

include any of the more modern search engines which incorporate artificial intelligence to improve the search pattern nor does it contain author or editor guided references between articles. Every word, almost, can be used for searching through the full text. This is very useful, for example, for searching for references to specific people or for unusual terms not included in the index. It is a pity that more use was not made of the ability to allow blocks of related data to be viewed in parallel with any article to avoid duplication of basic concepts or to give greater detail for experimental methods, for example.

The program used also does not allow the text to be seen as it is scrolled down with the scroll bars. This means that looking for a word in the title takes several motions of the scroll bars with pauses to see how far the scroll has progressed. A useful facility allows almost any word to be clicked on to find a list of articles in which that word appears. Selecting that article then opens the page with the search word

highlighted. This simplifies nonlinear searching through a thread of articles by clicking on appropriate terms.

In general, the encyclopedia is a good effort to present a body of information in an electronic form, taking advantage of text search engines to simplify finding information. The work could be improved by integration of the articles into a more cohesive form with explicit cross references, by filling the many gaps in information, and by inclusion of more broad review articles.

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Book Reviews

Introduction to Analytical Gas Chromatography, Second Edition, Revised and Expanded. Chromatographic Science Series, Volume 76. By Raymond P. W. Scott (Georgetown University). Marcel Dekker: New York, 1998. x + 397 pp. \$125.00. ISBN 0-8247-0016-3.

Introduction to Analytical Gas Chromatography, Second Edition, Revised and Expanded is Volume 76 in the Marcel Dekker Chromatographic Science Series. As implied in the book's subtitle, the text has been completely rewritten and updated to reflect the numerous changes that have occurred in the field since the first edition was published in 1981. The author has drawn upon his many years of experience in the area to write a book that is easy to understand, and at a level that is appropriate for those wanting to learn the important features of gas chromatography. The text is fairly evenly divided between the fundamental principles of the chromatographic process, basic instrumentation, operating procedures, and subsequent data interpretation. Both qualitative and quantitative aspects of analytical gas chromatography are discussed.

The book begins with an introduction of gas chromatography that includes the historical development of the method, which is followed by a brief discussion of the components of a modern gas chromatograph. The different chromatographic techniques are classified according to the mobile and stationary phases used, and the various chromatographic terms are defined. Chapter 2 discusses in detail how molecular interactions and molecular restraints affect retention times. Solute elution is rationalized in terms of plate theory, and numerous mathematical expressions are given for the calculation of effective plate number, resolution, enthalpy and entropy of transfer, and separation ratio from measured chromatographic data. Rate theory is presented in Chapter 3 to explain peak dispersion that occurs during the elution process. The various terms in the Van Deemter equation for packed columns are described, and the Golay equation is given for open tubular (capillary) columns.

The book's next three chapters concern gas chromatographic instrumentation. Chapter 4 discusses both packed and open tubular columns, along with their construction. Several examples of packing materials that can be used as solid stationary phases are given, along with the common gas-liquid chromatographic solid supports. Procedures for coating stationary phase solvents onto solid supports and onto capillary columns are reviewed. Gas supplies, flow programmers, injection devices, and column and detector ovens are discussed in Chapter 5. The next chapter is devoted to gas chromatographic detectors. The six detectors that are discussed in detail are flame ionization, nitrogen-phosphorus, electron capture, katherometer, helium, and pulsed helium discharge detectors. Schematic diagrams are depicted in Chapters 5 and 6 to help readers understand how each component operates.

Methods of sample preparation are presented in Chapter 7 for gas, liquid, and solid samples. The next chapter discusses chromatographic development, and shows how desired separations can be achieved through judicious stationary phase selection, and through temperature and flow programming. The application of gas chromatography for compound identification is addressed in Chapter 9. Combined gas chromatography/mass spectrometry, gas chromatography/infrared, and

gas chromatography/emission systems are discussed. Chapter 10 describes the basic principles of data processing, and the calculation of concentrations on the basis of upon peak heights and peak areas. The advantages and disadvantages of the internal standard, external standard, and normalization methods are compared. Practical chromatographic separations involving hydrocarbon analysis, food and beverage products, environmental samples, and forensic samples are illustrated in the last chapter of the book.

