Book Reviews

Advances in Electrochemical Science and Engineering. Volume 2

Edited by Heinz Gerischer and Charles W. Tobias. Pp. 270. VCH. 1992. Price £63.00; DM 168.00. ISSN 0938-5192; ISBN 3-527-28273-4 (VCH, Weinheim); 1-56081-139-0 (VCH, New York).

Volume 2 of this prestigious series contains four articles: two on technology related aspects and the other two on techniques for characterization of electrochemical reactions. Chapter 1 is written by Trasatti and discusses electrocatalysis in the hydrogen evolution reaction. Although this has been perhaps the most extensively studied reaction in electrochemistry, the relationship between electrode structure and composition, and reactivity, is still a matter of debate. Throughout this chapter, Trasatti makes the important point that any real progress for improving the efficiency of hydrogen cathodes will only be derived from a better understanding of the reaction mechanism and its relationship to metal properties. For example, the kinetics are influenced by the characteristics of alloys and intermetallic compounds. This chapter brings a very comprehensive tabular listing of what is known at present about all the materials used in the construction of hydrogen cathodes, which constitutes a very valuable reference source.

'This is an essential book for researchers in electrochemistry; it covers areas of both fundamental and practical importance, with reviews of high quality. The material is very well presented and the choice of topics reflects a balanced editorial policy that is welcomed.'

Chapter 2 is by Hammou, on solid oxide fuel cells. Similar in format to the first chapter, the practical problems encountered in the manufacture of this type of fuel cell are discussed both in terms of the underlying physical chemistry and practical considerations. The technology of fuel cells is being strongly driven by environmental considerations and the recent advances in material processing, ceramics and engineering are very exciting. This chapter gives a balanced view of the current state of this technology and of the medium term prospects for its large scale industrial implementation.

Chapter 3, by Richmond, describes the use of second harmonic generation (SHG) as an *in situ* technique to characterize single crystal electrode surfaces. SHG is a surface-sensitive technique which is being used increasingly not only on metal surfaces, but also (recently) for the study of interfacial structures on liquids, for instance, by a group in Colorado University. The theory has been thoroughly investigated during the past decade and it is to be expected that it will become more widely used in interfacial studies. This chapter provides a good description of current activity in this field.

Deslouis and Tibollet review in Chapter 4, the technique of flow modulation for the case of the rotating disc electrode (RDE). The basic flow equations are derived and their application to kinetic measurements is discussed. Flow modulation has many advantages over classical RDE methods and these are comprehensively presented in this chapter.

This is an essential book for researchers in electrochemistry; it covers areas of both fundamental and practical importance, with reviews of high quality. The material is very well presented and the choice of topics reflects a balanced editorial policy that is welcomed.

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Electrochemical Methods in Soil and Water Research

By T. R. Yu and G. L. Ji. Pp. xvi + 462. Pergamon Press. 1993. Price £65.00; US $105.00. ISBN 0-08-041887-2.

Yu and Ji's book is a substantial work covering the areas of analytical electrochemistry most pertinent to soil and water research. Although there is no indication of this on the title page or the front cover of the book, Yu and Ji are the editors rather than authors of this volume. The large majority of the chapters have been written by their colleagues at the Institute of Soil Science, Chinese Academy of Sciences.

There are fourteen chapters which deal with electrode potentials; potentiometric, conductimetric and voltammetric measurement techniques; and electrochemical instrumentation. The book tackles these subjects both from a fundamental and an applied angle. There are strengths and weaknesses in this approach. The strength is that the book is virtually self-contained: it would be just about possible to start with a rudimentary knowledge of electroanalytical chemistry and work through this book to quite a passable understanding of the subject. On the other hand, there is nothing new or startling in the fundamental and theoretical treatment of the selected electrochemical techniques. The approach is somewhat standard and, in this respect, the fundamental chapters could have been decreased significantly by structuring them as a review, and by judicious use of references to the well-known texts in this area.

The primary value of this book lies in the practical chapters: these contain much detail of the use of applied electroanalytical chemistry to practitioners. For example, an entire chapter is devoted to liquid junction potentials. This is a subject of primary importance in potentiometric measurements which gets scant airing in other texts. Similarly, the substantial experience of the authors in actually applying their techniques in real situations is manifest in the sections on: the measurement of oxidation–reduction potentials; common-problems in potentiometric measurement and their causes; conductimetric measurements; and voltammetric measurements.

There are several places in this book in which details are given concerning the construction of electrodes and electronic measurement instruments. These may seem superfluous to scientists in well-funded laboratories but for those with little money they are certainly most welcome. It is touches such as these that underline the essentially practical virtues of this book and which serve as reminders of the universal applicability of the simple and elegant instrumentation that can be used to perform electrochemical measurements.

The book has much to commend it, particularly to practitioners in soil and water analysis. Workers in the associated fields of biological and environmental analysis would find it useful in addition to students of electrochemistry and their supervisors who would benefit from its practical approach.

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Electrochemistry. Principles, Methods and Applications

By Christopher M. A. Brett and Ana Maria Oliveira Brett. Pp. xx + 428. Oxford University Press. 1993. Price £25.00 (softback). ISBN 0-19-855388-9.

