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