

damaging HO \cdot . The body's 'protective defences' (enzymes, storage proteins and biological antioxidants) are next discussed, in chapters which describe the control of O $_2^-$ and H $_2$ O $_2$ in biological systems. Discussion of the role of added ligands (such as EDTA, DTPA) provides a bridge to topics described in Part I.

With appetite whetted, the interested reader may well thumb through the pages to get to Chapter 9, 'Iron and human disease', to find out about iron overload, iron and cancer ('no experimental link established in humans'), iron and anti-tumour antibiotics (speculation on HO \cdot formation and DNA damage via reduced iron), iron and heart disease (where there is speculation on the possible relationship between iron levels and mortality), iron and neurodegenerative diseases (with sections on Parkinson's disease and Alzheimer's disease) and rheumatoid arthritis. No clear picture emerges, though in many cases experiments involving vitamin E and other antioxidants point to a role for free-radical damage. The book ends with a review of methods (colorimetric, spectroscopic), which may be used for detecting HO \cdot damage to proteins, DNA and lipids.

The book is written in a combination of styles which is sometimes distracting though rarely dull: it is likely to stimulate further reading, argument or — even better — experiment. Do not expect any definitive answers; but if you want to know more about the fascination of the simple Fenton reaction, and the complexity of biological analogues, or of developing interdisciplinary research where chemistry, biology and medicine interact, then read on.

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Handbook of Chiral Chemicals

David J. Ager (ed.)

Marcel Dekker, New York, 1999

x + 382 pages. \$165 ISBN 0-8247-1058-4

Handbook of Chiral Chemicals is an excellent book, providing a very useful account/overview of the problems faced in producing single enantiomers on a commercial scale. Almost all of the chapters avoid the pitfall of including too much detail of the chemistry and mechanism and so concentrate admirably on the main discussion theme namely which processes are commercialisable for the production of enantiomerically pure fine chemicals.

The introductory chapter sets the scene by outlining the methods currently contemplated commercially for producing single enantiomers, and the types of reactions that are robust enough for scale-up operations. The chapter is refreshingly succinct and the colloquial use of terms such as 'chiral compound' (for single enantiomers)

and 'optical purity' (for enantiomeric excess) does not detract from the main purpose.

Chapter 2 provides a useful list of non-racemic compounds that are available on a significant scale, and their suppliers. Chapter 3 describes the synthetic routes to 16 top-selling enantiomerically pure compounds (ten pharmaceuticals, three food additives and three agricultural products). Chapter 4 describes the various procedures that have been deployed to synthesize D- and L-phenylalanine and provides an interesting insight into the evolution of commercial processes. Chapter 16 repeats the process for L-aspartic acid.

Chapters 5 and 6 demonstrate strategies from chiral-pool starting materials (carbohydrates and terpenes). Chapters 7, 9–12, 14, 15 and 18 describe the main reactions used in the production of non-racemic materials by asymmetric synthesis, including substitution reactions, redox processes and catalysis, isomerizations, pericyclic reactions and application of chiral auxiliaries. Chapter 8 discusses case studies on large-scale chemical and enzymic resolutions. Chapter 13 describes the role of biotransformations for the production of fine chemicals by asymmetric synthesis and by resolution. Chapter 17 describes how one small company can tackle a range of custom syntheses employing a variety of techniques such as resolution, chiral-pool methodologies and biotransformations.

The order of the chapters chosen by the editor is curious in several instances. For example, the overview chapters (4 and 16) on routes to phenylalanine and aspartic acid are not together, nor are the general case studies (Chapters 3 and 8). This does not detract from the usefulness of the book, however, since each chapter stands alone. As a whole, the book provides an interesting and useful overview of the current state of one part of the fine chemical industry. It is to be recommended as an excellent addition to all industrial and academic libraries, although it would be difficult to justify its purchase for individual collections.