The aim of this book is to provide a basic text on electrochemistry that covers both the theoretical and applied

aspects of the subject. It has been pitched at the undergraduate/taught masters level, and is divided into three sections: namely, principles, methods and applications. In the first section, some fundamentals relating to the kinetics and thermodynamics of electrode processes are described. In the second section, the basic theory and practice of different electrochemical techniques are given, as well as introducing some microscopic and spectroscopic techniques, which are used for the characterization of electrode surfaces. The third section then deals with applications such as potentiometric and amperometric sensors, electrochemistry in industry, corrosion and bioelectrochemistry. Various appendices then detail some important mathematical expressions and simula-

'a basic text on electrochemistry that covers both the theoretical and applied aspects'

tion techniques, the principles of alternating current circuits, and a table of standard electrode potentials. The book is generally well produced, with relatively few errors, and is not too inhibiting for the novice to gain an insight into this vast area of scientific endeavour. Each chapter contains a reasonable list of references to texts and papers, where more detailed information can be obtained. In terms of balance, I feel that it should perhaps have contained more 'electroanalytical' material, particularly related to (bio)pharmaceutical and environmental chemistry, but in general it has been pitched at about the right level for the target audience mentioned above. It would certainly not suffice, however, for those students or practitioners who wish to specialize in electrochemistry, either in the fundamental or applied areas. The book has been produced in softback form at a relatively low price, hence it is good value for money, and I would recommend it for both personal and library use.

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Bioelectroanalysis, 2
Edited by E. Pungor. *2nd Symposium held at Mátrafüred, Hungary, October 11–15, 1992.* Pp. 450. Akadémiai Kiadó. 1993. price US$75.00. ISBN 963-05-6529-3.

The second conference on bioelectroanalysis at Mátrafüred was organized to review the major developments that have taken place during the last five years, especially in the area of electrochemical biosensors. The volume is organized such that questions and comments raised at the meeting follow each paper. Although the book has been produced from camera-ready copy, the overall quality of reproduction is high. Many of the papers themselves, including the plenary lectures, come

'The papers give a good flavour for the variety of topics of current interest in bioelectroanalysis.'

from some of the most active research groups working in this area of scientific endeavour, and cover topics ranging from amperometric and optical biosensors, ion-selective electrodes, microelectrodes and *in vivo* voltammetry. As with most volumes of this nature, the quality of some of the contributed papers is variable, and the reader should not expect to find much material that has not been published in the primary literature. The papers do, however, give a good flavour for the variety of topics of current interest in bioelectroanalysis. I would not particularly recommend the book for personal purchase but libraries may consider it suitable if they provide a service for research groups in analytical science or bio-chemistry.

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Practical HPLC Methodology and Applications
By Brian A. Bidlingmeyer. Pp. x + 452. Wiley. 1993. Price £45.50. ISBN 0-471-57246-2.

This is, as the title suggests, a practical, applications-oriented approach for the instruction of those who are encountering high-performance liquid chromatography (HPLC) for the first time. As such it is to be highly recommended, as it sets out to first introduce the basics of the separation process, before showing how various separations can be achieved in practice. The book also contains details of ten experiments, which start from demonstrating first principles to the development of various separations, quantification, monitoring kinetics and gradient elution. Within these experiments, there are many

'a practical, applications-oriented approach'

'self-help' questions to ensure that the practitioner understands the basis of the separations achieved. I was a little surprised, however, that the operation of only the basic ultraviolet and refractive index detectors was described, with no mention of electrochemical, fluorescence, diode array or mass spectrometric detection systems. I also thought that some more 'modern' references could have been supplied along with the 'dated' ones. These slight criticisms aside, the book is a valuable addition to the literature, and can be thoroughly recommended for both personal and library purchase. It is an excellent instructional tool for both undergraduate and short course students, and those using the technique in industry, but would need to be supplemented by more advanced texts for those going on to do masters degrees, or to carry out research in separation science.

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Chromatography, 5th edition: Fundamentals and Applications of Chromatography and Related Differential Migration Methods. Part A: Fundamentals and Techniques; and Part B: Applications
Edited by Erich Heftmann. *Journal of Chromatography Library, Volume 51A.* Pp. xxxvi + A552. Elsevier. 1991. Price US$179.50; Dfl350.00. ISBN 0-444-88236-7. *Journal of Chromatography Library, Volume 51B.* Pp. xxxii + B630. Elsevier. 1991. Price US$189.50; Dfl370.00. ISBN 0-444-88236-5. Parts A and B Set Price US$333.50; Dfl650.00. ISBN 0-444-88404-1.

This multi-authored, two-volume set is the fifth edition of Elsevier's 'standard text' on the title subject, the latest in a series of attempts to summarize all of the significant aspects of chromatography, both from a fundamental (vol. 51A) and applications (vol. 51B) perspective. I am pleased to report that the efforts of the editor and 37 authors have been successful, although there is considerable room for improvement in a few areas.

Collectively, this work is composed of 25 chapters containing a total of 936 pages of text, 197 figures, 101 tables and 5746 references that go up to 1989, except for a few in 1990 published by the authors. In addition to a different table of contents, each volume has: (*i*) a list of authors; (*ii*) a common list of abbreviations, symbols, italic symbols and Greek symbols; (*iii*) a common preface, foreword and 16-page index; and (*iv*) a common list of manufacturers and dealers of chromatography and electrophoresis supplies.

The 11 chapter 'fundamentals' volume covers (1) the theory of chromatography; (2) counter-current chromatography; (3) planar chromatography; (4) column–liquid chromatography; (5) ion-exchange chromatography; (6) size-exclusion chromatography; (7) affinity chromatography; (8) supercritical fluid chromatography; (9) gas chromatography; (10) field-flow fractionation; and (11) electrophoresis. The 14 chapter 'applications' volume covers (12) inorganic species; (13) amino acids and peptides; (14) proteins; (15) lipids; (16) carbohydrates; (17) nucleic acids, their constituents and analogues; (18) porphyrins; (19) phenolic compounds; (20) drugs; (21) fossil fuels; (22) synthetic polymers; (23) pesticides; (24) environmental analysis; and (25) amines from environmental sources.