Personally, I found the book to be extremely well-written and highly formative. I was slightly disappointed, however, by the very small number of literature references found at the end of select chapters. For example, only one reference was listed in the chapters on chromatographic development and on quantitative analysis. I highly recommend the book to individuals needing to know or interested in both the fundamental aspects and practical applications of gas chromatography. The book can also serve as a reference source (not a textbook) for graduate and undergraduate student instruction. My copy of the book will be placed in our University's library under reserved reference material for student use each time that I teach the graduate level special topics course on chemical separations.

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Advances in Lipobiology. Volume 2. By Richard W. Gross (Washington University School of Medicine). JAI Press: Greenwich, CT, and London, 1997. xii + 355 pp. \$109.50. ISBN 0-7623-0205-4.

Lipids display an almost bewildering structural diversity because they are defined by physical properties (organic solvent solubility) rather than by common structural features, and because each lipid class (for example, isoprenoids) encompasses thousands of structural variants. This complexity is hardly accidental, and biochemists have sought to crack the "lipid code" for over a century. Due largely to advances in technology and the development of simpler model systems, the past decade has seen considerable progress in "lipobiology", which is the understanding of the biological functions of lipids on a molecular level.

The stated objectives of this series (from Dr. Gross's Preface to Volume 1) are to "(1) broadly interpret the potential significance of recent findings in the area of lipid structure and function, (2) identify what does (and what does not) constitute 'proof of concept', and (3) provide a critical foundation for evaluation of experimental results and strategies in these evolving arenas". The chapters in Volume 2 deal with basic aspects of lipid metabolism, such as the regulation of carnitine acyltransferases (by J. H. Mar and J. B. McMillin) and the CDP-ethanolamine pathway (by P. S. Vermeulen et al.); lipids and cell signaling, which includes the sphingomyelin cycle (by Y. A. Hannun and J. Jayadev), prostaglandin endoperoxide synthase isozymes (by W. L. Smith and D. L. DeWitt), plasmalogens (F. Snyder et al.), and phospholipases (by M. Waite); and relationships between different facets of lipid metabolism and disease (by P. C. Choy et al.), especially

hypoxia/ischemia (with three chapters by L. M. Buja and J. C. Miller, D. D. Belke and G. D. Lopaschuk, and H. Wang et al.); as well as two chapters dealing with the lipids of clostridium (by H. Goldfine) and *E. coli* (by W. Dowhan) and the lessons they teach about structure/function relationships for lipids in general.

In a rapidly changing area, progress often outpaces publication of a book. Volume 2 of *Advances in Lipidology* has few citations after 1993, which is of some concern. Nonetheless, the chapters provide conceptual frameworks for understanding developments in their fields, rather than a mere cataloging of recent findings. Also, the selection of topics presents an interesting cross-section of research on different lipid classes—from the most basic aspects through disease. These features make the book valuable for readers who wish to broaden and deepen their understanding of “lipobiology”.

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Fuels and Chemicals from Biomass. Edited by Badal C. Saha (U.S. Agricultural Research Service) and Jonathan Woodward (Oak Ridge National Laboratory). ACS Symposium Series 666. American Chemical Society: Washington, DC. 1977. x + 356 pp. \$119.95. ISBN 0-8412-3508-2.

This collection of papers presented at a meeting in New Orleans in March 1996 should be on the shelves of all researchers concerned with the processing of lignocellulose. They represent, for the most part, an American perspective of the future of bioenergy research, in which there is still an emphasis on growing plant material *de novo* for the specific purpose of conversion to liquid fuel by saccharification and fermentation steps. Such a process is the focus of the first two articles in the book, which are useful sources of current references. To this reviewer, though, it seems that more immediately useful results are likely to emerge from the use of a feedstock with negative value than from specifically harvested biomass: such material has been used as a transportation fuel for a century and a half (in wood-burning steam locomotives), and it is difficult to see how the efficiency of the process will improve much by the introduction of a series of complex steps between biomass and heat engine.

The worldwide shortage of cellulose fiber for paper and board making moreover makes it likely that lignocellulose crop plants will be grown in the first instance for cellulose fiber, and that bioethanol production will usually involve the use of waste. The emphasis in Ingram's and in Krishnan's articles on the fermentation of hemicellulose sugars thus seems entirely sensible. The modeling studies of Zacchi and his co-workers, indicating that integration of bioethanol plants with others (such as pulp mills) can increase efficiency significantly, are also telling. The MixAlco process described by Holtzapfel and collaborators is ingenious, involving the fermentation of a range of largely waste products to carboxylic acids, formation of their calcium salts, pyrolysis to the ketones, and reduction.

