BOOKS

Ion Exchangers—Properties and Applications, Konrad Dorfiner, Ed. by Andrée Fé Coers, Ann Arbor Science Publishers, Inc., Mich. (1972). 317 pages. $17.50.

This excellent book is recommended highly, especially for engineers. It arrived at a time development work had led me back into the use of iron exchange as a processing tool. Despite my library on the subject, I have kept this book under lock and key for fear of its being involved in an irreversible "book exchange."

Why the strong praise? The book is well written, easy to read, and essentially free of mid-numbing jargon. In today's avalanche of scientific literature, much of it written in code; Dorfiner's text communicates. Hats off to the author and/or the translator.

Worth the price alone are the numerous tables of ion exchange materials and their properties that are available from various worldwide manufacturers. The subject matter and bibliography provide enough depth for all but the experts. Students and working engineers will find easy access to a wealth of useful information. Though emphasizing standard synthetic beaded ion exchangers, the author covers everything from ion exchange membranes and electrodialysis to liquid ion exchangers, from analytical techniques to large-scale industrial systems.

The book's strong point is also its most vulnerable. In today's climate of specialization the book may not specialize enough for some. Reading it cover to cover won't make you that specialist, but it gives a good start in the right direction.

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The Principles of Chemical Equilibrium, 3rd edit., Kenneth Denbigh, Cambridge University Press, New York (1971). 494 pages. Cloth $14.00. Paper $4.95.

As one might expect of a text entering its third edition, the virtues are many, the shortcomings few. The first 110 pages are an excellent review of the basic principles of thermodynamics. The development of the second law is one of the best anywhere. Students (and professors) have been befuddled for generations by the abstract nature of thermodynamics. Here concrete physical observations are shown step by step to lead logically and inevitably to the abstractions of entropy and the second law.

The next 220 pages cover most commendably the topics of phase and chemical equilibrium with two-thirds of this treatment devoted to the former. One of the few criticisms which might be raised is that Henry's law and Nernst's law are discussed as special cases of ideal solution behavior. This is mathematically correct, but a more physically realistic basis is to treat these laws as special cases of nonideal behavior.

The final 125 pages are devoted to statistical mechanics, and this is the least successful part of the text. As the author states, the extreme brevity of this introduction to such a vast subject requires a reduction in the rigor and thoroughness which characterizes the remainder of the book. The fundamental principles of statistical mechanics are developed from a point of view midway between the macroscopic development employed by Gibbs in his original work and the microscopic development adopted in many modern texts. A more conventional approach seems warranted for an introductory treatment of statistical mechanics.

Many interesting problems are found at the end of each chapter. The text is well written, and the approach is a highly personal one with many rare insights into thermodynamic phenomena. For example, the author shows that for many organic compounds the presence of air in the vapor enhances the predictive capability of the Clausius-Clapeyron equation. And on page 8 the author points out that ordinary water violates the standard interpretation of Gibb's phase rule.

Because of the book's thoroughness, clarity, rigor, originality, and interesting digressions, it belongs on the reference shelf of every serious student of chemical thermodynamics. The text is suited for advanced thermodynamics courses either at the senior or graduate level. Its use as a chemical engineering text is problematical. The theoretical content of the book is unequivocally excellent, but many topics relating to engineering practice are omitted. Thus for chemical engineers, as they are traditionally taught in this country, the book should be supplemented by some more practically oriented material from other sources.

Those familiar with the second edition will find little change. It is interesting, however, that as England rapidly converts to the metric system, Denbigh's book is a leader in this direction. This book, which in earlier editions made exclusive use of the metric system, is now largely converted to S.I. units (Système International d'Unités). Soon only American textbooks will remain to defend a system of units based on among other things the distance from the English king's finger to the tip of the English king's nose.

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Sewage Treatment (Basic Principles and Trends) 2nd Ed., R. L. Bolton and L. Klein, Ann Arbor Science Publishers, Inc., Mich. (1972). 256 pages. $14.50.

That so brief a book can treat so large a subject so well is no small tribute to the authors. *Sewage Treatment* is well characterized by its byline *Basic Principles and Trends* as it is essentially an introductory textbook. In general, it is well planned, employs clear writing, and has good tables and a good index. Some specific limitations include a lack of a glossary and/or list of symbols and abbreviations and the usage of combined sewers only for most textural examples. The major limitation, however, is that the book is thoroughly British. It does provide a good concise introduction to sewage treatment that should be valuable to most chemical engineers whether familiar with the subject or not.

The book begins with an excellent brief historical introduction that leads the reader from the origins of waste

waters through their impact on receiving waters to considerations of treatment methods. The chapter on the nature of sewage and its chemical analysis is unusually thorough and contains many excellent tables on common sewage tests and their use or significance, typical analyses (British values), and the like. After a brief look at the sewage systems or pipes, the flows therein, and storm water handling, the book moves quickly through the various techniques of conventional sewage treatment. The major processes of pretreatment, primary treatment, and secondary (biological) treatment are all given brief but adequate descriptions, with the exception of oxidation ponds to which a rather inadequate description is given.