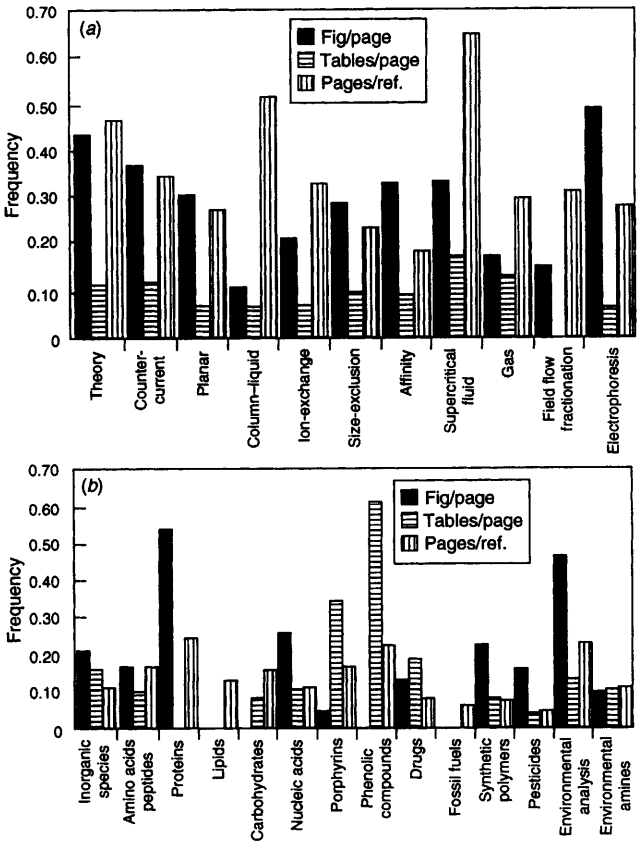
Given both my interests and limitations of time, I was only able to read closely Chapters 1, 4, 8, 11, 13, 14, 16 and 20 before I prepared this review. My first aim, however, was to identify more general strengths and weaknesses.

There are numerous potential advantages and disadvantages of multi-authored books such as the present work. Some potential advantages of a muti-authored text are: (*i*) a true expert can be selected to cover each area; and (*ii*) the contributions of each author can, in principle, if all authors adhere to the submission schedule, be delivered much faster to the publisher than if a single author was responsible for the entire work. Potential disadvantages of multi-authored text include: (*i*) a wide range of submission dates and its effects on literature coverage, time to publication, *etc.*; (*ii*) less effective cross-referencing; and (*iii*) a wide range of expository styles and/or depth of coverage among subject areas. Ideally, with careful attention from both the authors and editorial staff, the potential advantages can be realized and the disadvantages minimized.

Unfortunately, both the potential advantages and disadvantages of multi-authored books appear to have been realized here. While there is no denying the technical quality of most, if not all of the chapters, the drawbacks noted above are also quite evident. For example, although the book was not published until 1992, none of the literature cited was published later than 1989, except as noted earlier. Cross-referencing was also poor; for example, the sections on capillary electrophoresis in Chapters 4 and 11 did not refer specifically to each other, although readers of Chapter 4 are referred to Chapter 11 in a general way.

The lack of uniformity in the treatment of each subject is illustrated in Fig. 1, which compares the number of references, figures and tables in each chapter, normalized to the total number of pages in each chapter. Data for the references were reported as 'pages/reference' instead of 'references/page' in order to allow a common scale on the ordinate axis.

Both the data for the 'fundamentals' volume [Fig. 1(*a*)] and the 'applications' volume [Fig. (1*b*)] clearly indicate a significant variation in the treatment of individual topics. Especially noteworthy is the absence of figures in the chapter on carbohydrates; the absence of tables in the chapters on field flow fractionation and proteins; and the absence of both figures and tables in the chapters on lipids and fossil fuels. But even if the chapters lacking the figures and/or tables are eliminated from the comparison, the normalized numbers of references, figures and tables still vary by more than a factor of



3. Finally, it is apparent that the chapters on lipids and fossil fuels were written as critical reviews. Although critical reviews are often invaluable, that style is probably inappropriate for this book.

The chapters I read closely were technically very sound and had few typographical errors. And the quality of the tables and figures was from very good to excellent. The only significant drawback was the omission of from one to two key references in each of three of the above chapters. Given the generous number of citations in those chapters, it is unfortunate that even a couple of key references were omitted by the chapter authors.

Although chapter authors are largely responsible for the success or failure of a multi-author work, the page layout and related matters are the editor/publisher's responsibility. Unfortunately, there is room for improvement here as well. Although readers are conveniently directed to the references of each chapter by page numbers provided in footers on even-numbered pages, the frequent practice of providing chapter titles in headings on even- or odd-numbered pages was omitted for this work. The absence of such chapter headings makes it difficult to locate easily topics of interest without resorting to the table of contents or the index, and it is an unpleasant surprise as other recent books by the same publisher (*e.g.*, one devoted to capillary electrophoresis) do have chapter headings. I hope the headings will be included in later editions.