The chemicals section of the volume has interesting articles on the production of lactic acid, succinate, 2,3-butanediol, and xylitol and biodegradable plastics from biomass. The section is something of a grab-bag, but focuses on the main current target products. There are also articles on photosynthetic hydrogen production and biodiesel and use of synthesis gas in fermentations from a chemical engineering perspective, as well as the effect of carbon dioxide on alcoholic fermentations and expression of a β -glucosidase in a soil bacterium.

Inevitably in a symposium series such as this, the level of coverage and target readership of the individual articles is very uneven, but I detected only one real horror: the article on butane-2,3-diol seemed entirely innocent of any mention of the stereochemistry(ies) of the alcohol(s) produced.

The major disappointment, though, was the gaps in the coverage. Firstly, biomass is not necessarily lignocellulose; marine biomass is based on chitin, which is produced in similar quantities globally to cellulose. Secondly, the “chemicals” part could have been more profitably a “feedstock” part, to include both bacterial polymers and

cellulosic fiber; pulp treatments (bleaching, deinking, and refining) are now significant users of lignocellulolytic enzymes. Thirdly, if the social, political, and environmental rationale for much of the work was to be treated at all, at some point reasons should have been advanced as to why it was essential to devise new technologies of producing fuel, rather than improved technologies for burning less of it.

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Genetic Engineering: Principles and Methods. Vol. 19. Edited by Jane K. Setlow (Brookhaven National Laboratory). Plenum Press: New York. 1997. xiv + 309 pp. \$85.00. ISBN 0-306-45681-8

The ever increasing interdependence of biochemistry and molecular biology, especially in the arena of industrial and agricultural biotechnology, requires that chemists and biochemists working in these fields have a thorough understanding of gene structure, gene manipulation, and control mechanisms of gene expression. This outstanding series presents in-depth reviews of selected topics in genetic engineering. The emphasis is on recent advances that may be relevant to the pursuit of commercial genetic engineering projects. Although the series title mentions “methods”, no laboratory procedures will be found here.

In this volume, most of the essays are related to plant molecular biology. Included are Novel Approaches to Engineering Disease Resistance in Crops (K. M. M. Swords, J. Liang, and D. M. Shah), The Structure of Plant Gene Promoters (T. J. Guilfoyle), Pathways and Genes Involved in Cellulose Synthesis (Y. Kawagoe and D. P. Delmer), Regulation of Protein Degradation in Plants (J. Callis), Genetic Engineering of Oilseeds for Desired Traits (A. J. Kinney), Switching On Gene Expression: Analysis of the Factors that Spatially and Temporally Regulate Plant Gene Expression (L. Meisel and E. Lam), Nucleic Acid Transport in Plant-Pathogen Interactions (R. Lartey and V. Citovsky), Leaf Senescence: Gene Expression and Regulation (L. M. Weaver, E. Himelblau, and R. M. Amasino), and Recognition and Signaling in Plant-Pathogen Interactions: Implications for Genetic Engineering (M. Lawton). It is noteworthy that several authors are from companies such as Monsanto and DuPont, which have active R&D efforts in plant biotechnology.

The minority of articles in this volume deal with prokaryotic subjects. These include Plasmid Stabilization by Post-Segregational Killing (K. Gerdes, J. S. Jacobsen, and T. French) and Termination of DNA Replication in Prokaryotic Chromosomes (D. Bastia, A. C. Manna, and T. Sahoo). The former provides a useful description of the *hok/sok* (host killing/suppression of killing) system for plasmid stabilization, in which errant plasmid-free cells are killed by intracellular residues of a toxic protein (*hok*), but plasmid-containing cells are protected by the *sok* anti-sense RNA that prevents expression of *hok*. The article by Bastia et al. describes structure–function relationships arising from the recent crystallographic study of the replication terminator protein (RTP) of *Bacillus subtilis*. In this article, and in Comparative Molecular Analysis of Genes for Polycyclic Aromatic Hydrocarbon Degradation (G. J. Zylstra, E. Kim, and A. K. Goyal), will be found almost the only chemical or molecular structural content in the book; the rest is molecular genetics.

This series is well edited and nicely produced. All articles are thoroughly documented with references through 1996. A good index is included. Due to its timely content, the series is a must for a biochemistry or microbiology library. Also, given the rather moderate cost, it can be recommended for the library of a specialist in plant molecular biology or biotechnology.

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