addition of the discussions on reconstructed three-dimensional pore structure, use of stochastic theory, fractal pore morphology, and geostatistics. The new section on field-scale characterization is written at an introductory level, but adds to the completeness of the chapter. Putting this chapter ahead of the chapter on capillarity phenomena (chapter 2) makes this edition more readable than the first.

Chapter 2 reveals the relationship between pore structure and capillary hydrostatics. The discussions of the percolation models developed in the 80s and deficiencies of common interpretations of mercury porosimetry are some of the significant additions to this strong chapter.

Chapter 3 illustrates the relation between pore structure and single-phase flow. Inclusion of hydraulic conductivity concept, new empirical models, and mechanistic network models of permeability are some of the notable improvements.

Chapter 4 is a brief discussion of some of the applications. It is a weak chapter and has not been significantly updated for any recent work.

Chapter 5 shows the relationship between pore structure and two-phase flow, another strong chapter in the book. It has been vastly improved by including discussions on two-phase flow with coupling, effect of wettability and viscosity on waterflood history, dynamic capillary pressure, pore-level flow mechanisms, and the network models developed in the 80s.

The last chapter deals with miscible displacement and dispersion in tube and porous media. Significant additions have been the discussions on non-Fickian dispersion and dispersion in wetting and nonwetting phases. The section on instability is weak and not updated with the new developments. I liked the enlargement of the figures, but noticed a few typographical errors in some equations and chapter numbers.

This review of the field of transport in porous media is not exhaustive, as the author states, owing to limitation of space, time and author's own interest. This monograph missed the developments in the following topics in the last decade: Rate-controlled porosimetry and its modeling (chapter 2), calculations using lattice gas techniques for single- and two-phase flow (chapters 3 and 5), space renormalization techniques for flow in heterogeneous media (chapters 3 and 5), and modeling of instability in miscible and immiscible flow (chapter 6). I consider these developments to be significant and wish they were included in this monograph.

In summary, this edition is a significantly expanded and updated version of the original book. It is limited in scope, but still the best monograph on relating pore structure to transport in porous media. It is clearly written and should be quite useful to anyone doing research in porous media.

Kishore K. Mohanty
Dept. of Chemical Engineering
Univerity of Houston
Houston, TX 77204

The Chemistry and Technology of Petroleum, Second Edition, Revised and Expanded

By James G. Speight, Marcel Dekker, New York, 1991

This book sets out to describe petroleum chemistry and technology from deposition of geological sediments to petrochemicals for an audience of engineers and chemists. Chemical engineers who have an interest in refining should read the sections on petroleum and bitumen formation and chemistry, particularly the excellent sections on the composition of heavy fractions such as the asphaltenes. It, however, is not recommended as a reference on refinery processes.

The initial chapters on the genesis and occurrence of crude oil and bitumen, the history of its use over the past 6,000 years, and the brief summary of petroleum drilling and production provide an informative review. The best sections of the book are in the middle portion, covering the physical and organic chemistry of the raw products and separated fractions. Chapters 7 and 9 cover the composition of crude oils and bitumens, including elemental analysis and the major compound classes and solubility fractions. In the best chapter of the book (chapter 11), results from a wide range of experimental studies are combined with the constraints imposed by the origin and geochemistry of crude oil to develop a molecular description of the asphaltenes.

Coverage of the measurement of physical and thermodynamic properties and chemical composition is much weaker (chapters 8 and 10). Correlations are listed in chapter 8 for some properties, such as specific heat and thermal conductivity, but the origin and accuracy of the equations are not discussed at all. The use of the corresponding states approach to PVT calculations is recommended, but methods for estimating pseudo-critical properties are not discussed or provided. The reader is not referred to more comprehensive sources of data and methodology for thermodynamic and physical property calculations.

Chapter 10, titled "Identification," gives a good description of gas chromatography and the theory of other analytical chromatography methods, but no example results are provided for any petroleum fractions. The coverage of mass spectrometry is inadequate; no mention is made of methods for analyzing ring classes in distillates or field-ionization mass spectrometry (FIMS). Estimation of aromatic carbon content is presented mainly via correlations using refractive index, which are only of historial interest; the existence of ^{13}C-NMR and its routine application for direct measurement of aromatic carbon content are not mentioned. The methods discussed in this chapter, therefore, fail to give chemical engineers insight into the range of facilities and analytical methods used at a typical refining research laboratory.

The final portion of the book on refining opens with a good general discussion of the chemistry of how refinery processing modifies the carbon framework and removes hetero-atoms (chapter 12). Chapters 13 to 18 describe various refinery processes from crude distillation to product finishing. These chapters suffer from serious faults that would mislead an uninformed reader; many of the processes discussed are out of date (for example, thermal cracking for gasoline production), current process technology is often lacking, and quantitative information on process conversion, yield, selectivity, and utility requirements is not given. For example, chapter 17 on "Product Improvement" describes nine reforming processes, each in 1 to 2 paragraphs with reference to a block process diagram. The catalysts for reforming are discussed separately, toward the end of the chapter, with an emphasis on platinum on SiO_2/Al_2O_3; no mention is made of the platinum bimetallic catalysts (such as Pt/Ir and Pt/Re), which have gradu-

ally transformed the design and operation of reforming units since the early 1970s. In general, the chapters on refinery processes are sequenced as organic chemistry background, followed by process descriptions and catalyst descriptions. The elements of a given process are not integrated, and the process descriptions seem to be drawn mainly from the patent literature.