In many ways, this book is a 'one of a kind'. Thus, despite the shortcomings noted above, it will probably be invaluable to both research- and applications-oriented chromatographers. I highly recommend this two-volume set to all science libraries, and to any chromatographer who has a generous budget.

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Aluminium in Biology and Medicine
Edited by Derek J. Chadwick and Julie Whelan. *CIBA Foundation Symposium 169.* Pp. x + 316. Wiley. 1992. Price £42.50. ISBN 0-471-93413-5.

This superb book reports the proceedings of a 2½ day Symposium aimed at improving the understanding of the interactions between aluminium and biological systems. Only 15 papers were presented and these were extensively discussed by the 28 invited participants, all of whom are acknowledged experts in their own disciplines. The areas of expertise covered by the presentations encompassed: biochemistry, chemistry, epidemiology, medicine, molecular biology and nutrition, plus some applications of instrumental analysis. As with all reports of CIBA Foundation Symposia, the discussions are as important as the presentations, which pays tribute to the Chairman.

Following an introduction to some aspects of the chemistry and thermodynamic binding data of Al^{3+} in simple systems (Williams) there is an excellent paper (Martin) on the speciation of aluminium in biological systems. Both presentations provide bases for interpretations and discussions of many subsequent papers.

A comprehensive review of the dietary intakes of aluminium (Greger) includes observations on the enhancement, by citrate, of intestinal absorption of aluminium. The opposing role of silicate in protecting against the bioavailability and toxicity of aluminium was discussed by Birchall who also indicated the relative binding, *in vivo*, of aluminium either to silicate or to phosphate species. Supporting evidence of these interactions are provided in later papers. Studies of the mechanisms of intestinal absorption of different aluminium species using perfused rat jejunum/ileum (van der Voet) confirmed the enhancing effect of citrate, possibly by transcellular as well as by paracellular processes. Silicic acid was shown to protect against the intracellular effects of Al^{3+} on receptor-activated cytoplasmic Ca^{2+} signals in mouse pancreatic acinar cells (Petersen). Some possible mechanisms for the toxic effects of aluminium uptake were reported by Zatta who investigated the effects of lipophilic aluminium complexes on membranes and by Jope who studied the neurotoxic effects in rats, of aluminium added at high concentrations to their drinking water.

Most of the remaining papers are concerned with the toxicity of aluminium or with the similarities in, or differences between, its neurotoxicity and Alzheimers disease (AD). The suggestion by Martyn that aluminium added to drinking water as a flocculant is a risk factor in the environmental epidemiology of AD, found support from McLachlan who used the metal-binding agent desferrioxamine to remove absorbed aluminium and thus act as a palliative in the treatment of AD. The ensuing discussions of aluminium binding to species that normally contain iron are particularly enlightening. An excellent review (Kerr) of aluminium toxicity in renal disease, describes the anaemia, bone disease and neurotoxicity of excessive aluminium uptake, but notes differences between AD and dialysis encephalopathy. Elegant microscopic studies of neurons (Wisniewski) showed differences between neurofibrillary tangles (NFT) induced by aluminium toxicity and those associated with AD. These last two papers support the argument that although increased aluminiun in the brain adversely affects cognition it does not cause AD. The molecular characterization and measurement of AD pathology (Wischik) gives fine detail of the abnormal protein and peptide deposition in AD and of the mechanisms responsible for this, from sensitive immunochemical and microprobe X-ray studies. There was no evidence of a pathology related to aluminium accumulation.

'The book is very well presented and illustrated. It is undoubtedly of value to anyone working on the biological and clinical aspects of aluminium and is excellent value for money.'

The controversy of aluminium and AD was not resolved by other papers. Edwardson gave an excellent account of aluminium accumulation in the brain and the associated changes in the central nervous system. Using secondary ion mass spectrometric analysis, he showed the focal accumulation of aluminium in an unfixed, unstained section of brain from a patient who did not have AD but who did have senile plaques, which were identified by staining on adjacent sections of brain. Edwardson concluded that aluminium did not have a direct aetiopathogenic role in AD. The failure to detect aluminium in fixed, stained brain sections using particle induced X-ray emission (Murray) was related to sample preparation. The 'blank' signal equated to 225.08 ± 50.09 ppm (mean ± *s*). However Perl, who used the more sensitive laser microprobe mass analysis did detect aluminium in the NFT from the brain of an AD patient. The specimen was formalin-fixed, OsO_4 post-fixed, embedded in epoxy resin, cut and mounted on grids. Practical analytical scientists who have measured aluminium will marvel at the skills of those who, without difficulty, use stains that mobilize Ca^{2+} (how about Al^{3+}?) and work with blanks >200 ppm (measured to 5 significant figures, though!). The discussions of the latter two papers are well worth reading, also the Chairmans summing-up which mentions the need for 'better analytical cohorts' possibly hinting that internal quality control and external quality assessment of analysis might soon be discovered.

The book is very well presented and illustrated. It is undoubtedly of value to anyone working on the biological and clinical aspects of aluminium and is excellent value for money.

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Hyphenated Techniques in Supercritical Fluid Chromatography and Extraction
Edited by K. Jinno. *Journal of Chromatography Library. Volume 53.* Pp. x + 334. Elsevier. 1992. Price US$157.00, Dfl275.00. ISBN 0-444-88794-6.

The book overall offered an admirable sampling of hyphenated SFE and SFC research being conducted to date. All aspects of hyphenated SFC and SFE techniques were covered both from the perspective of novel detector interface in the former and chromatographic compatibility in the latter. In addition, the various interfaces of SFE with GC and SFC were covered but the HPLC interface was left out. There has been some work in this area and it should have been included.