The chapter "Methods of Improving Final Effluents" is generally too brief and is confusing in places. In particular the section on land treatment is not only brief but, confusingly, contains descriptions of nitrifying filters and removal of nutrients as subsections. "Sludge Treatment and Disposal" is a generally good discussion of this important facet of sewage treatment except that, although the British may practice the disposal of undigested sludges at sea or on land, current U.S. practice is to digest all sludges before such disposal. The last five chapters (9 to 13) of the book constitute a collection of interesting but miscellaneous subjects that do not naturally fall into any logical order.

The chapter on flow measurement (Chapter 9) introduces the use of weirs and flumes for the open-channel flow measurements necessary in most sewage treatment works but not commonly used in chemical engineering practice. The chapter on industrial or trade wastes is generally quite good and should be of special interest to chemical engineers (skip the chapter introduction). The table of example trade waste analyses is skimpy but serves to indicate the variations found in such wastes.

The chapter on small treatment plants is weak. "Trends in the Field of Water Pollution Control" discusses many topics including: regionalization, reclamation, load variations smoothing, plant automation, tip drainage, storm water treatment, radioactive wastes, and the synthetic detergents. The closing chapter (13) on chemical calculations is really too brief, covering only overall efficiency, applicable stoichiometry, sludge volume-moisture content relationships, and the conversion of British to metric (SI) units. The appendices include only suggestions for further reading and a good set of conversion tables (British-to-metric).

Perhaps the major drawback of this book for engineers in the United States is simply that it is British. For those interested in good examples and general discussion, this fact is of no consequence. However, the book is weakened as an introductory text or textbook for U.S. engineers simply because the use of British units, practices, tests, and average values will bring confusion to those not sure of the appropriate U.S. quantities. It is unfortunate that a U.S. version of the book, or one with insertions of analogous U.S. quantities, was not made in the U.S. printing.

In summary, the book is a good concise review of sewage treatment that can be recommended for most engineers' bookshelves for its brief but adequate descriptions of most of the common treatment methods.

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Heat Transfer, F. J. Bayley, J. M. Owen, and A. B. Turner, Barnes and Noble Book Co., New York (1972). 438 pages. $16.50.

The authors have collected a large number of classical problems covering heat transfer by conduction, convection (incompressible fluids only), and radiation which previously have been solved either analytically or by numerical techniques. A chapter deals with heat transfer by boiling and condensation, and a final one is concerned with the design of heat exchangers. There also is a section which introduces the reader to the numerical techniques used in solving some of the problems. Approximately 100 pages are devoted to the mechanics of fluid motion with heavy emphasis placed on boundary layer theory. Although the text is theoretical, at the end of each chapter there is a sufficient number of problems which are cast in practical form. In formulating these problems the authors sometimes use the S.I. units, the idea being to acquaint the reader with a system of units already adopted by a number of countries and presently being considered by our own.

Each subject is introduced starting from first principles; however, the degree of mathematical sophistication demanded of the reader increases rapidly, probably too rapidly for this book to be considered for use in an introductory heat transfer course for chemical engineers. The absence of many illustrative problems in all but the sections on free and forced convection does not help.

While the book probably is too theoretical to be used in an introductory course it certainly should be given consideration for use at more advanced levels, including graduate courses. The authors have selected classical problems which well illustrate the various modes of heat transfer. The statements of the problems are clear yet concise, the solutions are lucid. If there is a serious criticism to be made of the book it is that the authors leave it to the reader to deduce that multiple modes of heat transfer may play a role in a given problem.

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Process Dynamics and Control: Vol. 1. Analysis of Dynamic Systems, J. M. Douglas, Prentice-Hall, Englewood, N. J. (1972). 367 pages. $16.95.

This process dynamics portion of Professor Douglas' two-volume book introduces a wide variety of dynamic processes of chemical engineering interest. It should be of value to the chemical engineering student, the practicing process engineer involved in dynamic systems design, and the researcher. The systems analyzed start with the simple stirred-tank reactor and include many different types of chemical reactors, heat exchangers, and separation processes.

The introduction on optimal design and optimal steady state control concepts is an attractive way to bridge the gap between the traditional steady state approach and the transient analyses presented later. Model building is then introduced for the linear and nonlinear cases, along with linearization of nonlinear models.

The chapter on response of lumped parameter models discusses first- and second-order systems in both the time and frequency response domains. Dynamic analysis of a series of stages in a separation process uses concepts from the calculus of finite differences. Distributed parameter systems are analyzed in the frequency response and time domain with comparisons between lumped parameter approximations and distributed parameter solutions. Several approximation methods for matching the process reaction curves from real processes are discussed.

The final chapter is a short discus-