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### Book Reviews

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## BOOK REVIEWS

**PARTICLE FLUX IN THE OCEAN.** Scope 57, edited by V. Ittekkot, P. Schäfer, S. Honjo and P. J. Depetris, 372 pages, Wiley, Chichester, UK (1996). ISBN 0-471-96073-X. £70.00.

This book is the outcome of a workshop on the *Particle Flux in the Ocean* held in Hamburg in September 1993. Despite of this, the book is timely and covers a large variety of topics related to particle fluxes in the marine environment. It encompasses from basic definitions to last developments in the field such as the application of remote sensing to acquire meteorological information (e.g. winds, zonal distribution of clouds, rainfall, etc.) of interest for the interpretation of particle fluxes. Main sources of particles into the ocean such as atmospheric transport of mineral particles and the riverine transport is presented on a global basis and in the latter, as a case study (Sao Francisco River, eastern Brazil). The constraints of sediment trap technologies for flux measurements, such as hydrodynamic bias, swimmers, microbial growth and degradation of collected organic matter are described in great detail. The calibration of sediment trap fluxes with naturally occurring radionuclides is presented. The mineral composition and major organic constituents of settling particles is also described. Particle removal processes from the upper layer to the deep ocean and the estimation methods for the residence time of particles and the alteration of settling particles are discussed. The application of nitrogen and carbon isotopic tracers of the source and transformation of particle dynamics in the sea is also reviewed. Finally, the seasonal variability in the flux of particles in many regional seas, (e.g. deep Sargasso Sea, eastern Equatorial Atlantic, French Mediterranean and Atlantic margins, deep Arabian Sea, Bay of Bengal, south China Sea and western Pacific) and a lake (e.g. Baikal) is addressed.

In summary, this book provides a pluridisciplinary approach to the state of the art of flux measurement and the processes occurring to particles during sedimentation which will be of interest to marine biogeochemists.

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**POLLUTION: CAUSES, EFFECTS AND CONTROL**; 3rd. edition, edited by R. M. Harrison, 480 pages, The Royal Society of Chemistry, Cambridge, CB4 4WF, UK (1996). ISBN 0-85404-534-1. £35.00.

The first edition of this book was published in 1983 as the course notes from a Residential School held at the University of Lancaster in 1982. Since then, scientific activity in the pollution field has intensified greatly. The knowledge base has expanded greatly and the legislation and regulatory environment has intensified in response to mounting public concern over environmental issues. This third edition, has been produced largely to update and expand the contents in line with the current position in a fast moving field.

The book includes chapters on the causes and effects of pollution in the modern world, touching on soil pollution and land contamination, chemical pollution of the aquatic and marine environment by priority pollutants, the treatment of sewage, sewage sludge and toxic wastes, and the management of solid wastes. The atmospheric environment is largely covered with chapters on the sources and measurement of air pollution as well as the chemistry and pollution of the troposphere and the stratosphere, and the atmospheric dispersal of pollutants. The effects of gaseous pollutants on crops and trees and the control of pollutant emissions from road traffic are also covered. The environmental behaviour of toxic chemicals such as organochlorinated compounds and radionuclides are covered separately. Finally, the effects of pollution on human health are considered along the different chapters, but specific sections on drinking water quality, air pollution, indoor and outdoor, and a number of well known localized contamination incidents, from the Minamata to the Toxic Oil Syndrome, are included.

The book's treatment of its subject is essentially introductory, although some aspects are covered in greater depth. The contributions combine to give a broad overview, touching on a wide range of important areas. *Pollution: Causes, Effects and Control* is essential reading for all those who want to know the facts behind the effects of pollution on the world in which we live.

**VOLATILE ORGANIC COMPOUNDS IN THE ATMOSPHERE**. Issues in Environmental Science and Technology. Vol. 4, edited by R. E. Hester and R. M. Harrison, 140 pages, The Royal Society of Chemistry, Cambridge CB4 4WF, UK (1995). ISBN 0-85404-215-6. £15.00

Interest in volatile organic compounds (VOCs) as air pollutants has increased dramatically in recent years. This book covers a number of very topical issues concerning VOCs, including stratospheric ozone depletion due to CFCs, and their role in the photochemical formation of tropospheric ozone.