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Introduction to Fluorescence Spectroscopy

Ashutosh Sharma and Stephen G. Schulman

Wiley-Interscience, New York, 1999 xiv + 173 pages.
£38.95

ISBN 0-471-11098-1

This book is part of the series *Techniques in Analytical Chemistry*, edited by Frank A. Settle, of which the specific objectives are to provide an overview of the methods of analysis, including an introduction to the principles but with an emphasis on the actual usage of the techniques, to provide an insight into the capabilities and

limitations of the technique, and to do so in such a way as to be useful for a range of readers from technicians to PhD scientists.

The book amply meets these objectives. It is well written and gives the reader a clear insight to the power and potential of molecular fluorescence. Being a pioneer of atomic fluorescence, I am often confronted with objections to this technique but this book clearly defines the role of molecular fluorescence. It would, perhaps, be helpful if the title included a reference to 'molecular'. I shall, however, be referring my audience to this book as an introduction to the techniques.

Molecular fluorescence has many growing applications and this book gives a clear perspective of the current state of the art. It is recommended reading for chemists and biologists working in clinical and environmental areas.

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Molecules at an Exhibition

John Emsley

Oxford University Press, Oxford, 1999

xiii + 250 pages. £7.99 paperback

ISBN 0-19-286206-5

This publication targets readers with a wide variety of interests rather than specifically chemists, although all chemistry undergraduates would derive a great deal of pleasure, stimulus and satisfaction from reading it in their first year. The book is divided into eight chapters, called Galleries, and each Gallery contains written 'Portraits' covering topics of scientific interest and importance, in which environmental factors relating to health and pollution feature extensively. The contents are largely based on articles written for newspapers over a number of years.

Dr Emsley invites us to tour each Gallery, where we encounter both familiar and unfamiliar molecules accompanied by a description of their effects on humans and on the environment. Gallery 1 covers an account of simple chemicals that can influence our lives, e.g. addiction to chocolate due to phenylethylamine; the effect of oxalic acid present in rhubarb and of caffeine, which is more than a mere stimulant. The section on selenium, an essential element, describes its role as a component of enzymes that produce hormones in the

thyroid gland, its importance in Chinese medicine and its electrical properties.

The 14 biologically essential metals are considered, including their importance in skeletal tissues. Perhaps there should have been some reference to the effect of gravity on bone density as experienced by astronauts, and of hard or soft water. The biochemistry of iron, nickel and cobalt (as in spiders and lobsters, for example) and molybdenum (as in nitrogenases) is well presented. An amusing story is the part played by a molybdenum enzyme in the primary oxidation of ethanol to ethanal in the human body: Japanese have low levels of this enzyme, and hence the effects of consuming alcoholic drinks are prolonged. An excellent account is given of the function of nitric oxide (NO) in biological systems. Introducing iron sulphate into 60 km² of the Pacific Ocean was reported to have rapidly transformed a barren sea into a green plankton-rich habitat.

Gallery 3a is headed 'Strictly Private' and covers interesting aspects of the illegal drug Ecstasy, originally intended as a treatment for obesity. Almost every section includes humorously presented factual and novel information: for example, drinking five cups of tea a day provides the life-enhancing 15mg of aspirin. It might even come as a surprise to learn that the human body contains more potassium than sodium: the role of both is discussed, with fascinating examples. In the USA death sentences may be performed by injecting a lethal dose of KCl, leaving the body's organs undamaged for possible use in transplant surgery. Bananas generate ethene, which at a concentration of 1 ppm enhances the ripening of other fruits: hence the beneficial effect of having bananas in close proximity to other, unripe, fruits.

Organometallic chemistry features in relation to the use of chiral titanium, zirconium and hafnium metallocenes for the stereospecific polymerization of unsymmetrical alkenes, producing, for example, isotactic polypropene. Perhaps the dramatic change in the toxicity of some organometallic compounds (e.g. methylmercury) relative to inorganic metal compounds should have received more attention, though the dangers of using organotin compounds as antifouling additives in marine paints is mentioned. For chemists an Appendix, listing chemical structures, would have been a useful addition. However for those who want to know why the British paid royalties to the USA for their discovery of penicillin, why you may have zirconium in your armpits or how tree frogs manufacture a super pain killer, read this book!

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