Book Reviews

Selective Detectors Environmental, Industrial, and Biomedical Applications. Edited by Robert E. Sievers (University of Colorado, Boulder). Wiley: New York. 1995. xxi + 261 pp. $59.95. ISBN 0-471-01343-9.

This text is Volume 131 of *Chemical Analysis, A Series of Monographs on Analytical Chemistry and Its Applications.* Like many volumes in this series, the present text deals with recent developments in a specific area of chemistry: in the present volume the focus is on the applications of selective detectors in chromatography and particularly detectors based on chemiluminescent reactions.

The chemiluminescence of sulfur species is reviewed in Chapter 1 (coauthored by Sievers) with particular attention given to the chemiluminescent reactions of SO with ozone. Both flame and flameless methods for the production of SO are described. The flameless sulfur chemiluminescent detector (flameless-SCD) is discussed in detail in Chapter 2. It is claimed to be more sensitive and selective than other sulfur detectors. In gas chromatography, the minimum detectable amount of sulfur that can be routinely detected is given as roughly 25 fg of S/s when oxygen rather than air is used for the ozone generator, which is considerably smaller than the sensitivity claimed by the vendor (Sievers Instruments, Inc., Boulder, Colorado) of 0.5 pg of S/s.

The usefulness of the chemiluminescent reactions of NO with ozone as the basis of a sensitive method for the detection of nitrogen-containing compounds is discussed in detail in Chapter 3 (also coauthored by Sievers). Methods for the conversion of various N compounds to NO are discussed, and many applications including the thermal energy analyzer (TEA) for nitrosamine compounds are reviewed. A redox chemiluminescence detector based on the oxidation of various analyates of interest by NO_2 that produce NO that can be detected by the chemiluminescent reaction with ozone is an example of the breadth of the method.

U. K. Gökeller covers the oxygen flame ionization detector (O-FID) in Chapter 4. This involves the conversion of oxygen-containing compounds to CO and then the conversion of CO to methane detected in a conventional FID. Whether this is really a selective detector for oxygen seems a matter of semantics, but perhaps the real need to selectively detect oxygen containing species justifies Chapter 4 and the acronym. The hydrogen atmosphere flame ionization detector (HAFID) which is selective for some organometallics over hydrocarbons by a factor of 10^4 when a positive biasing voltage is applied to the wall of the FID detector is covered in Chapter 5. Uden comprehensively discusses the use of various plasma sources for element-selective detection in gas chromatography (via atomic spectrometry) in Chapter 6. Of particular interest is the capability of GC/AED to differentiate and quantify isotopes of elements of low atomic number.

The most powerful and selective chromatographic detection method is undoubtedly mass spectrometry and the usefulness of GC−MS methods has been well established. This topic is not covered in the present text, although Byrdy and Caruso (Chapter 7) cover plasma mass spectrometry with an emphasis on the use of the inductively coupled plasm (ICP) torch as an ion source for mass spectrometry (MS) for element selective detection. High-performance liquid chromatography (HPLC) is most common chromatographic method used with the ICP plasma, and many applications of HPLC/ICP/MS described since around 1986 are noted. These authors also cover the helium-induced microwave plasma (MIP) as an ion source in MS for gas chromatography, GC/MIP/MS.

Hadd and Birks discuss the applications of peroxyoxalate chemiluminescence (PO-CL) in Chapter 8. Unlike most chemiluminescent reactions where luminescence is due to some reaction intermediate derived from one of the reagents, in PO-CL, the peroxyoxalate reaction transfers energy directly to a variety of fluorescent molecules that then emit light identical to their fluorescence. In PO-CL, unlike conventional fluorescence, there is no background light emission from the excitation source that is the primary reason for the great sensitivity of this method (reported at the attomol (10^{-18} mol) level in selected cases). Birks has pioneered research in this field, and a large amount of material relevant to the present text is condensed and presented.