The first chapter provides a broad introduction to the atmospheric cycle of VOCs by considering their sources, distribution and fates. Recent years have seen a growing awareness for the naturally generated VOCs in the atmosphere. The chemistry and fluxes of these natural VOCs is covered in the following chapter. The recent availability of automated instrumentation for monitoring VOCs in urban air has led to a rapid expansion of our database and knowledge. This is exemplified in the presentation of the UK hydrocarbon monitoring network, one of the most advanced networks in the world. The book describes, then, techniques used for the calculation of emission inventories and strategies for control, and explores the many Government policy matters relating to VOCs. The atmospheric chemistry of VOCs is crucial to an appreciation of their behaviour, and two articles deal, respectively, with the tropospheric and stratospheric behaviour of important VOC compounds. Finally, the measurement and health implications of VOCs in indoor air is also dealt with.

The issue has assembled some of the most up-to-date relevant material now currently available on atmospheric VOCs. It will certainly provide readers with in-depth, clearly explained coverage of the many complex scientific and policy issues surrounding VOCs in the atmosphere. As the other volumes in the series reviewed below, it constitutes an essential reading for students taking specialized courses in environmental chemistry, and will provide supplementary reference material for general science courses.

**AGRICULTURAL CHEMICALS IN THE ENVIRONMENT.** Issues in Environmental Science and Technology. Vol. 5, edited by R. E. Hester and R. H. Harrison, 127 pages, The Royal Society of Chemistry, Cambridge CB4 4WF, UK (1996). ISBN 0-85404-220-2 £17.50

Enormous increases in agricultural productivity can properly be associated with the use of chemicals that may pose some threats to the environment. The first chapter of the book examines the use of nitrogen fertilizers to increase growth rates of agricultural crops and the problems associated with nitrate leaching from soil. The potential health hazards constituted by high nitrate levels is also reviewed. The role of agricultural fertilizers in promoting excessive growth of aquatic weeds in rivers and of algal blooms in lakes and the impact of agricultural pesticides on water quality are then discussed.

A chapter on agricultural nitrogen and emissions to the atmosphere show how airborne pollutants can result from agricultural practices. The conditions which lead to emissions of nitrogen oxides, mainly NO and N<sub>2</sub>O, from soils in which vegetation and an active microbial community are present, as well as the scale of emissions of reduced nitrogen as NH<sub>3</sub> from animal waste are explained. Drugs

and dietary additives, their use in animal production, and potential environmental consequences are also discussed. The residues and metabolites of such additives may be innocuous, harmful or beneficial to man and the environment and these issues are examined in depth here. The final chapter is concerned with detection, analysis, and risk assessment of cyanobacterial toxins. These can be responsible for animal, fish and bird deaths and for ill-health in humans. The causes, identification and assessment of risk, and establishment of criteria for controlling risk are discussed.

From the above it is apparent that the book explores a variety of issues which currently are subject to wide-ranging debate and are of concern not only to the scientific community and to students, but also to farmers, landowners, managers, legislators, and to the general public.

**CHLORINATED ORGANIC POLLUTANTS.** Issues in Environmental Science and Technology. Vol. 6, edited by R. E. Hester and R. H. Harrison, 183 pages, The Royal Society of Chemistry, Cambridge CB4 4WF, UK (1996). ISBN 0-85404-225-3, £17.50

Under this heading the editors have included a range of semi-volatile persistent compounds, notably polychlorinated biphenyls (PCBs), polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) as well as a number of chlorinated pesticides. This volume reviews current knowledge of the sources, environmental concentrations and pathways, human toxicity and ecotoxicology, and control methods for these groups of compounds. The first chapter addresses some of the problems of quantification inherent in understanding the environmental inventories and budgets of PCBs, PCDDs and PCDFs. The source inventory approach is extended to evaluate sources of human exposures to PCDDs and PCDFs. Such exposure to these compounds depends crucially upon biological uptake and transfers through the food chain, so a detailed insight into the processes involved and their relative efficiencies are provided. The next two chapters describe, respectively, the human toxicology and ecotoxicology of exposure to chlorinated organic micropollutants. Two more chapters focus on the usage, environmental cycles, particularly atmospheric processes and concentrations of chlorinated pesticides, showing that even compounds which are subject to extensive bans upon production and use are still cycling within the environment.

One of the ecosystems which has suffered the greatest pollution from PCBs is the North American Great Lakes system. This has been the subject of intensive scientific investigation which is described as a case study. Finally, the operating procedures and control technologies available for minimizing emissions of PCDD and PCDF from waste combustors are described.

This volume gives a unique and valuable compilation of information of an extremely important group of environmental pollutants. It is fully up-to-date, and will provide a comprehensive overview of this topical subject that will be useful to academic, student and professional alike.

