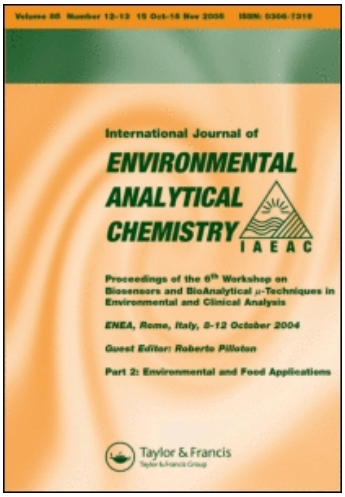

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Book Review

APPLICATIONS OF MASS SPECTROMETRY TO TRACE ANALYSIS. Ed. S. Facchetti, Elsevier, US $78.75, Dfl. 185.00.

This volume consists of the lectures given at a course held at the Joint Research Center, Ispra (Italy), September 29–October 3, 1980. It offers a wide range of topics and will be of particular interest to those wishing an introduction to topics in this field.

Since this is a collection of lectures by different speakers, the organization of the material does not always follow a logical sequence. The major drawbacks of such an organization scheme are that (1) much material is repeated and unnecessary, (2) material is presented at a number of levels of complexity, whereas some may be overly basic, others are highly technical and lacking the necessary background and (3) the sequence of lectures is not arranged so that basic material is presented before advanced material.

The contents consist of sixteen lectures followed by a round table discussion. The first ten lectures are general in nature and the following six discuss applications from a range of fields.

Chapter 1, "General aspects of trace analysis" and Chapter 2, "Sample preparation and separation methods in organic trace analysis with special respect to mass spectrometry" both by K. Beyermann present extremely basic material consisting primarily of definitions and statistical reviews of analytical techniques reported in the literature. The second chapter covers several sampling and separation techniques, but ignores others. Chapter 3 entitled "methods of determination of organic traces with special reference to mass spectrometry" also by K. Beyermann consists of further statistics concerning literature references and does not deal with the title subject but rather with a review of areas of application of MS.

Chapter 4 by E. Barretta, "Application of Thin Layer Chromatography in the isolation of traces of compounds (candidate drugs) from biographical samples for structural analysis by mass spectrometry", was a short section which dealt fairly well with the combination of TLC and

MS. The later sections of this chapter become somewhat too specific to a particular analysis. This chapter would have been better situated later in the book.

Chapter 5 by C. Brunnee, "Trends in MS instrumentation for trace analysis" was one of the best sections in the book and dealt with some advanced topics in instrumentation such as GC/MS, LC/MS, MS/MS, electro-optical ion detection and several others. The section of LC/MS interfacing is the only place in the book that this important and growing field is mentioned and the information is somewhat out dated.

Chapter 6, "Recent developments in organic trace analysis" by D. Hazelby is highly technical and presents material without the necessary background covering subjects such as metastable decompositions. The later sections, however, are clearer and somewhat more basic. It should be noted at this point, that at no place in the book is the basic instrumentation of mass spectrometry been discussed. This is reasonable, if the book is intended for those familiar with the field, in which case the first three chapters and several other sections which cover other basic topics should be omitted.

Chapter 7, "The role of high resolution GC and related ancillary units in the sample treatment for MS trace analysis". by F. Poy and Chapter 8 "Fused silica capillary GC/MS and negative chemical ionization-applications in environmental science" by D. J. Dixon are both excellent chapters and cover techniques used in coupling capillary GC with MS. Chapter 7 is largely concerned with sample introduction systems whereas chapter 8 deals with interfacing systems and an interesting discussion of negative chemical ionization. The only criticism here is that these two sections might have appeared earlier in the book.

Chapter 9, "Sources of error in quantitative mass spectrometry", by B. J. Millard, presents some interesting material, but in no sense is exhaustive.

Chapter 11 "Methods for improving selectivity in quantiative GC-MS" by D. S. Millington deals primarily with improving *sensitivity*. The two concepts are confused throughout the chapter, although definitions are presented in the beginning (the definitions are not totally correct e.g. sensitivity is defined as the minimum detectable concentration, whereas it should be the change of signal with change of concentration).