Chapter 9 by James E. Lovelock, entitled Tales of a Reluctant Instrument Maker, is the final chapter in this text. It is based on a talk by Lovelock at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy held in Chicago in 1994. Lovelock is one of the more interesting and colorful personalities in chemistry in this century who is perhaps most generally known in recent years for his Gaia hypothesis. In the field of chromatography, his invention of the electron capture detector (and many other chromatographic detectors) is recognized as his greatest achievement. Lovelock's description of his own classical education "as submitting to a long and pointless education (in the classics) as a necessary prerequisite to becoming a scientist" and his description of his own education in science as an apprentice to the owner of a private consulting firm offer an interesting and novel perspective on education.

This text is well written and should be of interest to people in many diverse fields who need more sensitive and selective chromatographic detectors. The authors of the various chapters are all known authorities in the areas they cover and the text seems to have been carefully edited. The references are up to date with a fair number from 1993 and a few from 1994.

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JA9551953

Organic Synthesis Highlights II. Edited by Herbert Waldmann (University of Karlsruhe, FGR). VCH: New York. 1995. x + 420 pp. $95.00. ISBN 3-527-29200-4.

This book is a collection of 40 articles by German and Swiss industrial and academic chemists. A little over half the book is devoted to synthetic methods, and the remainder, to the synthesis of particular compound classes, including brief discussions of several major syntheses in the natural product area.

The treatment is very suitable for advanced graduate students, as well as those with experience beyond the Ph.D. level, and the book is clearly an excellent starting point for an introductory overview of the subjects it covers. References generally span the period from the late 1980's up to 1992, with a few references that are more recent. A full listing of the contents is not appropriate here, but a representative selection will illustrate the sensible choice of important topics: Sharpless epoxidation; enantioselective *cis*-dihydroxylation; carbohydrate complexes in enantioselective carbon−carbon bond formation; C_2-symmetric amines as chiral auxiliaries; iron η^5 complexes; rhodium-catalyzed carbenoid cyclizations; some applications of organolanthanides, oxidative cleavage of silicon−carbon bonds; use of temporary silicon tethers; use of enzymes in the formation of carbon−carbon bonds and in the synthesis of *O*-glycosides; cyclizations of iminium, oxonium, and sulfonium species; fluorine in organic synthesis; hypervalent iodine reagents, group selective reactions and two-directional synthesis. The section on specific synthetic targets contains examples one would expect to find in a collection of recent "highlights": rapamycin, calicheamicin γ_1^I, taxanes, carbacyclines, *O*-glycosides, penems, mitomycins, morphine, CC-1065, and a number of others are represented.

The presentation is clear and the diagrams are neatly drawn, although they are not always printed as close to the corresponding text as one would wish. Any synthetic organic chemist in the early stages of a research career will find this a helpful—and enjoyable—source of information and an excellent overview of the state of modern organic synthesis. The present book is the second of its type from VCH, and I hope that a third volume will appear in due course.

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JA955308I

Glass Chemistry. 2nd ed. By Werner Vogel (Friedrich-Schiller-Universität Jean). Springer-Verlag: New York, Berlin. 1994. xiv + 464 pp. $98.00. ISBN 0-387-57572-3.

Many music lovers can recall occasions where they purchased a record or a tape of a piece performed by well-known artists only to be disappointed at the poor quality of the recording. In such cases, the new record is not likely to have a significant impact, especially when excellent alternatives already exist. Unfortunately, the second edition of *Glass Chemistry* by Werner Vogel is not likely to bring much benefit

to the education of scientists and technologists interested in glass and its applications. This is an area which, in the past, gave rise to excellent texts such as Morey's *The Properties of Glass*, Weyl's *Coloured Glasses*, Mackenzie's *Modern Aspects of the Vitreous State*, Holland's *The Properties of Glass Surfaces*, Iler's *The Chemistry of Silica*, Wong and Angell's *Glass—Structure by Spectroscopy*, Doremus' *Glass Science*, Paul's *Chemistry of Glasses*, and the series *Glass Science and Technology* edited by Uhlmann and Kreidl. In contrast with these carefully prepared and clearly written texts, Vogel's book, although containing some useful insights, gives the impression of being a poorly and hastily compiled set of lecture notes. It is surprising that a respected publishing house such as Springer-Verlag issued this book without meeting minimum editorial standards, especially since this is already a second edition of the book. There is hardly a single page without major editorial deficiencies such as undefined symbols in formulas and equations, inconsistencies (the use of various symbols for the same quantity), syntax errors (e.g., sentences without beginning or end), spelling errors, and simple typographical errors. It is difficult to concentrate on the technical substance when the text is plagued with references to "duped glass", "reasoning nucleus", and "attached (instead of attacked) glass" and with the persistent use of the symbol "Pa" for both Poise and Pascal, etc.

