data, methods for estimating vapor-liquid equilibria, group-contribution methods, data sources, and computerized data banks. Finally, the CHEMCO data bank, whose manual is in Appendix E, is described with a sample program illustrated as Example 10.1. In Chapter 11, several topics are addressed concerning the practical usage of a flowsheet program. These are followed by the simulation of a toluene hydrodealkylation process, with a program presented in Table 11.1 for simulation using the UNICORN program, whose "mini-manual" is in Appendix E. The approach in Chapters 8–11, although helpful, does not appear to teach the important concepts as effectively as can be accomplished with numerous examples using one or more flowsheet programs.

Chapter 12, Process Optimization, offers a 38 page introduction to this important subject. The concepts of linear programming are reviewed, but not taught. For nonlinear systems, univariate search procedures are introduced. These are followed by 12 pages of qualitative descriptions of the direct search, steepest ascent, generalized reduced gradient, quadratic programming, simplex, and adaptive random search algorithms, with some comparative performance results. The chapter finishes with introductions to integer optimization and the optimization of batch processes, and Example 12.5, in which a network of heat exchangers is optimized.

Chapter 13, Safety and Loss Prevention, is especially timely and contains a fine qualitative introduction to this subject. After a brief introduction, the section on loss prevention identifies the kinds of hazards, followed by considerations in reducing the danger, either in the design stage or during the operation of a plant. Then, a section on implementing safety measures during design completes the qualitative treatment very effectively. The next section focuses on the more quantitative methods of risk analysis. First, hazard indices are introduced followed by formal hazard studies, such as the HAZOP, Failure Mode and Effect Analysis, and Fault Tree Analysis, and finally the use of expert systems. These measures and methods of risk analysis need more emphasis in design courses, but unfortunately the Wells and Rose discussion seems inadequate for teaching students how to apply and utilize these quantitative methods. Three brief sections follow with qualitative discussions

on site and plant layout, implementing loss prevention programs, and the consideratons in storing and unloading chlorine. The last section considers the application of all of these methods to a process for the hydrodealkylation of toluene. This process study is well-conceived, but nine pages are barely sufficient to confirm the importance of hazard analysis and the utilization of the methods presented in the chapter.

Chapter 14, Storage Scheduling and Plant Availability, provides a brief introduction to the optimal use of storage for raw materials, products, and intermediates in continuous and batch processes. This is followed by similarly brief sections on the scheduling of batch operations, plant availability, and the use of stochastic simulation.

Finally, Chapter 15, Flow Diagrams and Control, in just 34 pages introduces some important design considerations with sections devoted to the synthesis of the control system, microprocessor based controllers, and the piping and instrumentation diagram.

In summary, The Art of Chemical Process Design, provides coverage of the topics most educators seek to include in a modern process design course. However, the treatment is too introductory, with many examples, but too little information for students to master the design methodologies that enable them to undertake quantitative design studies as seniors in chemical engineering curricula. The book contains many exercises following the chapters and these should be very helpful to design instructors.

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Polymer Surfaces and Interfaces

This book is a collection of 12 articles summarizing presentations made at a symposium of the same title that was held in Durham, UK in April 1985 under the auspices of the Pure and Applied Macromolecular Chemistry Group of the Royal Society of Chemistry and the Society of the Chemical Industry of the UK.

The volume has several strengths. First there is a diversity of topics, covering polymer blends to proteins to plasmas, with especially good introductions to an

array of modern instrumental techniques that those in the field working on surfaces will find useful even if they are not particularly concerned with each specific application discussed by the author. The chapters are authoritative and the material is up-to-date.

Several chapters are particularly good in surveying the topic well and providing a good basis for research in their area. These include Winnik's on luminescence techniques, Kinloch's on metal-adhesive interfaces, Petty's on Langmuir-Blodgett techniques and Lundstrom, et al., on protein adsorption. Several of the articles focus more narrowly than they should on the author's own contributions to the field, thus limiting their usefulness as survey articles. This certainly is not unusual in a symposium volume where it is difficult to enforce complete uniformity of style and coverage.

There is no doubt that anyone interested in polymer surfaces and interfaces will want to peruse this volume.

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Annual Review of Numerical Fluid Mechanics and Heat Transfer, Volume 1

The editor's preface states that this new series will survey fluid mechanics and heat transfer for nonspecialists such as graduate students. The chapter titles are:

Chapter 1. Thermal Radiation in Particulate Media with Dependent and Independent Scattering (Tien and Drolen)

Chapter 2. Pressure-Velocity Coupling in Incompressible Fluid Flow (Comini and del Giudice)

Chapter 3. New Explicit Methods for the Numerical Solution of Diffusion Problems (Evans)

Chapter 4. Numerical Methods for One-Dimensional Reaction-Diffusion Equations Arising in Combustion Theory (Ramos)

Chapter 5. Buckling Flows: A New Frontier in Fluid Mechanics (Bejan)

Chapter 6. Numerical Methods for Multidimensional Radiative Transfer Analysis in Participating Media (Chan)

Chapter 7. Fundamental Aspects of Analytical and Numerical Methods on