Chapters 10 and 12 through 15 cover specific applications but are good examples of real cases from a range of fields including inorganic analysis (Chapter 10), atmospheric analysis (Chapter 12) biological analysis (Chapter 13) and toxicological analysis (Chapters 14 and 15). Although Chapter 14 concentrates somewhat too much on toxicology and not enough on analysis, Chapter 15 presents an interesting discussion of a

toxicological computer data base (ECDIN). Data bases are otherwise largely ignored throughout the book.

In conclusion, although the book presents several interesting discussions, much of it is superfluous, redundant and overly basic.

J. A. APFFEL

QUANTITATIVE AQUATIC BIOLOGICAL INDICATORS, by David J. H. Phillips, Fisheries Research Station Aberdeen, Hong Kong, POLLUTION MONITORING SERIES (1980), 488 pages (including 99 figures, 103 tables, 44 pages of literature references up to 1978, an author index of 10 pages, a species index of 4 pages, and a subject index of 18 pages), linen, format 228 × 148 mm, ISBN 0-85334-884-7, Applied Science Publishers Ltd., London, £26.

This monograph can be highly recommended to all those who are monitoring trace metals and organochlorine pollution. It is well structured and it is easy to find the appropriate information. The book deals on one side with the powerful techniques using indicator-organisms to monitor the degree of contamination of water bodies. On the other side—as compared to the traditional analytical methods for water and sediments—also the introduced variables are discussed. These may influence the uptake or accumulation of contaminants by the chosen organisms, and may therefore give rise to spurious conclusions with respect to the true availability of the pollutants studied in some areas. Suggestions to the most reliable types of monitoring organisms to quantitate trace metals and organochlorines in freshwater, estuarine and marine environments are given. If the correct sampling, analytical and interpreting techniques are employed, the method of monitoring provides rapid and inexpensive data. Many of the ideas dealt with have been developed during the International Mussel Watch Conference in Barcelona, December 1978. The author envisages the monitoring of pollutants in aquatic ecosystems also as a step in the protection of the ecology.

The volume is dealing in 14 chapters with the following important questions:

—Introduction: The Sources of Pollution

—The Preliminary Selection of an Indicator Organism

—The Effects of Lipid on the Accumulation of Organochlorines and Trace Metaly by Biota

—Seasonality of Organochlorines in Aquatic Biota

—The Effects of Age (Size, Weight) on Trace Metals in Aquatic Biota
—The Effects of Age (Size, Weight) on Organochlorines in Aquatic Biota
—The Influence of Organism Sex on Accumulation of Trace Metals or Organochlorines
—The Effects of Shore Level or Depth of Sampling
—Pollutant Interactions as a Source of Error in Monitoring Studies
—The Use of Sheels as Indicators
—Behavioural Alterations which may affect Indicator Ability
—Biological Indicators: A Retrospective Summary.

One finds also—especially in the tables—valuable data about concentrations found in different waters and organisms, and the book is therefore also a good supplement to "Metal Pollution in the Aquatic Environment" (Springer, 1979, by U. Förstner, Heidelberg and G. T. W. Wittmann, Pretoria). Regarding metals, many elements from aluminium to zinc in the alphabetical order, and their interactions are dealt with. Regarding organochlorine compounds one finds information for instance about Aroclor, BHC, DDD, DDE, DDT, Dieldrin, PCB's, Pentachlorobenzene (but not Pentachlorophenol!), Toxaphene, but also about some non-chlorinated pesticides. Also other important factors are discussed, such as age of organisms, biological half-life, migration, salinity, seasonability, solubility, temperature effects and tissue distribution.

E. MERIAN
NOVEMBER 1981

DIRECTORY OF POLLUTION CONTROL EQUIPMENT COMPANIES IN WESTERN EUROPE, Third Edition (1980), 588 pages (including an index of 127 pages, which is however structured somewhat arbitrarily according to types of equipment and according to countries), stiff paper cover, format 210 × 147 mm, ISBN 0 906685 00 1, European Directories, a Division of Inter Company Comparisons Ltd., 23, City Road, London EC1Y 1AA, £30.