Compared with the texts by Doremus and Paul, for instance, the present volume presents a rather narrow approach to glass chemistry. Reactions of glasses with the environment (aqueous or gaseous) and processes such as ion exchange are only briefly mentioned. Glass electrodes, coatings, catalysts, and sorbents are ignored or get a very brief mention. The entire book is dominated by the pre-eminence of immiscibility and the separation of glassy or crystalline phases as the key to every aspect of glass behavior. While these phenomena are very important, this leads to underemphasis on chemical bonding. Acid—base concepts, in particular oxygen ion activity, are not discussed, although these concepts are essential to the understanding of coordination and oxidation states of transition metal ions in glasses. Other examples of the lack of attention to chemical bonding include the disregard of thermodynamic models based on oxide combinations in determining properties such as hydrolytic stability and viscosity, as well as the absence of any attempt to account for the high resistance of vitreous silica, as contrasted with alkali silicate glasses, to radiation-induced coloration.

The book is also severely limited in its selection of glass compositions. It is amazing that although thousands of papers have been published in the last 30 years on nuclear waste glasses, including borosilicates, aluminosilicates, and phosphates, and although the research in this area provided much information about phase separation, crystallization, viscosity, and low-silica glasses, none of these data are mentioned in the book. Natural glasses and glasses for use in fiber composites (e.g., E-glass) are only mentioned in passing. Geographically, the book heavily concentrates on work done in East Germany, with some mention of developments at Corning, and largely ignores studies conducted in England, France, and elsewhere. At times (e.g., the discussion of the development of glass ceramics in Section 10.4.3), the text actually becomes a catalog of studies performed at particular, mostly East German, facilities. Large parts of the book are outdated. For instance, the methodology and results of structural studies are discussed without mentioning the important work of Goodman, Gladden, Bunker, Elliott, Gaskell, and others, and the use of many modern spectroscopic methods.

The beginning chapters of the book (1—5) are particularly prone to editorial problems and unclear terminology (e.g., the Abbé ratio and other optical properties). The discussion of glass formation, structure, and characterization techniques is largely outdated and the discussion of thermodynamic aspects of the glass transition is inadequate. Chapters 6—10 cover the subjects of most interest to the author, viz. phase separation, crystallization, and the importance of these phenomena in optical glass and glass ceramics technology. These are the best chapters of the book, and they contain a significant amount of useful information, even though the picture is not complete. (For instance, aluminates, high-sodium borates, and glassy polymers are not mentioned in Chapter 7, the criteria for athermal glasses in Chapter 8 are not clearly defined, the use of fluorides as IR-transmitting glasses is not mentioned in Chapter 9, and hydrolytic stability classification is mentioned without explanation or discussion of hydrolytic processes.) The last three chapters of the book, dealing with strength, radiation effects, and miscellaneous properties, are more sketchy. Again, there is almost exclusive emphasis on immiscibility while chemical bonding effects are overlooked. There is insufficient attention to surface reactions, and confusing terminology is used (for instance, it is not clear whether the strength discussed in Chapter 11 is tensile, compressive, or flexural). Chapter 13 is very fragmentary, and parts of it are much more appropriate to other parts of the book.

Without considerable revision, *Glass Chemistry* provides a partial and not very clear view of the chemistry of glasses. It is not suitable for use as a textbook or as a comprehensive guide to the literature. It is of some value to specialists in areas of glass technology where phase separation and crystallization are predominant, such as glass ceramics, and provides useful information on various classes of optical glass.

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JA955322V

Electroactive Polymer Electrochemistry. Part 1. Fundamentals. Edited by Michael E. G. Lyons (University of Dublin). Plenum Press: New York. 1994. xv + 488 pp. ISBN 0-306-44792-4.

