of fluid flow are both particularly lucid and well-written. It must be noted on balance, however, that the same strength of presentation is not present in the very brief description of turbulence and the Prandtl mixing length approximation in the same chapter, which emerges rather devoid of physical description due to the use of a purely continuum mechanical approach for derivation of the constitutive relation for Reynolds stress.

On the negative side are a number of relatively minor, but annoying, misrepresentations of physical intuition and omissions of subject, both major and minor, which may be of particular relevance in a book for chemical engineering students. For example, little mention is made of interfacial phenomena in spite of their crucial role in many transport problems in chemical engineering. In fact, the only reference to surface tension I could find (p. 56) consisted of a one-page discussion of the continuum description of phase interfaces, with surface tension appearing in the single equation on the page without physical description or prior discussion. Likewise, almost nothing is said of the natural convection mode of heat transfer. However, it may be said with justification that these omissions (or indeed some of Slattery's inclusions) are a matter of personal taste and hence of questionable relevance in a review of the book.

In fact, my main concerns about the book as a pedagogical tool are the more serious assumptions which the author makes about audience. In particular, the reader is assumed to have considerable knowledge of tensor analysis and of the abstract concepts of functional analysis and modern algebra, and yet, apparently to have a much less developed grasp of solution techniques for partial differential equations. Thus, for example, much of the introductory material in the foundations chapters (1, 2, 5, 8) is unnecessarily abstract because of the use of concepts of modern algebra and is likely to cause considerable difficulty for the student who has not encountered a fairly advanced course in transport phenomena as an undergraduate. (Consider the following introduction to section 1.1.1.: "A body is a set; any element S of the set is called a particle or a material particle. A one-to-one continuous mapping of this set onto a region of the space E studied in elementary geometry exists and is called a configuration of the body: $z = X(\zeta)$, $\zeta = X^{-1}(z)$. The point $z = X(\zeta)$ of E is called the place occupied by the particle ζ, and $\zeta = X^{-1}(z)$ the particle whose place in E is z").

On the other hand, having derived appropriate governing equations in considerable detail, complete with reference to simple fluid theory and other advanced topics, the author abandons this level of rigor in attempting to obtain solutions. We are continually asked to intuitively "guess" the fundamental form of the solutions, even when dealing with linear differential equations. We are introduced to similarity transformations with no specific motivation for the particular problem nor any of the more general motivations common to problems which lack inherent length scales.

Finally, the parameter approximations of high and low Reynolds number are presented without particular care to describe the limits of applicability or the nonuniform nature of the approximations in terms of spatial position. This is particularly unfortunate for the section on boundary-layer theory which is partially presented in the modern terms of singular perturbation theory and partly by intuition, but which must leave the uninitiated reader feeling that the whole idea of boundary-layer theory has been pulled from a hat. Questions of the appropriate positions for application of boundary-conditions became unnecessarily complex when stretched coordinates are introduced without any mention of matching conditions (in fact, the word "patch" is used on p. 140). Likewise, it is mentioned that the vertical velocity component does not vanish at the outer edge of the boundary-layer region; however, without pursuing the concepts of perturbation theory, this fact is left unexplained and probably quite mystifying for the uninitiated student. All in all, the emphasis on modern algebra without a requisite knowledge of partial differential equations produces a rather strange mixture of rigor and detail in some sections with intuition and lack of detail in others and of both sophistication and naivety at the same time.

The book will find its greatest interest among those who are actually teaching graduate level courses in transport phenomena. Whatever other faults the book may have, the author presents many subjects from a refreshingly unique point of view and does offer a considerable amount of well-conceived unification and organization of material as noted above. All of us can benefit from utilizing some aspects of Slattery's presentation in our own lectures. Whether the book can be successfully used as the actual textbook for such a course remains to be seen. It surely does fill a gap between the more specialized graduate level texts in each of fluid mechanics, heat and mass transfer, and the less sophisticated (though unified) approach of Bird, Stewart, and Lightfoot's familiar text. However, for the reader being introduced to a more advanced level of knowledge of transport phenomena for the first time, the text would seem to offer a number of difficulties as suggested above.

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The Ecological Effects of Oil Pollution on Littoral Communities, E. B. Cowell, (ed.), Institute of Petroleum, 61 New Cavendish Street, London W1M8AR (1971). 250 pages.

This book contains the proceedings of a symposium organized by the Institute of Petroleum held at the Zoological Society of London, November 20 to December 1, 1970. It presents the results of oil pollution research carried out between 1967 and 1970 at the Orielton Field Center, Pembroke, SW Wales.

The geographical focus of the research is Milford Haven, a major new deep water oil port which grew from 200,000 tons per annum in 1960 to 40 million tons by 1969 and which anticipates handling 80 million tons by 1980. The scene is set for the later biological papers by Captain G. Dudley (Harbor-