The useful directory brings together information on 6000 individual companies in the United Kingdom and 16 other countries of Western Europe. The manufacture, supply, marketing and development of pollution control equipment, and advisory services on pollution problems, comprise the range of activities attributable to these firms. Each company entry contains the following information: Company name and address, telephone and telex numbers, major executives, sales figures for the last

financial year and a description of each company's products. The completeness depends however of having answered a questionnaire. Therefore some important instrument producers are missing. For obvious reasons no qualifications of the companies could be given, and therefore producers, selling companies and planners are presented somewhat promiscuously. Also the arbitrarily chosen alphabetic order makes it sometimes difficult to find an information.

In the first part—the main body of the directory—seventeen chapters (one for each Western Europe country) contain individual company entries. The second part of the directory is a valuable product index divided into five main sections, and numerous sub-sections. The content can of course not be more complete than the main body, and sometimes the assignment to the different subsections has not been made consequently, probably because the questionnaire was not always answered the same way. Therefore one has to consult several subsections to find the complete information available. The five sections refer to equipment for analysis and measurement pollutants, equipment for control and treatment of specific types of pollutant, general pollution control equipment, pollution control consultancy services and associations and institutes with pollution control interests. In spite of some deficiencies, which may be improved in the next edition, the directory is advantageous as a who-is-who to find addresses.

ERNEST MERIAN, OCTOBER 1981

HALOGENATED BIPHENYLS, TERPHENYLS, NAPHTHALENES, DIBENZODIOXINS AND RELATED PRODUCTS, by R. D. Kimbrough (ed.) (Elsevier Biomedical Press, R.V., Amsterdam, NL. U.S. $95.00, Dfl 195.

During the last 15 years, the halogenated aromatic compounds have become increasingly important in many disciplines of environmental research. The principal grounds for this interest stem from the toxicological properties of this class of compounds, particularly a high fat-solubility, resulting in accumulation in food chains, and a very low degradability. Therefore, a volume on halogenated biphenyls and related products is an obvious and well-timed addition to the Series on Topics in Environmental Health.

Chapters 1–3 give an introduction to the class of compounds.

Chapter 1 outlines production, properties and usage of the chlorinated biphenyls, terphenyls and naphthalenes and of brominated biphenyls and terphenyls. This chapter will be of use for all those who are interested in

the roots of this major environmental issue. Many interesting facts are mentioned, including production data of the major manufactuers and trade-marks for commercial brands. Chapter 2 reviews the analytical methods including extraction procedures and purification of different matrices. The main part of this chapter deals with the dibenzodioxins and the dibenzofurans; methods for PCB's, PCN's, PBB's and PCT's are briefly mentioned. However, a discussion is lacking on the very serious and interesting problems dealing with the quantitation of PCB's in environmental samples. In particular, a view on the differences between, let us say, the North American and the European approach, or rather between the use of packed column pattern comparison and the use of high resolution capillary chromatography for preselected isomeric quantitation, would have been a valuable addition. Moreover, the use of GCMS for confirmation purposes is now generally adopted as indispensable in these types of analysis. This very fact is not mentioned as such in the section on PCB analysis.

For obvious reasons, the size of chapter 3 on environmental pollution of air, water and soil, has been kept to a minimum. Firstly, only the environmental levels generally found are reviewed. Secondly, it is surprising, that, despite the fact that the substances, this volume deals with, are increasingly becoming a subject of major concern, so little investigations have been carried out to collect reliable data on their environmental levels. In fact, such data are only available for the PCB's, at present. The analytical problems involved in collecting these data are a limiting factor here, of course.

Chapter 4 deals with metabolism and bioaccumulation. It consists of a well documented review on experimental data and gives the various mechanisms known at present to be involved in substance-breakdown and accumulation of substances and/or metabolites. The purpose of chapter 5 on chronic toxicity is to delineate certain aspects of toxicity, i.e. carcinogenicity, teratogenesis, mutagenesis and effects on reproduction in animals. Emphasis has been laid upon dioxins and biphenyls, since less is known about naphthalenes and furans, and very little about terphenyls. This chapter is well illustrated and every section contains a useful summary of the toxicological potential of these compounds. In chapter 6 an attempt to a more theoretical approach of the biochemical activity of the halogenated aromatics is given, by reviewing known structure-activity relationships. In chapter 7, a specific toxic effect, of certain halogenated hydrocarbons, viz. the chemical porphyria, a type of liver malfunction, is discussed. Although the mechanism of porphyrinogenic action of hexachlorobenzene—the most extensively studied agent—and related polyhalogenated aromatics is still unknown, these compounds seem to