Electroactive Polymer Electrochemistry, Part 1, is the first volume of what is envisioned as a three-volume series. Part 1—Fundamentals (Chapter 1—4), is reviewed here, and Part 2—Applications (Chapters 5—11) will have chapters on atomistic simulation of matter transport phenomena, digital simulation of charge transport, ellipsometry and FTIR spectroscopy, osmium and ruthenium redox polymers, bioelectrochemistry and bioelectronics, analytical applications of polymer modified electrodes, and a survey of analytical applications, all as they apply to electroactive polymers. Part 3 (currently in the planning stage) will discuss polymer ionics.

The preface states that the idea for writing Part 1—Fundamentals had its origin in the lack of a suitable textbook for a graduate course on chemically modified electrodes and electroactive polymers taught by Professor Lyons at Trinity College Dublin. The first two chapters of this book (374 pages of a total of 484 pages), which are written by Professor Lyons, admirably fill this gap, but others should be forewarned that an introductory graduate level course in fundamental electrochemistry is a prerequisite for understanding what is written here. Initially, I was put off by the fact that 77% of what is billed as an edited review series was written by the editor of the series, but that should not have been a concern. Lyons' chapters present a balanced picture of the field with lots of references to the primary literature and positive commentary on the contributions of other leaders in the field.

Chapter 1, Charge Percolation in Electroactive Polymers by Michael E. G. Lyons, first discusses the basic concepts of electron hopping, doping and conduction in electroactive polymers, and the experimental basis for these ideas and then surveys experimental techniques. All the standard techniques involving current and voltage measurements are surveyed as well as the results of electrochemical quartz crystal microbalance (EQCM) and probe beam deflection spectroscopy (PBDS). A minor omission is the neglect of any mention of the simultaneous electrochemical electron paramagnetic resonance (SEEPR) measurements of Osteryoung *et al*., although mention is made of the difficulty of separating capacitive and Faradaic effects which SEEPR is uniquely capable of investigating.

Chapter 2, Electrocatalysis Using Electroactive Polymer Films by Michael E. G. Lyons, discusses mathematical models for chemically derivitized electrodes, polymer-modified electrodes, and conducting polymer/enzyme composite catalytic systems. Included are a number of interesting case studies of metallopolymers, catechol electrooxidation, and Michaelis—Menten substrate kinetics.

Chapter 3, The Membrane Properties of Electroactive Polymer Films by Karl Doblhofer and Mikhail Vorotyntsev, discusses ion transport and partitioning in both ionic and nonionic polymers.

Chapter 4, Transmission Lines for Conducting Polymers, is written by W. John Albery and Andrew R. Mount. In this chapter Albery and Mount briefly outline their method of using transmission lines as circuit elements to successfully model electrical conduction through membranes and polymer-modified electrodes. Unfortunately, this chapter does not follow the balanced approach with positive commentary on the work of others used in the preceding chapters. Critical discussion

of competing theories is fine, but attacking authors by name and the snide caption to Figure 4.2 have no place in a scholarly work of this type.

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JA955241Z

A Guide to the Complete Interpretation of Infrared Spectra of Organic Structures. By Noel P. G. Roeges (Katholieke Industriele Hogeschool O-VI). Wiley: New York. 1994. x + 340 pp. $69.95. ISBN 0-471-93998-6.

Infrared and ultraviolet spectroscopy were the principal methods for organic structure determination from 1950 until around 1965, when they were overtaken by NMR and X-ray crystallography, techniques which have since become increasingly dominant. It is unfortunate that infrared spectroscopy has become neglected, as it can offer much insight into the structure of molecules and into intra- and intermolecular interactions. Thus, a true modern overall guide to infrared spectroscopy would indeed be of great utility.

