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The first ten chapters of the "Elements" deal with civil engineering aspects of water utilization. Such topics as rainfall, run off, and the population growth of cities are of slight interest to the average chemical engineer, but other sections like the chapters on water distribution and waste-water collection are valuable. The first half of this book provides good reference material for chemical and process engineers.

The second ten chapters relate to the processing of water for use or after use and cover a field of considerable interest to the chemical engineer. A joint discussion of water and wastes is possible because the authors have based their work on principles rather than practice. The latter, however, has not been ignored, and the book is a useful reference for the practicing engineer. The significance of test methods and test results is described adequately, without detailed outlining of the procedures.

The authors describe "unit operations" of water and sewage treatment; this term is not used in the conventional chemical engineering manner but includes also chemical and biological processing. Screening, sedimentation, flotation, and filtration (sand filters) receive detailed consideration, as do chemical- and biological-treatment methods. This half of the book should be particularly useful to chemical engineers. The section on industrial water and industrial wastes is brief, but perhaps it is felt that this field belongs particularly to the chemical engineer and that adequate reference books are already available.

Fair and Geyer have done an excellent writing job on the civil and sanitary aspects of water, and one or the other of their two books is recommended to all chemical engineers concerned with water and waste.

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**Applied Mathematics in Chemical Engineering**, 2 ed., Harold S. Mickley, Thomas K. Sherwood, and Charles E. Reed. McGraw-Hill Book Company, Inc., New York (1957). 413 pages. \$9.00.

About twenty years ago Sherwood and Reed, recognizing that most advanced mathematics texts for engineers had the example problems divided among several fields of engineering, directed the first edition of this book specifically toward problems in chemical engineering. These included reaction kinetics, and unsteady state mass balances, heat transfer fluid flow, and diffusion. Now the authors, in this second edition, have reorganized the book and added new topics which reflect advances in the profession. The primary objective of the text continues to be the formulation and solution of problems which involve differential equations, but also included are chapters on the treatment and interpretation of engineering data, which serve as a natural introduction to the primary objective. Since the mathematics presented in this text is considered as a tool for the solution of problems, much of the rigor found in texts written for mathematicians has been omitted or simplified.

The second edition may be divided roughly into three sections: treatment and interpretation of engineering data, ordi-

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nary differential-equations problems, and partial-differential-equations problems.

The chapter on the treatment of engineering data extends the applications of elementary calculus to other topics from the first edition. However, the discussion of types of graph paper, alignment charts, enthalpy-concentration diagrams, and Ponchon-Savarit method has been eliminated. Those few graphical methods which are retained in this edition, such as the Schmitt method for conduction, are presented in more concise form in the appropriate chapters on numerical solutions. Dimensional analysis is still omitted.

The authors have incorporated some of the topics previously described as theory of errors and precision of measurements into a chapter on interpretation of data. This chapter, which is largely statistics, includes new topics such as factorial design of experiments, statistics of variance, and confidence levels for the Gaussian distribution of small samples.

Prefacing the solution of differential equations is a discussion of methods of transferring the physical problem into terms of differential equations. Some discussion of kinetics is omitted in this second edition. The section on solution of ordinary differential equations is essentially the same as in the first edition except that the presentation of infinite series is rewritten and includes the Frobenius method and more detail on the general form of Bessel's equation.

The section on partial differentiation has undergone substantial change. An introduction to vector analysis including line and surface integrals has been added. New chapters include the Laplace transform and other topics in operational calculus, the calculus of finite differences for use in stage processes, and substantial stress on numerical methods in a form suitable for use of high-speed digital computers. The relaxation method has been added, but few graphical methods have been retained. Missing is the discussion of Jacobians for deriving thermodynamic relationships.

Mathematical topics are introduced directly into the sections where they are first required. Derivations are held to a minimum. As a result, the limitations of the mathematical methods are often touched lightly, and if the reader wishes to understand some of the mathematical concepts better, he should refer to more rigorous advanced-calculus texts. The authors have recognized these limitations and in this second edition have placed suitable bibliographies at the end of every chapter.

Nevertheless, the notable shortcoming of this text is due to its lack of rigor, especially in the first topics of advanced calculus. However, this disadvantage is also a virtue. Because of the simplified mathematical development, the material is in more readily available form for both undergraduates and practicing engineers.

This text continues to be outstanding and unique in the field of chemical engineering. Furthermore, this new edition is a welcome revision containing substantial improvements in organization and coverage and is highly recommended both as a text and a reference.

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