My most fervent negative comment concerning the book is the poor grammar, terrible sentence structure and incorrect spelling used in many of the chapters. This to me is disgraceful since the authors are surely knowledgeable about their respective topics. However, it appears that these authors' did not take the time to ensure that the reader could benefit from this knowledge by clearly communicating their ideas. If not the authors' responsibility, I believe it is in the editor, as well as the publishers', best interest to correct such inadequacies. Obviously, this was not a concern of the editor since the preface of the book was one of the worst offenders. Eight chapters (Chapters 3, 6, 7, 10, 11, 12, 14, 15) out of fifteen had proper format, grammar and spelling. This level of writing ability should not be considered extraordinary but expected

when submitting for publication in a book. These chapters were easily read and the main point(s) of each easily deduced. However, for the remaining chapters (Preface, 1, 2, 4, 5, 8, 9, 13), I believe revision of grammatical and typographic errors is necessary. These chapters constitute 46% of the book. In most cases, these chapters had to be read at least twice in order to deduce the authors' main point(s). I am afraid, however, that readers will likely not take as much time as I have taken as most of the information presented here can be found elsewhere. In summary, I believe that the poor written quality of seven chapters (and the Preface) of the book really degrade the overall quality of the book.

'An admirable sampling of hyphenated SFE and SFC research being conducted to date.'

Another important point not addressed by the book (except for Chapters 10 and 11) was the reproducibility of each hyphenated system. This was particularly true in the SFC-detector hyphenated systems. Since both SFE and SFC are now being used routinely in many industries (*i.e.*, petroleum, chemicals, polymers) it would have been important to have a chapter that addressed the practical day-to-day application of these on-line techniques. The techniques described within the book are obviously applicable to a wide array of samples as indicated by the given chromatograms. However, in most of the articles, the day-to-day reproducibility as well as the method accuracy of the system were not addressed. After all, system reproducibility is at the heart of any valid analytical technique.

Other comments on the book (per individual chapter) are as follows:

Chapter 1: Good introduction and foundation for other hyphenated techniques described later. The poor grammar and organization used prevented some of these points from being immediately clear.

Chapter 2: Again, grammar and misspellings made reading and comprehending difficult. However, the discussion of the ion mobility detector for SFC is a valuable addition to the book. Even though I have a strong background in SFC, this is not a detector I was familiar with. In addition, its compatibility with modified and non-traditional SF is also worthy of noting as many detectors are not compatible with these fluids.

Chapter 3: This chapter (along with Chapter 11) was one of the best chapters in the book both for content and clarity in writing. The analysis of inorganic selenium sulfides in dandruff shampoo was a very interesting and non-traditional application. SFC–MS is one of the most important hyphenated systems for SFC because it allows for universal detection. However, one problem was discovered. In the Introduction, a chapter on packed column SFC–MS was promised but never delivered.

Chapter 4: Many problems were encountered. Figures were not labelled properly (*i.e.*, Figs. 9 and 12). SFC–ELSD represents an excellent hyphenated technique as it offers universal detection without the expense of a mass spectrometer system. Why is FAB-MS even discussed as a possible application? This type of MS is most useful for very high relative molecular mass analytes which are not handled well by SFC. The poor writing in this segment of the chapter further hindered comprehending the practical applicability of SFC–FAB-MS.

Chapter 5: Figure labelling was confusing. Figure numbers jumped from 3 to 5. Fig. 4 was after Fig. 7. Pages were also out of order. Page 70 carried over to page 73 and page 71 starts a new section. These types of typographic errors are inexcusable. Despite these problems, the article was well-written. Spectral interpretation was very helpful and made the chapter a general review for IR detection use.

Chapter 6: This chapter contrasts nicely with Chapter 5. Information on CO_2 absorbance was very helpful. This chapter addressed more practical instrumentation considerations than Chapter 5.

Chapter 7: As with many collaborative books, this chapter says nothing that Chapters 5 and 6 have not already said. In fact many of the references in this chapter were already mentioned and reviewed in Chapter 5. Fig. 20 is shown in Chapter 5 as well. The writing and organization of this chapter were impeccable, however, and the authors should be recognized for their effort.

Chapter 8: The use of preparative SFC is an application often overlooked. Unfortunately, the horribly poor grammar and organization required me to read this chapter *four* times before I understood the main point(s) of it. Many figures were also mislabelled (*i.e.*, Figs. 11 and 12) which made correlation with the text and/or captions impossible.

Chapter 9: Again poor grammar and spelling errors made comprehension difficult. However, the use of SFC to analyse organo-metallic compounds is an interesting application. Conversely, these are the only applications given. Analysis for other heteroatoms (*i.e.*, S, N, Cl) would make the detector more universally applicable to organic molecules, which are typically applicable to SFC analysis.

Chapter 10: This chapter compliments Chapter 9 as it describes mainly element-specific organic compound analysis *via* SFC–MIP. Extensive introduction gives a good review of many of the detectors not discussed in this volume. Reproducibility of this system was also briefly addressed. The comparison with other detectors was also beneficial in illustrating the versatility of the SFC–MIP. The excellent writing and organization of the chapter also made comprehension easy.

Chapter 11: Chapter 11 was the best written chapter of the entire volume. It offered just the right blend of introduction and review of the subject matter. This chapter also showed many schematic diagrams of the plumbing which are the crux of the on-line SFE chromatography system. These schematic diagrams illustrate the complexity of on-line systems for less advanced SFE and SFC users. References were made to Chapter 10 being a chapter dedicated to the comparison of on-*versus* off-line SFE. These references should be deleted because this is not the case.