Infrared spectroscopy offers two major types of information—absorption frequencies and absorption intensities. The book under review, with the exception of a brief discussion of qualitative strengths of benzene modes on page 308−312, omits any treatment of intensities, which is a pity as intensities offer, arguably, more interesting and important information than frequencies, especially as regarding intra- and intermolecular interaction (a subject which is not mentioned in the present volume). Thus, this book cannot be described as "a complete interpretation". What the book *does* provide is a guide to the frequencies of the characteristic infrared bands for common functional groups, in a treatment which is rigorously based on the number of bands to be expected according to normal coordinate analysis. The book explains the way in which these characteristic frequencies vary with structure for a rather large number of simple functional groups and for a very few ring systems. An enormous amount of work has gone into compiling all this data, and it has been done carefully. The work is certainly up-to-date; references to papers published in 1993 are included. Almost one-third of the book is taken up by lists of references. The procedure adopted of giving reference lists after each short section, however, means that many of the references are repeated as many as 10 times.

Infrared frequencies depend significantly on phase (solid, gas, or solution) and on solvent, and in this compilation, it is not very often that any reference is made to the medium to which the data refer, although this could presumably be obtained from the references. Although, in the opinion of this reviewer, the title of this book is misleading, it does provide a valuable reference source to infrared frequencies for a large number of functional groups and has collected data from numerous sources into a readily accessible form.

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JA945091C

Molecular Cryospectroscopy. Edited by R. J. H. Clark (University College, London) and R. E. Hester (University of York). Wiley: New York. 1995. xxvi + 391 pp. $140.00. ISBN 0-471-94280-4.

This book overviews experimental and theoretical approaches in modern cryospectroscopy, which has developed extensively during the past few decades.

The first chapter presents experimental setup for optical cryogenic investigations. Several types of cryocells and cryostats and requirements for their design are described in detail and illustrated.

Next, Chapter 2 gives an introduction into the theory of cryospectroscopy of solutions and describes methods of cryosystem analysis. The authors present quantitative spectral analysis for determination of solubility of substances in liquid cryosolution, including the origin of random and systematic errors and a brief review of theoretical evaluation of solubility and its connection with thermodynamics.

Intermolecular interactions in cryosystems and their influence on optical spectra are considered in Chapter 3. Dipole moment formalism is applied to describe spectral band shape, half-width, and intensity. Several factors like thermal effects, local field effects in a dense medium, shift of bands producing a redistribution of probabilities of resonant transitions, changed Coriolis coupling of rovibrational states, changed electrooptical parameters of solute molecule which can significantly change position, and shape and intensity of spectral band are analyzed and illustrated by numerous experimental examples. The first three chapters serve as an introduction to modern cryospectroscopy.

Chapters 4−8 are further illustrations of the general approaches made above. Infrared spectra of solutions in liquid Ar, N_2, and O_2 as a source of information on vibrational characteristic of polyatomic molecules are discussed in Chapter 4. Several models are proposed to describe solvent effects and the influence of anharmonisity and vibrational resonance on spectra. The presented theoretical results are in good agreement with experimental data.

Chapter 5 describes absorption spectra of molecular complexes in the liquid phase, especially hydrogen halide complexes due to the presence of discrete rotational lines and recently developed models of rovibrational bands of hydrogen-bonded species. The influence of specific and nonspecific interactions on spectra (changes in band shape and position) is illustrated by wide experimental results for cryosolutions, which are compared with the gas phase or inert matrices.

Induced spectra of cryosystems are discussed in Chapter 6, which also briefly outlines the theory of induced absorption.

Chapter 7 is devoted to nonlinear spectroscopy and photochemistry of cryosystems. Nonlinear absorption of SF_6 in pure or doped Kr illustrates the possibility of preparing of a nonequilibrium distribution and methods for its investigation. The relaxational parameters derived from the spectral data are widely discussed for diatomic and polyatomic molecules. The photochemistry in cryosolutions and the use of cryosystems as possible active media are also considered.

The final chapter describes organometallic photochemistry in liquefied and supercritical noble gas solutions with the purpose to show the possibility of identifying organometallic complexes prepared photolytically.

The book provides numerous examples, tables, figures, and a bibliography. It will be very helpful for those who are interested in experimental and theoretical methods of modern cryogenic spectroscopy and its applications.