**ENVIRONMENTAL FATE MODELLING OF PESTICIDES**, by O. Richter, B. Dieckkrüger and P. Nörtershenser, 281 pages. VCH, Weinheim, Germany (1996). ISBN 3-527-30064-3. DM 190.00

This book presents the material from a course on environmental modelling at the University of Braunschweig and from different research projects on the dynamics of pesticides. Mathematical models of pesticide degradation in the environment considering various abiotic and biotic factors like temperature, humidity, water transport, soil properties and microorganisms are presented. Different aspects of environmental modeling hitherto treated include compartment theory, nonlinear biological degradation models, modelling toxicity, parameter identification, coupling of physical and biological processes, pedotransfer functions, translation of models across scales, coupling geographical information systems with models, and FUZZY approaches. A completely new approach is the regionalization of pesticide transport in soils.

Applications are covered from the laboratory scale to the field and the catchment scales by coupling stochastic models with deterministic and kinetic models. Large-scale variability is incorporated by combining soil survey data with models using geographical information systems.

The book addresses environmental chemists, ecotoxicologists and biomathematicians working experimentally to elucidate the environmental fate of organic chemicals and wishing to establish experimental designs using mathematical models. A short outline of required mathematical fundamentals and a lot of examples are helpful tools for the reader to elaborate suitable models for his own practical use.

**ENVIRONMENTAL COMPARTMENTS**. Issues in Environmental Science and Technology, by E. K. Dursma and J. Carroll, 297 pages, Springer-Verlag, Berlin, Germany (1996). ISBN 3-540-61039, DM 98.00

This book explains many of the theories used to identify links and predict the movement of natural and anthropogenic chemical compounds between the different environmental compartments of biota, air, water, land and aquatic sediments. Processes and equilibria between compartments, complexation of metals by dissolved organic matter and adsorption by marine sediments, diffusion principles in the aquatic environment, competitive processes in estuaries, distribution

patterns in seas and effects of conservativity are dealt with along the corresponding chapters.

Besides basic information on theories about processes and measurements on the distribution of contaminants between compartments, a number of case studies are presented, which concern budgets on radionuclide and trace metals in the marine environment and on organochlorines in both the marine environment and the atmosphere. The book is closed with the application of all these principles in environmental impact assessment studies.

To encourage self-study, a number of exercises are incorporated in the text. A disk is also added, containing demo models of radionuclide transport from dumped nuclear waste in the Kara Sea, a shallow Arctic sea, illustrating the role of biodiversity in coastal zone management and assessing risks of multiple stresses caused at the population level by various human activities. In summary, a new perspective, both theoretical and practical of dealing with environmental contaminants, primarily directed to university education, but also intended to broaden the views of environmental scientists and policymakers.

**BIOSPHERE-ATMOSPHERE EXCHANGE OF POLLUTANTS AND TRACE SUBSTANCES**, edited by J. Slanina, 528 pages, Springer, Berlin, Heidelberg (1997). ISBN 3-540-61711-6. DM 198.00

The biosphere is the ultimate sink for air pollutants, and it is also the source of many precursors for the formation of photo-oxidants. In any analysis of air pollution and for determining source-receptor relationships, reliable emission and pollutant concentrations or depositions must be taken into account, together with their interactions between the atmosphere and the biosphere. This book presents a number of authoritative review articles covering topics which include biosphere—atmosphere exchange of ammonia, nitrogen oxides, ozone and sulfur containing gases, the biological mechanisms involved in the exchange of trace gases, as well as generalisations of deposition over Europe. There are also 37 short contributions that show the diversity of the research in Europe which has been significantly promoted by the european coordinated research project EUROTRAC, within the EUREKA initiative. The project, aiming the study of the transport and chemical transformation of pollutants in the troposphere, has achieved a remarkable scientific success since its start in 1988, and the present book provides an overview of the main achievements of the subproject BIATEX. The book includes a list of more than 500 scientific publications produced by the subproject from 1988 to 1995. In summary, one of the most updated and authoritative publications, necessary for a proper appreciation of the field.

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**TOXICOLOGY: Principles and Applications**, edited by R. J. M. Niesink, J. de Vries and M. A. Hollinger, 1284 pages, Times Mirror International Publishers, London (1996). ISBN 0-8493-9232-2, £49.50

This book covers the broad discipline of Toxicology in 40 chapters, from molecules to organs and organisms (animals and humans), with particular emphasis in organ toxicology. The book is the product of a collaboration between the Netherlands Open University and EUROTOX (the European Societies of Toxicology), and it is specifically addressed to advanced toxicology students and professionals in different fields who need a working knowledge of toxicology. The structure of each unit begins with a table of contents, an introduction and a learning core, where basic concepts are clearly explained and numerous figures and tables help to illustrate key points, making the text didactic and easy to read.