Chapter 12: This chapter really has very little to do with the intended subject matter of the book as most examples given are for off-line analysis (not hyphenated or on-line) and basic SFE information. Since this chapter is very basic, I believe it should have been placed before Chapter 11. It would serve as a good introduction for the SFE chromatography chapters (Chapters 11–14). Is Chapter 12 the chapter that is referred to in Chapter 11 introduction (see above)? If so, the order should be changed.

Chapter 13: Again the writing in this chapter was very poor. In addition, the molecular mass ranges applicable for SFE and SFC are misquoted (Fig. 1). To my knowledge, I am not aware of any application where species of molecular mass of 10 000 can be examined by either SFE or SFC. This is very misleading to the beginner or less advanced SFE and SFC users. In addition, these molecular mass claims are not supported by the rest of the authors chapter because only alkanes up to C_{40} were extracted and analysed with any accuracy by the SFE–GC system. Such grand claims for SF based techniques were one reason why they declined in popularity in the early 1980s. In short, if it is possible to analyse substances in this relative molecular mass range, I would like to see references given to support the figure. Another issue with this chapter is the redundancy with Chapters 11 and 12. These chapters were much better written and because this chapter really offers nothing new, it could be left out entirely.

Chapter 14: This is even a more basic review of SFE than was given in Chapter 12. As a result, this chapter should be presented before any of the other hyphenated SFE chapters. The premise in including this chapter and Chapter 11 was a sound one: it is important to give a sound introduction to a topic prior to covering more advanced ones. Therefore, I am not sure why this chapter is after three more advanced SFE hyphenated chapters. In fact, among Chapters 11 and 14, the same figure is used twice (Fig. 11 and Fig. 2)! Such redundancy is a waste of paper and of the readers' time. Other than the thorough review of SFE principles, this chapter adds nothing to the volume.

Chapter 15: Since this chapter refers to the SFC–detector interface, it should have been grouped with the other chapters of this type (before Chapter 11). The chapter gives an overall excellent review of FT–based detectors with GC, SFC and HPLC. The comparisons drawn among the various chromatographic methods is also informative. Its place at the end of the book is illogical, however.

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Dictionary of Analytical Reagents

By R. Lobinski, Z. Marczenko and P. Rhodes. Pp. xxx + 1370. Chapman & Hall. 1993. Price £595.00. ISBN 0-412-35150-1.

The Dictionary of Analytical Reagents is the only single-volume dictionary to contain information on all common analytical reagents. It is drawn from the Chapman and Hall Chemical Database, although some of the entries derive from the dictionary of Organic Compounds (5th edition, 1982) with the addition of some analytical information. The dictionary contains chemical, usage and bibliographic data on over 5000 reagents.

The available information can be accessed by use of one of four computer-generated indexes. The Name Index is an alphabetical listing of all names given throughout the dictionary, *i.e.*, entry names, synonyms or names given to derivatives. The Molecular Formula Index lists the formulae of all entries and also of their principal derivatives. The Chemical Abstracts Service Registry Number Index lists the numbers of all compounds with CAS entries in serial order. Finally, the Type of Compound Index is a list of all the reagents in the Dictionary classified under three or more headings according to analyte, compound group and analytical application. This last index is most helpful in finding all reagents of a particular use, or of a particular structure.

'With 5000 entries the dictionary is quite comprehensive'

Some of the monographs in the Name Index are fairly brief, consisting of the name of the compound, any synonyms, including a systematic name, the CAS Registry number, in most cases a structure, the empirical formula, the relative molecular mass, the use(s), appearance, solubility, p*K*a value and one or more references to its synthesis. This may occupy as little as 2¼ column inches. On the other hand, entries where the basic reagent has many derivatives and a large number of references to its synthesis, derivatization, analysis and properties (particularly if dangerous) may occupy well over 11 column inches. When the systematic name corresponds to one used in the 8th (1967–71) or 9th (1972–76) Collective Index Period of CAS this information is also included, as 8CI or 9CI.

I presume that at a cost of £595 most sales of this book will be to libraries. The structures will be very useful to those who have to assign systematic names to reagent chemicals while the toxicity information could be essential to those who are about to handle an unfamiliar compound. With 5000 entries the dictionary is quite comprehensive, and it will be a valuable reference book for those who can gain access to it.

R. A. Young

Ion Exchangers

Edited by Konrad Dorfner. Pp. xxxi + 1496. Walter de Gruyter. 1991. Price DM680.00. ISBN 3-11-010341-9; 0-89925-311-3.

This book is an invaluable source of ion-exchange information for anybody working in the field. It is divided into seven chapters, the first of which is an introduction to the principles of ion-exchange and a discussion of the many different types of substrates available.

Chapter two is devoted to the application of ion-exchangers in industry, and comprehensively covers topics such as raw water treatment, condensate polishing, waste water treatment and applications in areas such as nuclear technology and the sweetener industry.

Chapter three deals with the use of ion-exchangers in pharmacy, medicine and biochemistry. There is a valuable and interesting discussion on the use of ion-exchange and polymeric absorbents for the extraction of streptomycin, gentamycin and cephalosporin *c* from fermentation broths. There is a useful evaluation of the use of resins in biochemistry and biotechnology for extraction and purification of proteins such as lactate dehydrogenase, cytochrome *c*, insulin and monoamine oxidase.