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JA955292W

Femtosecond Chemistry, Volumes 1 and 2. Edited by J. Manz and L. Wooste (Free University, Berlin). VCH: New York. 1995. xxiv + 916 pp. $235.00. ISBN 3-527-29062-1.

This is a collection of excellent chapters covering a wide variety of contemporary areas of chemical research being done with femtosecond lasers. The two-volume book is divided into five parts.

Part I covers the general area of femtosecond chemistry and consists of review articles by Lord G. Porter and Professor A. H. Zewail. The second part focuses on "simple systems" and is a collection of chapters that are devoted to the experimental and theoretical studies on small molecules. Topics such as the broad-band absorption spectroscopy of photodissociated gas-phase molecules, threshold ionization spectroscopy, and developments in transition-state spectroscopy are also highlighted. The third part emphasizes the femtosecond spectroscopic studies of clusters. In this section, as well, there is a nice blend of experiment and theory. This is followed in Part IV by a set of five chapters that focus on complex media. The topics addressed range from liquids to phase transition in GaAs to surface processes and finally photosynthesis. The final section contains set of five chapters that focus on some of the new directions in femtosecond chemistry, such as coherent control of chemical dynamics.

All of the chapters in this book are well written, and the reference lists are current through 1994. This book will serve as an excellent introduction to some of the fields of active research in femtosecond spectroscopy as well as some of the current theoretical models that are being used to interpret the experimental data. Professionals in the field

of femtosecond spectroscopy, especially in the gas-phase and cluster areas, will find this to be a valuable resource.

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JA955161V

Advances in Electrophoresis. Volume 7. Edited by A. Charmbach, M. J. Dunn, and B. J. Radola (National Institutes of Health). VCH: New York. 1994. x + 490 pp. $175.00. ISBN 3-527-30049-X.

Volume 7 of the series *Advances in Electrophoresis* contains eight different chapters with a total of 480 pages. All eight chapters are comprehensive reviews written by experts in the field of capillary electrophoresis, polyacrylamide gel electrophoresis of carbohydrates, and other important applications of electrophoresis, e.g., protein blotting, bacterial genome analysis, PCR hetroduplex analysis, etc.

Chapter 1 entitled Chiral Separations in Capillary Electrophoresis (S. Fanali, M. Cristalli, R. Vespalec, and P. Bocek) provides a detailed description of the principles of chiral separations by capillary electrophoresis and discusses the various direct and indirect methods for the chiral separations by capillary electrophoresis (CE). In the indirect resolution method, the enantiomers are reacted with a chiral compound to form stable diastereoisomers prior to analysis. The diastereoisomers have different mobilities and can be readily resolved in an achiral electrolyte by CE. The direct methods of separations are based on ligand exchange, chiral micelles, inclusion complexation (e.g., cyclodextrins and crown ethers), affinity interactions (e.g., with linear polysaccharides and proteins), and combined approaches (e.g., capillary gel electrophoresis with chiral additives and micellar electrokinetic capillary chromatography with chiral additives). This review provides an account for important applications. In summary, the review is well illustrated, containing an extensive tabulation of recent applications, and has 136 references, most of which cover the period 1990−1993.

Micellar Electrokinetic Chromatography (MEKC) is the title of Chapter 2 by S. Terabe, N. Chen, and K. Otsuka. MEKC, which was introduced by Terabe in 1984, has extended the potentials of CE to the separations of neutral solutes. The review is comprehensive, describing in details the separation principles of MEKC for neutral and charged solutes and also the factors affecting band broadening, resolution, and selectivity. Furthermore, the review provides explicit guidelines regarding the choice of surfactants, buffer solutions, and additives as well as the optimization of separations. It concludes with an ample amount of important applications. The chapter is an exhaustive review listing 228 references, most of which are published in the late 1980s and early 1990s, thus reflecting the importance of this new separation technology.

Chapter 3 is on Capillary Electrophoresis and Thin Layer Electrophoresis of Carbohydrates by P. Oefner and H. Scherz. This review emphasizes the approaches that were developed for the separation and detection of derivatized and underivatized carbohydrates by CE and gives a detailed description of the various media which were recently introduced for the efficient separation of carbohydrates. The chapter concludes with a short section on the use of thin layer electrophoresis (TLE) on paper, cellulose acetate, and glass fiber paper in the analysis of mono-, oligo-, and polysaccharides of various kinds. The chapter is an exhaustive treatment of CE and TLE of carbohydrates citing 130 recent references.

