

tional research accurately enough. Most, however, are progress reports of specific research rather than state-of-the-art reviews although sections by M.E. Farago (Metal Ions and Plants), R.J. Shamberger (Selenium Metabolism in Man and Animals) and R.J.P. Williams (The Inorganic Chemistry of Biominerals) are among the exceptions. The main emphasis is in the structural and mechanistic studies of metallo-proteins and bioinorganic complexes and the examination of models of metal-ion containing binding sites.

The book should certainly be carefully scrutinized by all those using the current basic spectroscopic techniques whether Mössbauer, EPR, NMR or EXAFS, and notably by those interested in the possibility of optical detection of paramagnetic resonance by magnetic circular dichroism (paper by Thomson, Barrett, Peterson and Greenwood). Iron, iron-sulphur and copper

environments receive most attention but there are also a number of studies of nickel-containing proteins. There are only 3 reports on Mo and a similar number on nucleic acid-metal interactions, the latter including a disappointingly brief paper by the Eichhorn group on their influence on genetic information transfer.

While presented as an interdisciplinary survey the conference reports will be of much greater value to the chemist and less relevant to those mainly interested in environmental or clinical applications, despite the presence of an examination by Cross, Read, Smith and Williams of 'Plutonium Speciation from Disposal Vault to Man', a survey by Kolchuk on 'Clinical Disorders of Zinc Metabolism' and a good review 'Gold Drugs' by Berners-Price and Sadler.

J. Mason

Biohalogenation

Principles, Basic Roles and Applications

by S.L. Neidleman and J. Geigert

Ellis Horwood; Chichester, 1986

203 pages. £25.00

This monograph on biohalogenation is organised into a brief introduction (chapter 1), 7 main chapters, a short concluding chapter on future directions for biological halogenation, a bibliography and an index.

Chapter 2 gives a chemical description of halo-metabolites and their sources. One immediately has an impression of the scope of this area by the chemical diversity of halometabolites, and by deduction, the range of enzymes that elaborate these compounds. The sources of these metabolites are then amply documented by extensive lists and structures and detailed consideration is given to the role of bacteria, fungi, algae, higher plants and marine animals in the production of halometabolites.

Chapter 3 is concerned with an excellent description of the halogenating enzymes (haloperoxidases) and sub-classifies them as iodo-, bromo- and chloroperoxidases, and describes the reaction types which each of the enzymes catalyse. A useful section in this chapter outlines step-by-step protocols for the isolation and purification of chloroperoxidases, bromoperoxidases, myeloperoxidases, eosinophil peroxidase, bacteroperoxidase, thyroid peroxidase and a listing of commercially available enzyme preparations. This latter section is coupled with detailed methodology on several assay systems currently used to detect and monitor enzyme activity. The chapter concludes with a compendium of in vitro haloperoxidase reactions, focussing on the reasons why these

enzymes do not exhibit the classical enzymatic properties of reversibility, high product selectivity and narrow substrate range.

Chapter 4 consists of a more detailed discussion of the enzymology of the haloperoxidases by highlighting current knowledge, but also emphasises the lack of precise knowledge of active site geometry, haem ligand coordination and the controversial nature of the halogenating intermediate. Consideration is given to the basic haem chemistry of the haloperoxidase prosthetic group and the role of this protoporphyrin in catalysing the heterolytic cleavage of H_2O_2 and in the regulation of the oxidation-reduction potential. The authors also consider the role of the glycoprotein component in determining enzyme reactivity and stabilisation of the reactive halogenating intermediate.

This chapter continues with the basic protein biochemistry of the haloperoxidases including documentation of molecular mass, amino acid contents and sequence, carbohydrate content, subunits and known isoenzymes. This section is augmented with a review of the optimal pH, substrate binding sites, reaction rate constants and concludes with reaction mechanisms. For the reaction mechanisms, emphasis is placed on the 5 oxidation-reduction states that are known for these enzymes, concluding with a discussion of the possible halogenating intermediate.

Chapter 5 is addressed to the role of enzymes and halometabolites in both (1) key elements in the biochemical synthesis of metabolites and (2) as a means of elaborating compounds with enhanced and desirable biological activities. Chapter 6 considers the role of halogenating enzymes in mammalian defence mechanisms as viewed from cellular, biochemical and molecular targets and concludes with a brief discussion of the medical significance of haloperoxidase activity.

Chapter 7 outlines some of the commercial applications of the haloperoxidases with emphasis on process technology and biotechnology, particularly on how to overcome suicide inactivation of the enzymes and therefore to prolong their active life as a biocatalyst. It must be emphasised that these enzymes have not found widespread use in industry at present, and the authors outline potential uses in the areas of (1) haloperoxidase-driven catalysis in the production of industrial chemicals, (2) medical application in bacterial chemotherapy

(release of hypohalous acid), (3) in pollution control as a biocide to overcome slime growth, (4) removing industrial contaminants and (5) as analytical diagnostics.

Chapter 8 is concerned with the process of removing halogens from organic compounds (dehalogenation) with an emphasis on environmental pollutants including halogenated solvents, gasoline additives, fumigants and pesticides. This chapter highlights the ability of microorganisms to dehalogenate these chemicals, albeit slowly, as reflected in the long (sometimes years) biological persistence in the ecosystem. The majority of the chapter deals with a detailed description of the chemistry of enzymatic degradation of halo-compounds including reductive dehalogenation, dehydrohalogenation, hydrolytic dehalogenation, epoxidation and oxidative displacement. This chapter concludes with the application of genetic engineering techniques in developing plasmids encoding the degrading enzymes.

I was fascinated by this book in that it covered all of the aspects one would expect (and hope) to find in a monograph of this nature. The extent of coverage is impressive and gives detailed discussion of the chemical, biochemical and industrial aspects of haloperoxidases. I particularly like the inclusion of the chapter on dehalogenation as it gave a well-rounded shape to the book.

The authors have developed a crisp, clear style of writing that gets right to the heart of the matter without the need for pages of extraneous material. The monograph is amply illustrated, particularly the chemical pathways. Because this is an authored monograph (as opposed to an edited, multi-author work), there is continuity of style, with little overlap in the subject matter between chapters. There is an extensive bibliography at the end of the book containing 412 references, many of which refer to recent work up to 1985. As the authors point out, the last review of this subject appeared in 1976 and this monograph is therefore timely in its publication. My only minor criticism is that the index is rather sparse. However, this should not detract from the fact that Biohalogenation is well worth purchasing and will serve both as a primer to this ubiquitous area of science and as a superb overview of the subject.

G. Gordon Gibson