affect the porphyrin metabolism in a common way. Biotransformation of the agent seems to play a major role here. In chapter 8, another type of specific activity, viz. the influence on the immune system, is reviewed. Finally, chapter 9 deals with human exposure, including sections on general population exposure, the Yusho incident, the TCDD contamination in Vietnam, Missouri and Seveso and occupational exposure. Many useful figures are given in these sections, like for instance those on PCB levels in human milk and adipose tissue. This chapter gives the reader a good understanding of the environmental hazards that attend the production and consumption of these compounds.

This volume illustrates many sides of the problems environmental scientists have to cope with when dealing with these substances. It consists of well documented contributions of recognized experts in the various fields. Although the "environmental health" has to be interpreted as of a mainly anthropogenic nature in this volume, the lack of a more ecotoxicological view is on, on the one hand, explainable on account of the few data available, and, on the other, more than offset by the quality of the various contributions and the volume as a whole. No need to say the purchase is recommended.

PIM DE VOOGT

CHROMATOGRAPHY AND THE ENVIRONMENT, Environmental problem solving using gas and liquid chromatography, R. L. Grob and M. A. Kaiser, Elsevier, Amsterdam, 1982, XII+240 pages, ISBN 0-444-42065-7

In Volume 21 of the well known Journal of Chromatography Library series R. L. Grob and M. A. Kaiser devote some 230 well readable pages to environmental problem solving by means of chromatographic techniques. After two short introductory chapters, attention is directed to the all too often rather neglected theme of sampling techniques (defined as processes performed outside the laboratory). The statistical background of sampling, grab sampling, adsorption, freeze out and trapping techniques are among the many topics discussed. Liquid–liquid extraction, headspace equilibration and the use of derivatization procedures are the principal topics in the chapter on sample treatment (preparing a representative sample for analysis) which is relatively short and, unfortunately, not too well balanced in places.

Gas chromatography (GC) still is a much more important technique for environmental analysis than is liquid chromatography (LC), and this is reflected in the relative size of the next two chapters (50 vs. 15 pages). For

both techniques the text, of necessity, is a rapid overview of basic aspects such as selection of separation conditions, detection principles and use of retention indices rather than a detailed discussion of either these or more advanced chromatographic topics. As for GC, a representative listing of the more recent methods for the analysis of air and water samples for many of the commonly encountered pollutants serves a highly useful purpose; the total number of references is 379. The chapter on LC is slightly disappointing. To quote some examples, the section on detectors devotes as much attention to refractive-index and wire-transport detectors as it does to UV absorption and fluorescence detectors, modern developments such as on-line trace enrichment and LC/MS are mentioned hardly, if at all, and there are only 46 references.

The final two chapters deal with safety in the chromatographic laboratory (these pages should have been used to include more about chromatography in the laboratory!), and regulations, and international and national (22 countries) regulatory and advising groups.

The use of gas and liquid chromatography as techniques of analysis, and the selection of the environment as the field of application makes for a combination well suited to attract the attention of a large number of chemists. The particular blend provided by the present book makes it, to my opinion, primarily useful for the environmentalist who wants to use chromatography to solve his daily problems, and who wishes to avoid pitfalls during the pre-chromatography steps of sampling and sample preparation. He will find much valuable information in the present text, inclusive of a large number of references. He should also realise, however, that relevant chromatographic topics such as the use of thin-layer chromatography as a screening technique, capillary GC, and even GC/MS, are dealt with very summarily. For actual chromatograms, MS spectra or a real discussion on how to increase the sensitivity and selectivity of detection he will have to search the (quoted) literature. Obviously, the book is of much more limited value to the active chromatographer. Still, even for him attentive reading of a chapter such as that on sampling techniques may well be rewarding.

U. A. TH. BRINKMAN