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 (Harbormaster, Milford Haven Conservancy Board) with an excellent statistical summary of the oil pollution history associated with the port's rapid growth.

The bulk of the biological material is the work of Jenifer M. Baker and Geoffrey B. Crapp who between them either authored or coauthored 17 of the 22 papers in the book. Miss Baker's timely work on the effects of oil pollution on plant life is particularly significant. The complexity of the oil pollution problem is shown in her findings which include the following:

1. Although the reasons for it are not clear, oil pollution produces statistically significant growth stimulation for some marsh grasses.
2. Extremely low concentrations of oil in refinery effluent cause damage to plants due to successive coverage with an oil film. The damage apparently is not due to soil contamination.
3. Successive spillages are damaging, but the recovery of marsh flora from up to four spills appears good; a single spillage does not cause long-term damage.
4. Differences in the properties of the polluting oil are very important; the low boiling fractions of crude oil are the most toxic. The undiluted emulsifiers tested were more toxic than fresh Kuwait crude, but concentrations of less than 10% caused no permanent damage.

Mr. Crapp's papers concern the littoral fauna, and they complement those of Miss Baker. They support and extend previous work of others who have dealt with the effects of oil pollution on animal life.

A strong point of the book is its Discussion sections in which the symposium attendees critically discuss and supplement the presented papers. Several noted experts in the oil pollution field attended and their discussion substantiates the credibility and findings of the authors.

The book contains valuable reference information and is recommended to chemical engineers who are actively engaged in correcting oil spill pollution problems.

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Analytical Methods in Conduction Heat Transfer, Glen E. Myers, McGraw-Hill Book Company, New York (1971). 508 pages. $19.50.

This is an excellent introductory textbook to the advanced treatment of heat conduction problems. The physical problems are well formulated into mathematical ones for which the solutions are developed clearly, often followed by the physical interpretations of the results.

The book consists essentially of two parts: analytical and numerical methods. In the analytical approaches, the methods of Frobenius, separation of variables, superposition or Duhamel's theorem, complex combination for sustained periodic solutions, and Laplace transforms are discussed. The mathematical treatments are given, in general, first for simple geometries with fewer variables and then extended to more complex situations. These subjects may be found in various mathematical textbooks on advanced calculus but they are treated here with particular reference to conduction heat transfer problems. Noteworthy is a method of splitting complex nonhomogeneous problems into a set of simpler subproblems for which the solutions may be obtained with relative ease.

In view of the ever-increasing need for the computer-oriented solutions, emphasis is placed on the numerical methods of finite differences and finite elements. In fact, one-half the book is devoted to this subject matter. The finite difference method has been used extensively since the dawn of the computer age; however, the method of finite elements has been relatively recently introduced in association with the need to provide thermal information for thermal-stress evaluations even though the variational calculus on which the finite element method is based had been developed quite some time before. The presentation in developing these numerical schemes is excellent with reasonable treatment on numerical instabilities associated with explicit, implicit, and combined explicit-implicit formulations of transient problems. The use of the matrix, system is shown to simplify the mathematical treatments considerably and systematize the inputs to computer applications.

The usefulness of normalization or non-dimensionalization is also demonstrated, and ample exercise problems with prepared answers enhance the value of the book.

The shortcomings of the book may be the sparse treatment of three dimensional or spherical coordinate systems (only one simple case is considered), and the complete absence of the use of Green's functions, transformation methods other than Laplace transform, problems involving phase changes, and complex variable conformal mapping for two-dimensional steady state temperatures. In the numerical treatments, systems involving flowing media in which the fluid temperature is space- and time-dependent as a result of the heat transfer with the surrounding structures are not considered at all. This is one of the most frequently confronted conduction problems in the transient thermal processes in chemical and nuclear piping and heat exchangers for which the computer-aided solutions are almost essential. The major problem here is a difficulty in selecting a proper computation time from a numerical instability standpoint because the stability criterion is also dependent upon the flow velocity.

In spite of the shortcomings mentioned above, the book is of a high quality—well-written and easily understood. Although it is addressed primarily to the first-year graduate student, it may serve as an excellent reference book for those who, at times, need to refresh themselves on the analytical and numerical approaches of conduction heat transfer. A thorough understanding of the analytical methods shown in the book will help a reader advance to the more complex books such as Carslaw and Jaeger's treatise on Conduction of Heat in Solids.

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Elements of Transport Phenomena, Leighton E. Sissom and Donald R. Pitts, McGraw-Hill Book Company, New York (1972). 813 pages. $18.50.

The stated purpose of this book is to combine the elements of heat, mass, and momentum transfer in such a way that it can be presented to junior-level engineering students with a knowledge of differential equations and an elementary exposure to vector analysis. The authors have attained their goal. However, the text is not suitable for graduate-level instruction in engineering or more helpful than existing texts to the practicing engineer who is familiar with transport phenomena.

The authors begin with definitions and the elementary aspects of thermodynamics and fluid statics. They continue with the classical equations of steady and unsteady state heat transfer, elements of diffusion with and without chemical reaction, and radiative heat transfer.

The basic equations of mass, momentum, and energy are derived and used