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-

sion of the use of perturbation theory in the analysis of nonlinear systems. Examples are presented for lumped parameter and distributed parameter systems.

The book was designed for undergraduate and graduate level courses. At the end of each chapter a large number of problems are given with an indication of their level of difficulty. That portion of the text concerned primarily with lumped parameter systems has been designated as suitable for an undergraduate course. Since some type of chemical reactor is used as the basic example in many discussions, students should have a reactor design course as part of their preparation.

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Chemical Technology: An Encyclopedic Treatment. The Economic Application of Modern Technological Developments, Barnes and Noble, New York. 8 volumes.

The encyclopedia (8 volumes) is prepared in such a way that the information is accessible to a large number of readers whose knowledge of science and technology is limited. A nonspecialist in need of brief accurate data about materials and processes can refer to a single reference work that correlates technical facts with economic and financial data in a simple yet highly organized and readily understandable fashion. This encyclopedia is a comprehensive guide, broad enough in scope to include information about all the world's raw materials. The primary manufacturing and agricultural processes involved, world output prices, and other related information are all presented in such a way that the reader can rapidly gain an overall view of a subject or a variety of subjects.

The wealth of economic information presented in these volumes should be immense value to those engaged in business, manufacturing, finance, economics, journalism, public relations, research, analysis, government, and indeed to everyone involved in commercial applications in marketing of raw materials. This work may be considered a successor to Dr. J. V. van Oss's Systematic Encyclopedia of Technology (Warenkennis en Technologie). The present encyclopedia, however, has been thoroughly updated and comprises an entirely new work that is in every way a far more ambitious and elaborate project than its predecessor.

The first three volumes are now available with five volumes in preparation ($40.00 single copy, $35.00 per copy to subscribers):

Vol. I. Air, Water, Inorganic Chemicals and Nucleonics. 1968. 703 pages.
Vol. II. Non-Metallic Ores, Silicate Industries and Solid Mineral Fuels. 1971. 828 pages.
Vol. III. Metals and Ores. 1971. 918 pages.
Vol. IV Petroleum, Organic Chemicals and Plastics.
Vol. V. Natural Organic Materials and Related Synthetic Products.
Vol. VI. Wood, Paper, Textiles and Photographic Materials.
Vol. VII. Vegetable Food Products and Luxuries.
Vol. VIII. Edible Oils and Fats, and Animal Food Products.

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Cryogenic Fundamentals, G. G. Haselden, Ed., Academic Press, New York (1972). 757 pages.

The publisher's description of this book as "the first comprehensive source book covering the full cryogenic temperature range from liquid methane down to the lowest temperatures reached by physicists" is justified by its 12 chapters, each written by one or more experts. The longest 3 chapters, Heat Transfer, Expanders and Pumps, and Superconductivity stand out. Heat transfer as it relates to low temperatures is treated in depth, with an impressive 6 pages of supporting references. Both fluid dynamic and mechanical aspects of the design and operation of expanders and pumps (both centrifugal and reciprocating) are summarized in a way that should be useful as an introduction to design or as a primer for users of this type of equipment. The phenomenon of superconductivity is described in basic terms (with a minimum of mathematics), practical materials are discussed, and the dynamic behavior of superconductors is given extensive coverage.

The chapters on Refrigeration and Liquefaction Cycles and Materials of Construction and Techniques of Fabrication also excel. The thermodynamics of refrigeration and liquefaction cycles is effectively explained, and comprehensive descriptions of cooling methods (even the vortex tube), liquefaction cycles, practical liquefiers (including methane cycles), and closed-cycle refrigerators are presented. The discussion of materials and fabrication techniques is incisive, with emphasis on fundamentals. Other chapters deal with Insulation, Fluid Dynamics, Adsorption, Instrumentation, Safety, and Thermophysical Data.

The salient features of the book are its diversity of subject matter, extensive references, and a healthy mixture of theory and practice. It will be valuable both to those already working in cryogenics and related fields, and to newcomers. Specialists will inevitably find omissions in areas of their interest, probably in recent developments; but even the specialist may find the book useful as a source of information in areas outside his specialty.

RAYMOND W. MOORE, JR.
ARTHUR D. LITTLE, INC.
CAMBRIDGE, MASS.

Process Control, Alan Pollard, American Elsevier Publ. Co., New York (1972). 393 pages. $14.00.

The author, a Senior Lecturer at the University of Leeds, has covered thoroughly and clearly the fundamental aspects of process dynamics and control. The book seems to be designed adequately for a reader with a background of differential equations and basic unit operations, or as the author states, a knowledge "compatible with the penultimate-year honours course." A knowledge of LaPlace techniques would be very helpful as there is a minimum of material included on these techniques. This book appears to be one of the better books available for self-study in process control for a person with some knowledge of LaPlace transforms because in general it is thorough, clear, and includes numerous examples. It covers most of the usual undergraduate material in this field, process dynamics, control functions, closed-loop analysis, root-locus, frequency response and some discussions and examples of controller mechanisms and complex control loops. It does not appear to be intended for advanced courses or reading in dynamics or control. It does not go deeply into instrument mechanics, valve characteristics, or the selection and location of process instrumentation. The units used may be somewhat unfamiliar to American engineers, but this should not be a significant problem.

The desired contents of a book such as this depend to a large degree on the individual reader or instructor preferences. My preferences would be for