

Book Reviews

Metal Ions in Biological Systems. Volumes 2 and 3. Edited by Helmut Sigel. Marcel Dekker, New York, N. Y. 1973.

The editor's objective in this carefully outlined series of six volumes is "to focus attention on the connection between the chemistry of metal ions and their role for life," and "to break down the barriers between the historically independent spheres of chemistry, biochemistry, biology, medicine, and physics."

Volume 2, *Mixed-ligand Complexes* (\$25.25, 294 pp), contains five chapters, the first three of which describe classical chemical studies of systems with one metal ion competing for various ligands in solution. Chapter 1 covers the detection of mixed complexes of amino acids and peptides, their structures, and pH effects on their stability. Chapter 2 covers other kinds of mixed-ligand complexes of chelating agents and gives a good summary of the factors which affect the stability of mixed complexes, including ligand field strength, σ vs. π bonding, charge neutralization, and steric effects. Chapter 3 carries these concepts to the kinetics of ligand association and disassociation in mixed complexes and gives some insight to the origin of the equilibria observed for the mixed complexes. These chapters are recommended to all investigators working with metalloenzymes and model systems as a good source of generalizations and trends in reactivity, as well as for the tabulation of rate and equilibrium data for the mixed complexes. Chapter 4 describes results obtained with computer simulation of multimetal-multiligand equilibria as a model for the exchangeable pool of metals in plasma or in the entire body. The results obtained agree well with the therapeutic and/or side effects observed with agents such as penicillamine, EDTA, triethylenetetramine, and ethambutol. Much of the emphasis in Chapters 1-4 is on copper, probably because its complexes are the nicest to study. It is unfortunate that the amount of work done on other biologically important metals, *e.g.*, zinc, manganese, and especially iron, is rather small. Chapter 5, modestly entitled "artificial enzymes," reviews many of the types of reactions which are catalyzed by metal ions in a fashion similar to their catalysis

by metalloenzymes. Although its author and others have written numerous similar reviews and even entire books, it is a good review, brief but broad in its coverage.

In Volume 3, *High Molecular Complexes* (\$22.75, 289 pp), Chapter 1 reviews metal ion-nucleic acid interactions and clearly reveals the inadequacy of both our current knowledge and the methods of investigation in that area. Fortunately Chapter 2 paints a better picture for protein-metal ion interactions. It gives a brief evaluation of the methods of study as well as the results, a surprising one of which is that many proteins not thought of as metalloproteins have the ability to bind metal ions strongly and specifically. The chapter is a logical extension of the concepts elaborated in Volume 2 concerning amino acid and peptide complexes. Chapter 3 concerns the effects of metal ions on the structure of water and the collagen triple helix, and Chapter 4 illustrates with a copper ribonuclease system the difficulties of trying to pin down a metal ion binding site by means of solution studies. Two other chapters on copper proteins, cytochrome oxidase and hemocyanin, seem oddly out of place in this volume because they are extremely specific metalloproteins, whereas the rest of the chapters deal with less specific and weaker binding of metals by macromolecules. A final chapter on monovalent cation-activated enzymes has a brief discussion of the physicochemical basis for ion selectivity, but most of the chapter is a cataloging of the results of studies with numerous enzymes and no attempt at coherence is apparent. The latter comment could almost apply to Volume 3 as a whole.

Each chapter in both volumes is well referenced, and each volume has both an author and a subject index. Overall they are quite recommendable (especially Volume 2) but because of their price tag and degree of specialization (especially Volume 3), most readers will use the library copy.

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