ChE book reviews

Transport Phenomena for Engineers, Louis Theodore, International Book Company (1971) xiv plus 338 pages Scranton $12.00

This book *emphasizes the bare skeleton of transport phenomena. It teaches the systematic formulation and solution of boundary value problems* involving momentum, energy, and mass transfer, and combinations of the same, in solids, and in liquids in laminar flow. The coverage includes chemical reactions involving heat effects.

A student who studies this book will become proficient in setting up transport phenomena boundary value problems. He will have an opportunity to apply his mathematical tools: Leibnitz rule for differentiating integrals, Gauss' divergence theorem, separation of variables and Laplace transform methods for solving partial differential equations, properties of Bessel functions and the error function, Runge-Kutta and finite difference methods for solving ordinary and partial differential equations. He will develop insight into the physical significance of the pertinent partial differential equations. Chapter 2 provides some mathematical tools. Chapters 3, 4, 5, and 6 are the meat of the course.

In Chapter 2, the author teaches the fundamentals of vector analysis. In chapters 3, 4, 5 *he derives the equations of continuity, motion, energy, and mass transfer. He uses the vector method and a stationary volume element.* In each of these chapters he tabulates the equations in rectangular, cylindrical, and spherical coordinates. He assumes all physical properties are constants. He restricts discussion to binary mixtures, and he uses a simplified form of Fick's law.

In sections 3.6, 4.6, 5.6, 6.3, and 6.5 *he teaches by presenting a series of well planned examples.* These show the student how to "extract" the equations for a particular case from the tables of general equations, how to choose appropriate boundary and initial conditions, and how to solve a boundary value problem after it has been formulated. He emphasizes systematic procedures. The examples are stimulating. Most are adapted for self study. A few are specially suited for inclass discussions. Problems at the ends of chapters 3, 4, 5, 6 give the student a chance to drill. These problems also are well planned and stimulating, and are not overly difficult.

In most part the author writes unusually well. *He helps his reader proceed rapidly by leaving in the intermediate steps. And he encourages the student to participate in the thought process.* The format of the book is conducive to study. The print is large. Bold face type effectively sets off chapters, sections, examples, figures, and tables. Equations and text are nicely spaced out. Figures are numerous and well drawn. The page size, type, and format are reminiscent of *Transport Phenomena* by Bird, Stewart, and Lightfoot, John Wiley and Sons, publisher.

Most of the nomenclature is consistent with that of *Transport Phenomena* by Bird, Stewart, and Lightfoot. There are some differences. For example:

Symbol	Units	
df	L^2	differential surface element, p. 40.
$d\tau$	L^3	differential volume element, p. 45.
lb_m		pounds moles , p. 191.
<Q>	of Q	time average of Q in turbulent flow, p. 58.

To supplement this book the student will need a table of Laplace transforms, a handbook of numerical tables of functions, and Dwight's *Tables of Integrals and Other Mathematical Data,* the MacMillan Company, publisher.

Some observations and suggestions:

The author uses Liebnitz rule many times, but he does not include this rule in his chapter 2 on mathematical preliminaries. On pages 78, 84, 145, 203 he applies the rule implicitly. The author does a good job of deriving the equation of change by the vector method. Some students will ask about $\tau \cdot df$, p. 83 and will question the Gauss type divergence theorem, p. 85. More mathematics in chapter 2 would take care of such questions.

The reviewer feels that the *shell balance* method is the least ambiguous method for deriving the equations of change. There are only two examples of shell balances in the book, see index. Both are confusing. A more explicit explanation of the sign convention for τ would help. The author uses a simplified form of Fick's law. The reference velocity for the mass flux vectors J_A and j_A pp. 193-195 is not clear.

This book is a text not a handbook. Nevertheless it contains considerable useful reference material. A list of the tables would provide a convenient index to this material. A concise summary of the examples and their solutions is tabulated pp. 247-251. There are 50 problems total at the ends of chapters 3, 4, 5, 6.

This book "evolved from notes prepared by the author for a required *one*-semester three-credit course given to *senior* chemical engineering students . . . The course is offered as an elective to other engineering disciplines . . ." The book has been pared down to the bone. *Prediction of transport properties, shell balances, turbulence, convective coefficients, and macroscopic balances are discussed very briefly or not at all.* Even the bibliography has been omitted. The author depends on the teacher to provide embellishments.

The drastic abbreviation in content adapts the book to special applications. Foremost is that of text for a 3 credit senior course like that the author teaches. *All three transport phenomena can be covered in a single semester.* Ideally such a course would be preceded by a more traditional two course sequence in momentum, energy, and mass transfer. The *senior course would then fix the structure of transport phenomena in mind and stimulate interest in applications and advanced study.* This book would be useful as the text for a *refresher course for practicing engineers.* For this purpose the current edition of *Transport Phenomena,* by Bird, Stewart, and Lightfoot would be a good companion volume.

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NEWS (Continued from page 152)

teraction with industry, information about new textbooks being written or evaluated etc. A third objective is to interject into the whole educational system the exciting and new experiments and ideas that are being done.

The format of the minisession is unique. From the responses to a questionnaire circulated in June, some will be selected to briefly describe the unique features and challenges in presenting this material. These will be very brief, say 2 to 10 minutes, with the main purpose being to introduce people and ideas. The meeting may break up into smaller buzz sessions or group discussions; again the main purpose is for everyone to get to know each other and to have some idea of what everyone is doing. Available at the back of the room will be copies of course descriptions, hopefully from each and every school. We may also have sample textbooks or manuscripts on display. After the formal session, we then adjourn to have lunch together (in groups of 6 to 10) in various locations so that the discussion can continue informally.

The minisession forms part of the "Free Forum on Undergraduate Education" with G. F. Bennett, University of Toledo, Chairman, and G. M. Howard, University of Connecticut, Co-Chairman. The minisession is co-chaired by D. R. Woods, McMaster University, Hamilton, M. J. Gluckman, City University of New York and Drs. Bennett and Howard. For more information contact: D. R. Woods, McMaster University, Hamilton, Ontario, Canada. 416-522-4971 Ext. 292, or G. F. Bennett, University of Toledo, Toledo, Ohio 43606.

ANNOUNCEMENT

The Latin American Teaching Fellowships program is now accepting applications for positions in Latin America from individuals in the social and natural sciences, engineering, business, law, and medicine who hold PhD's, professional degrees, or are PhD candidates. Placement possibilities exist for the 1973-74 academic year. These opportunities are part of a service program to assist latin American universities to develop advanced programs. Salaries are geared to moderate subsistence level rather than being competitive with North American salaries. Address inquiries to Latin American Teaching Fellowships, Fletcher School of Law and Diplomacy, Tufts University, Medford, Massachusetts 02155

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TO DEPARTMENT CHAIRMEN:

The staff of CHEMICAL ENGINEERING EDUCATION wishes to thank the 55 departments whose advertisements appear in this fourth graduate issue We also apprepiate the excellent response you gave to our request for names of prospective authors. We regret that, because of space limitations, we were not able to include some outstanding papers and that certain areas are not represented. In part our selection of papers was based on a desire to complement this issue with those of 1969, 1970 and 1971. As indicated in our letter we are sending automatically to each department for distribution to seniors interested in graduate school at least sufficient free copies of this issue for 20% of the number of bachelor's degrees reported in "ChE Faculties." Because there was a large response to our offer in that letter to supply copies above this basic allocation, we were not able to fully honor all such requests. However, if you have definite need for more copies than you received, we may be able to furnish these if you write us. We also still have some copies of previous Fall issues available.

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