The remaining four chapters discuss the theory and application of ion-exchange in analytical chemistry.

There are two appendices at the back of the book supplying information on commercial sources and activities of resins.

This book provides information of great value for both scientists and engineers working with ion-exchange resins. It should be used as a reference text and provides a good perspective on the area. The references at the end of each chapter are fairly comprehensive and cover the literature up to 1989. I would expect to find this text in a research department library in either a university or in industry.

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Handbook of Derivatives for Chromatography. Second Edition

Edited by Karl Blau and John M. Halket. Pp. xxii + 370. Wiley. 1993. Price £65.00. ISBN 0-471-92699-X.

It is now some fifteen years since the first edition of this handbook was published under the editorship of Karl Blau and Graham King. Containing over 500 pages, the first edition provided a comprehensive summary of derivative chemistry ranging from the classical esterification and acylation, to esoteric methods for derivatizing inorganic anions and thus allowing determination by gas chromatography.

The second edition, this time edited by Blau and Halket is, surprisingly, somewhat more concise at 357 pages. The range of topics covered however, has increased and some chapters,

that on silylation for example, have also increased whereas the chapter on acylation has become much more compact. A new

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chapter on coloured and UV-absorbing derivatives reflects both the development of HPLC as a mainstream analytical technique and the need for more selectivity in both reactivity and detection. Another new chapter is concerned with the derivatization of optically active compounds to maximize their potential for separation by liquid chromatography. Ion-pair extraction is also considered as a derivatization reaction because it renders the analytes both separable and detectable. Specific attention is also given to derivatization for fast atom bombardment mass spectrometry (FAB-MS) and to supercritical fluid chromatography. Finally it is good to see a concluding chapter covering practical considerations, reminding us that analytical chemistry is essentially a practical subject. Hence, this is a book for practising chemists who, though they may never read it, will often refer to it.

The first edition contained material primarily for gas chromatographers. The second edition devotes considerable effort to summarizing the chemistry of derivatives for use in liquid chromatography and is thus a replacement for the first edition rather than an addition to it.

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Applications of Supercritical Fluids in Industrial Analysis
Edited by John R. Dean. Pp. xiv + 224. Blackie A & P. 1993. Price £65.00. ISBN 0-7514-0057-2.

This book reflects the continuing developments in the application of supercritical fluids in the analytical laboratory for both chromatography (SFC) and extraction (SFE) and would provide a broad introduction to any newcomer to the field. After a general comparison of supercritical fluids by Hitchen and Dean, Greibrokk reviews the current state of supercritical fluid chromatography, including a wide range of detectors. Dean and Kane then survey the available instrumentation for supercritical fluid extraction in a disappointing chapter, which contains a number of errors including, 'the smaller the (restrictor) orifice the greater the mass flow rate'.

'a broad introduction to any newcomer to the field.'

The remainder of the book reviews different application areas. Wilson, Davis and Ruane examine the role of supercritical fluids in the pharmaceutical industry. They show that a wide range of structural types have been examined, from alkaloids, barbiturates and beta-blockers to steroids, and they particularly note the use of SFC for chiral assays. Knowles and Hoge then examine applications in polymer analysis, which is one area where supercritical fluids offer a clear advantage over conventional GLC and HPLC assays. Most of the survey concentrates on the separation of the polymeric materials, with only a brief mention of the extensive work on polymer additives. In the next chapter Dean reviews food science applications, both of natural constituents and contaminants such as pesticides.

Janda, Bartle and Clifford use the application of SFE to environmental analysis to report their studies on the physical chemistry of extraction, although these studies have already been overtaken by their recent work on a more sophisticated model. The chapter also describes the determination of a range of different groups of pollutants.

In the final chapter, Lynch suggests some future developments in supercritical fluid technology. Inevitably some of these have already been implemented, but they suggest some interesting areas for possible future research.

Overall, this book provides a general introduction to the current state of supercritical fluid applications, although most are still in research areas rather than in industrial applications. The problems of these techniques is that automation is only just being introduced and this is delaying repetitive applications. Many supercritical systems are still not sufficiently robust for routine use in an industrial environment, and there is concern about the reproducibility and efficiency of extraction. The book would have been more interesting if it had addressed these problems and the steps being taken to eliminate them in modern systems. There are a number of typographical errors including a graph whose time axis runs from 0 to 5 to 0 with no units.

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Quantitative Calculations in Pharmaceutical Practice and Research
By Themistocles P. Hadjiioannou, Gary D. Christian, Michael A. Koupparis and Panayotis E. Macheras. Pp. xii + 462. VCH. 1993. Price DM 198.00; £81.00. ISBN 0-87573-282-3.

This excellent, but expensive book presents in a single volume almost all the calculations that a practising analyst in the pharmaceutical industry is likely to require in everyday work. The treatment provides a balance of explanation of theory, worked examples and problems for the reader. The theory sections are particularly well written and should discourage the too common practice of thoughtlessly substituting numbers into a memorized formula of unknown origin. The reader is presented with an explanation from which he can, and is encouraged to, derive the formulae himself, and so is able both to recognize their limits of applicability and to extend them to cover situations not explicitly discussed.

As well as treatment of the strictly analytical calculations (deriving actual amounts of analyte from results of photometric, electrochemical and other measurements) attention is also given to those calculations that are important in deciding the conditions required for an analysis (*e.g.*, complexation equilibria, solubility, extraction, *etc.*) and of those needed to assess suitability (*e.g.*, peak shape and plate count in chromatography). There are also excellent chapters describing the uses to which the analytical results are put to in pharmacokinetics, drug disposition and stability studies. While these chapters by no means give a complete account of the current 'state of the art' in these fields, they provide the background that every analyst should know.