Very brief descriptions of natural gas composition and purification are included, as well as petrochemicals derived from petroleum, but these sections are too short to provide more than a summary of major process steps. In chapter 19, for example, the modified Claus process for converting hydrogen sulfide to elemental sulfur is illustrated in a process block diagram, but it is not described at all in the text. Some of these shortcomings could be overcome by referring the reader to more comprehensive sources of process information.

Murray R. Gray
Dept. of Chemical Engineering
University of Alberta
Edmonton, Alberta, T6G 2G6

Bubble Column Reactors

By W.-D. Deckwer, Wiley, New York, 1991.

The bubble column appears to be a simple piece of equipment. Its basic form contains no internals or mechanical moving parts, and efficient gas-liquid contact can be obtained by virtue of the large interfacial area. However, the simplicity is deceptive. Process parameters such as the interfacial area, mass transfer coefficients, and axial dispersion coefficients are determined by very complex interactions between hydrodynamics and surface phenomena; thus, the estimation of the yield in a gas/liquid reaction, for example, is no easy matter. As the use of bubble columns has expanded in the past 20 years, there has been an enormous growth in the number of specialized research publications. These papers are, of course, well intended, but they threaten to swamp the average technical reader, particularly the engineer in industry who has a specific problem to solve in the design or operation of a bubble column.

Deckwer has come to the rescue with this well-produced book, but a word of caution is needed. The book was first published in a German edition in 1984 and the cited references listed at the end of each chapter only go up to 1982 with a few references dated 1983. The present English edition provides an Appendix of about 600 "updated references" covering the period from 1983 to 1991. These additional references are listed in relevant chapters, but are not specifically discussed in the text. Although this updated listing is useful, it should be realized that the text of the book reflects the state of the art ten years ago. For example, there is no coverage of pulsed- and reciprocating-plate bubble columns, which have received considerable attention in the last decade. Despite its lack of immediate topicality, the book fills a severe information gap for potential users of bubble columns and will help researchers and graduate students to place their ideas in the context of what has gone before.

Its chapters are grouped in three sections. Chapters 1–5 provide a descriptive introduction followed by discussion of some of the industrially important reactions that can be carried out in bubble columns, and the necessary background on gas-liquid equilibria, diffusivities, and the kinetics of absorption with reaction. The bubble-column researcher will be most interested in chapters 6 to 9, in which research results on hydrodynamics and transport phenomena in bubble columns are brought together and critically discussed. Deckwer's own very considerable contributions in this field have given him a sound basis of knowledge and authority for his critical and well-balanced review. Rather than take a "partisan" stance on rival models of axial mixing, he has sought to bring out points of agreement and consensus between them. He has tried to bring order to the contradictory data on interfacial area as measured by different methods. The final chapters (10 to 12) illustrate modeling and simulation techniques in which the earlier research results are put to work in the actual design process. Today's bubble-column designer will benefit greatly from reading these chapters, but he/she would be well advised to also check the "updated references" carefully so that more recent developments can be noted.

M. H. I. Baird
Dept. of Chemical Engineering
McMaster University
Hamiton, Ontario L85 4L7, Canada

Emulsion Polymer Technology

By Robert D. Athey, Jr., Marcel Dekker, New York, 1991, 320 pp., $110.00 (U.S. and Canada), $125.50 (other countries).

Emulsion polymers (polymeric lattices) are important industrial products that are often overlooked in many curricula. This may be due, in part, to the necessity of understanding both polymer chemistry and colloidal phenomena to adequately describe the behavior of lattices during both formation and processing. As a result, most of what a practitioner in this field learns they do "on the job." The author, as stated in the preface, seeks to provide a book on this topic that is a "brief reference," which "may be used by the scientist/engineer in industrial practice or as a supplementary text for the advanced student in material science, polymer chemistry, or colloid science."

The book is divided into four sections: the first contains a brief review of basic principles, the second a description of typical monomers, the third covers procedures for testing and analysis, and the fourth describes various additives to the postpolymerization product. The second and fourth sections contain a large amount of useful information for the practitioner and are by far the most valuable portions of the book. The first section contains reviews of colloidal phenomena, polymerization mechanisms, and polymerization processes. The description of colloidal phenomena is very elementary, especially that concerning ionic adsorption leading to the development of the surface charge. This portion lacks so many details that it may in fact be misleading to people not intimately familiar with adsorption phenomena.

The section on polymerization mechanisms, however, is the most deficient. While this section contains a reasonable general description of polymers and some details of other polymerization mechanisms a description of emulsion polymerization is completely lacking. Since emulsion polymerization has its own distinct kinetics, which are partially responsible for the unique properties of the final product, it is hard to understand how a book on the topic of emulsion polymers could omit such a description. In fact, Smith-Ewart kinetics are never mentioned directly (the reference to the original article appears as an unreferenced