The structure of the book emphasizes four major themes: fundamental principles of toxicology, molecular aspects, organ toxicology and application areas. Units 1 to 7 are dedicated to general principles of toxicology (exposure, biotransformation, absorption, distribution and elimination, toxicokinetics,...). Molecular aspects are treated in units 8 through 13 with particular emphasis in carcinogenesis, but also structure-activity relationships, toxicity of mixtures and cytotoxicity. Units 14 to 35 constitute the core of the book and they cover a wide variety of topics (nephrotoxicity, hepatotoxicology, immunotoxicology, endocrinotoxicology,...) which are organized in three main themes, viz. organ toxicology (3 units), organs involved in absorption and elimination (9 units) and organs involved in maintaining homeostasis (10 units). Finally, the last part of the book (units 36–40) gives an overview of application areas, from nutritional toxicology to medical, clinical and occupational toxicology, and ecotoxicology.

In summary, the choice and treatment of subjects is excellent and the different units give a good and updated state-of-the-art for most of the topics in Toxicology. A need not often covered by the expansive bulk of highly specialized books and journals dedicated to Toxicology.

**ENZYME IMMUNOASSAYS: from concept to product development**, by S. S. Deshpande, 464 pages, Chapman & Hall, London, NY. (1996). ISBN 0-412-05601-1, £79.00

This book is addressed to professionals in the field of immunoassays, and it is specifically intended to provide practical information for the development of a commercial immunodiagnostic product based on enzyme immunoassay technology. The reader is taken through all stages of this process, from conceptu-



alization, product design, and manufacture to introduction of the product to the market.

The author clearly divides the book into two parts, the first one gives an overview of basic concepts in enzyme immunoassay technology, whereas the second part emphasizes the process of product development. Chapters 1 to 7 are dedicated to basic principles of immunoassays including the classification, structure, and function of antibodies, antigen-antibody reactions, conjugation techniques or antibody production. The properties and characteristics of the most widely used enzymes in immunoassays are discussed as well as the choice of various solid-phase systems available in the market.

Part II of the book, chapters 8 to 12, covers the actual product development process. It includes information on the classification and the various formats of enzyme immunoassays available for product development. Good laboratory and good manufacturing practices (GLP and GMP) as well as international marketing requirements such as the ISO 9000 certification are described in chapter 12.

In summary, a good guide for those who want to star-up their own enterprise in this exciting field with an expansive market, but also to those willing to have a broad overview of immunoassays techniques, from the concepts to the development and application in clinical, agricultural, food or environmental diagnostics.

**ENVIRONMENTAL IMMUNOCHEMICAL ANALYSIS FOR DETECTION OF PESTICIDES AND OTHER CHEMICALS: A User's Guide**, edited by S. J. Gee, B. D. Hammock and J. M. Van Emon, 107 pages, Noyes Publications, Westwood, New Jersey (1997). ISBN 0-8155-1397-6, \$39(U.S.)

This book is a basic tutorial designed to instruct the reader in the use and application of immunochemical methods -mainly immunoassays- for analysis of environmental contaminants. The book is divided in 6 chapters; the first part of the book covers (a) a brief introduction to immunoassays, advantages/disadvantages, principles and applications (chapter 1); and (b) useful suggestions for protocol design, sample preparation, data handling, quality control, plus safety considerations and examples of troubleshooting (chapters 2 and 3). Chapter 4 is entirely devoted to introduce to the reader six specific immunoassays step by step; all six methods are based on the same working principle and illustrate different applications, viz. the two first methods describe the analysis of lipophilic analytes such as triazines; the third one describes the analysis of the insecticide carbaryl in both environmental and biological samples. The analysis of water soluble analytes (p-nitrophenol, paraquat and triazine mercapturates) are illustrated, as well as the application of the technique to urine samples and

hence exposure assessment studies. In addition to immunoassay methods, the document shows how to perform immunoassays, protocols for preparing buffers and optimizing assay conditions, pipetting techniques, etc. (chapter 5); and provides an appendix of commonly used terms in order to facilitate understanding of the technology (chapter 6).

In summary, the treatment of the subject is excellent and the book constitutes a good guide for those professionals in the field of environmental analytical chemistry willing to discover, understand and apply recent developments on enzyme immunoassay technology.

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