'a balance of explanation of theory, worked examples and problems for the reader.'

An entire chapter is devoted to the apparently trivial problems of 'Metrology and Concentration of Mixtures'. This covers procedures for the calculation of quantities required to

make solutions of specified strength (expressed in terms of m/m m/v, normality, etc.) and calculations to determine the surface area of a given mass of particles of given shape and size. It is surprising how often apparently well-qualified staff have 'blind-spots' in some of these areas.

A preliminary chapter discusses statistics and the estimation of errors in a fairly conventional way, covering all the usual topics (*e.g.*, '*t*' tests, linear regression, *etc.*) but not extending, for instance, to analysis of variance. The elementary level of the statistics section perhaps explains why the authors have not provided any account of analytical method validation (it would be helpful even, just to give some examples of how to estimate the expected accuracy and precision of a method from the known errors in the individual procedures and instruments) or the design of experiments. There is also no account of biological or microbiological methods, which would be useful background even for the chemical analyst, who is often called on to compare his results with those of biological determinations.

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Multivariate Pattern Recognition in Chemometrics, Illustrated by Case Studies
Edited by Richard G. Brereton. *Data Handling in Science and Technology. Volume 9.* Pp. xii + 326. Elsevier. 1992. Price: hardbound US$174.50, DFl150.00; 5 pack paperback plus software supplement US$428.50, DFl750.00; software supplement US$100.00, DFl175.00. ISBN: hardbound, 0-444-89783-6; paperback, 0-444-89784-4; 5 pack plus software supplement, 0-444-89786-0; software supplement, 0-444-89785-2.

This book is an excellent compilation of eight chapters covering the techniques which fall into the general area of pattern recognition. The informal tutorial style of each chapter makes it an ideal text for anyone wishing to gain proficiency in the subject area. Each chapter contains a series of intext questions which reinforce the subject at strategic points. These intext questions are augmented by useful editorial comments which brings an aspect of uniformity to the book. The individual authors' chapters, despite containing different notation (a point the editor has diligently cross referenced), are surprisingly uniform in their style and the level of understanding expected of the reader (which is fairly basic). Each chapter is very thorough and written in an easy to read manner.

The first two chapters focus on the visual geometrical aspects of pattern recognition and cover: principal component analysis, multivariate space, multiple linear regression, discriminant analysis, factor rotation and mapping techniques. The spatial concepts of these first two chapters are supported by the following two chapters which expound in the underlying

'the book is a first class text in the underlying-principles and practical use of pattern recognition techniques.'

matrix algebra and multivariate analysis of the technique used. Both chapters are well written, make good use of intext questions and represent a suitable starting point for those with a limited background wishing to get more into the mathematical rigour of pattern recognition. The fifth chapter specifically focuses on principal component analysis, from a more pragmatic viewpoint, considering points such as how data is reduced and what methods are available with the technique for interpreting results. Chapters 6 to 8 discuss classification techniques which are basically split into unsupervised methods (cluster analysis), soft modelling (SIMCA) and hard modelling. These chapters are again easy to read with good use being made of practical examples and intext questions, giving the reader a most valuable insight into the major types of pattern recognition. The book comes with a comprehensive index and each chapter contains its own reference section.

There is at the end of the book an appendix which describes, in tutorial style, two software programs, SPECTRAMAP and SIRIUS. A software supplement can also be obtained which can be used in conjunction with the book. Installation of the software is relatively simple and it will run on a basic 286 machine. However, the software offers little in addition to that described in the appendix of the book. One is therefore left a little frustrated and caught in a difficult situation of having to find just over the cost again of the book (approximately $96) to purchase the real usable software (a good marketing ploy for Elsevier but something of a disappointment for the science).

In conclusion the book is a first class text in the underlying-principles and practical use of pattern recognition techniques. It is well priced for a book of its type at $85.50 (paperback) and is strongly recommended.

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Detectors for Capillary Chromatography
Edited by Herbert H. Hill and Dennis G. McMinn. *Volume 121 in Chemical Analysis: A Series of Monographs on Analytical Chemistry and Its Applications.* Pp. xx + 444. Wiley. 1992. Price £67.00. ISBN 0-471-50645-1.

Detectors for Capillary Chromatography is volume 121 in a series of monographs on analytical chemistry. This volume deals primarily with detectors for gas chromatography and touches briefly on capillary supercritical fluid chromatography and on microcolumn liquid chromatography. This latter technique is included presumably because it utilizes the same types of detector that are also used in gas chromatography. Mass spectrometry and flame ionization are two examples.

'Although intended as a reference text this book is very readable and will be a useful addition both in the library and in the laboratory.'

The book contains the expected chapters on the flame ionization detector, the electron capture detector and on nitrogen, sulfur and phosphorus detection. More interesting however, is a very enlightening chapter on the electrolytic (Hall) detector. New detection principles are included, and hence there are chapters covering atomic emission detection and the use of Fourier Transform infrared spectrometry as detection principles.

Particularly interesting (and gratifying) is the inclusion of a section on ion-mobility spectrometry (IMS). This little known and little used technique shows great promise because of its sensitivity and its potential for selectivity in detection. IMS can be used as a detector for GC, LC and SFC and seems destined to become a major new addition to the range of detectors already available.

Although intended as a reference text this book is very readable and will be a useful addition both in the library and in the laboratory.

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