To provide the reader with a complete description of the current status of carbohydrate electrophoresis, right after the review on CE and TLE of carbohydrates comes the fourth chapter on The Analysis of Fluorophore Labeled Saccharides by High Resolution Polyacrylamide Gel Electrophoresis by P. Jackson. This concisely written review provides not only the details of labeling reducing saccharides with fluorophores and their subsequent separations by polyacrylamide gel electrophoresis (PAGE) but also the various methods for the release of glycans from glycoconjugates. It describes the preparative elution of saccharide bands, viewing and imaging the electrofluorograms, and applications of the method, e.g., oligosaccharide profiling, enzymic structural analysis, glycan structural analysis, two-dimensional polyacrylamide gel electrophoresis of fuorophore labeled saccharides (PAGEFS), affinity PAGEFS, blotting of electropherograms, and clinical applications. The chapter has a total of 163 references.

Chapter 5 is on Molecular Methods in Typing of Histocompatibility Antigens by D. Middleton and A. M. Lazaro. This chapter describes the DNA methods used in typing of histocompatibility antigens (HLA). Due to their numerous advantages, DNA methods have begun to replace the serological techniques during the last few years. Gel electrophoresis in its various operational formats is extensively used to monitor DNA typing of HLA. The chapter has reviewed 76 references.

Again, gel electrophoresis plays an important role in DNA Hetroduplex Technology, which is the topic of Chapter 6 written by J. Bidwell, N. Wood, T. Clay, M. Pursall, D. Culpan, J. Evans, B. Bradley, L. Tyfield, G. Standen, and K. Hui. This chapter treats in details the theory and practice of polymerase chain reaction (PCR)−heteroduplex analysis. Furthermore, the chapter describes the equipment recommended for PCR−hetroduplex analysis, outlines the methods for DNA isolation, and gives the methods for HLA class I analysis. This review summarizes the findings of 66 references.

Chapter 7 is concerned with Bacterial Genome Analysis by Pulsed Field Gel Electrophoresis (PFGE) Techniques and is written by U. Römling, T. Heuer, and B. Tümmler. After a brief description of the various PFGE techniques, the chapter provides a detailed description of the separation of bacterial chromosomes and plasmids by PFGE. Following, the macrorestriction fragment pattern analysis of bacterial genomes by PFGE is described, including the methodology, the evaluation of genome fingerprints, and applications. The use of PFGE as a tool for isolation and cloning of bacterial DNA as well as for macrorestriction mapping of bacterial genomes is well documented. The chapter lists 86 pertinent references, most of which are of late 1980s and early 1990s.

Finally, Chapter 8 is a review on Protein Blotting: Research, Applications and Its Place in Protein Separation Methodology, written by B. A. Baldo. This chapter emphasizes the importance of polyacrylamide gel electrophoresis (PAGE), especially in two-dimensional (2-D) format, as an analytical tool for both qualitative and quantitative information on separated proteins. Usually, 2-D PAGE is followed by an electrophoretic transfer of the separated protein on a solid support, a process referred to as protein blotting or Western blotting, which renders the protein accessible to a variety of analytical probes including specific antibody. The chapter (i) provides easy to follow tabulations and diagrams, (ii) explains in details the methods for DNA cloning, protein structure, and blotting, (iii) discusses the improvements in sample handling, protein transfer, detection methods, blotting from ultrathin gels, and blotting from thin layer chromatography, and (iv) assesses the place of protein blotting in current protein separation methodology and microsequencing. Furthermore, there is a wealth of information regarding recent applications and studies of a wide range of proteins. This comprehensive treatment involved the description of a vast literature totaling 210 references.

In total, Volume 7 of the series *Advances in Electrophoresis* is as real a success as its predecessors. I recommend this book to all libraries and to all users of capillary electrophoresis and gel electrophoresis.

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JA955132K