The next review covers mixed-metal clusters, but there then follows a discussion of ligand–metal surface interactions. This is surface chemistry. The diversity of topic characterises the whole collection, with conventional coordination and organometallic chemistry mixed with discussions of metal particles, metal clusters, oxide surfaces, and theoretical analyses.

I cannot comment on the quality of such a diverse set of reviews, 18 in all, neither would I suggest that they did not make a good Advanced Studies Institute. From the editors' comments it was clearly enjoyable, but I do feel that the material is so diverse as not to be suitable for publication between the same covers. The NATO Science Committee should consider the contents and potential audience of such a book before deciding whether to publish. Although many might well wish to read some of the contents, few would wish to read them all, and only a very few would be prepared to pay so much for the privilege.

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Deciphering the Chemical Code, Nicolaos D. Epiotis, VCH, New York, 1996, xlvii + 933 pp., $89.95, ISBN 1-56081-946-4

This book represents a massive effort to reinterpret ideas of chemical bonding based on modern computational methods as well as experimental information during the past several decades on a variety of chemical substances. The familiar trichotomy of covalent, ionic, and metallic (delocalized) bonding appears in considerably modified form as T bonds, E bonds, and I bonds, and the ideas are developed from non-orthogonal valence bond theory without using any of the basic ideas of molecular orbital theory.

This mammoth book, containing no less than 43 chapters, is very reasonably priced for its size. It is divided into the following five major parts: *I. The Valence Bond Theory of Chemical Bonding* (52 pages); *II. The T Bond* (154 pages); *III. The Molecular I Bond* (484 pages); *IV. The Cluster I Bond* (160 pages); *V. Chemoelectricity, Chemomagnetism, and Beyond* (72 pages). Organometallic compounds play a prominent role in much of the theoretical development in this book, e.g.:

(1) Chapter 21, with the title *The Relay I Bond and the Foundation of Organometallic Bonding* (12 pages), discusses allyl and cyclopentadienyl derivatives of main group metals;

(2) Chapter 24, with the title *The Chemical Code Cracks in the p-Block*, includes a discussion on ligand attraction in square pyramidal $Bi(C_6H_5)_5$;

(3) the relatively long Chapter 26, with the rather cryptic title *... and It Shatters in the d Block* (40 pages), includes metal carbonyls, metallocenes, and platinum–olefin complexes in its discussion.

In the development of this new theoretical approach the author has clearly assimilated a vast amount of experimental information on essentially all of the exciting types of substance discovered during the past decades. This includes not only the organometallic compounds mentioned above but other currently significant areas, including fullerenes (Section 16.6) and high critical temperature superconductors (Chapter 41). Chapter 42, with the intriguing title *Is There Hyperbonding and Hyperchemistry*, even includes a brief discussion of 'cold fusion'. The theory underlying the effort in this book to reinterpret chemical bonding is clearly a work of unusual creativity. Many of the ideas in this book are likely to stimulate chemical thought for the next several decades, so that by the year 2050 this book has the potential to become a real classic similar to Pauling's book *The Nature of the Chemical Bond*. Unfortunately, however, assimilation of Epiotis' book by the chemical community is likely to be very slow because of the variety of new concepts involved. Thus the "Pictorial Glossary" at the beginning of this book explaining the most critical concepts needed to understand this book is 17 pages long. Also, many of the new ideas are presented in rather unfamiliar and unusual terminology, apparently in order to avoid confusion with established ideas. For this reason, deciphering the interesting ideas presented in this book and truly understanding them is likely to take the chemical community many years. This book may well be a preview of chemical bonding theory in the 21st, and possibly even the 22nd, century.

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Metals and Ligand Reactivity, E.C. Constable, VCH, Weinheim, 1996, pp. 312 + xiv, ISBN 3-527-29278-0 (hardcover), ISBN 3-527-29277-2 (softcover), DM128 (hardcover), DM68 (softcover)

This text is the second, revised, and expanded edition of a book that is an introduction to the organic chemistry of metal complexes. It aims to provide a general readership with sufficient background knowledge to understand the bases of this rather recent subject, and

everywhere attempts to describe generality rather than detail. It should be appropriate for advanced undergraduates (UK style), though nowhere is this specifically spelled out.

The initial chapters are a quick guide to the principal theories of metal–ligand bonding, and though they should be familiar enough to coordination chemists and not merit much attention from them, students and organic chemists should find them useful. As with all the subsequent chapters, each finishes with a list of recommended reading to amplify the material in the chapter, often with comments concerning the value of each.

Chapter 3 starts the main body of the book. It concerns the reactions of coordinated carbonyl compounds with nucleophiles. The effect of coordination on reactions of carbonyl compounds with nucleophiles is then discussed, starting with esters and amides as a specific class, and then generalising.

Chapter 4 is somewhat nebulously headed "Other Reactions of Coordinated Ligands with Nucleophiles". Apart from being uninformative, this title also implies that there is such a thing as an uncoordinated ligand. In a text book, of all places, it should be a requirement to use language precisely, but if a ligand is simply to be a compound that may in some circumstances be bound to a metal then a valuable distinction is lost. What is then ligand field theory? And how does one define a ligand? Granted there is the need for a word to convey the idea of a potential ligand. I have suggested the term "proligand", to describe such materials, and this would at least free one from tautologies such as "coordinated ligand". All this is, of course, a side issue. The material of the chapter is clearly arranged, well exposed, and supported by very clear diagrams and equations. I would have liked more discussion on phosphate hydrolyses in biology, but this is a subjective comment. There are adequate suggestions, with useful short notes, for further reading.

Chapter 5 then deals with reactions of simple electrophiles with, again, "co-ordinated ligands". I would have liked to have seen more discussion of biological reactions integrated into these chapters, to emphasise that biological systems involve complicated ligands mediating simple processes, but this is a minor point. Another omission is an adequate discussion of those classical reactions of ligands, metallation and insertion. The author has purposely refrained from discussion of organometallic systems, but I find that this gives an unbalanced impression of the field.

Chapter 6 deals with cyclic ligands and template effects. It touches finally on one of the authors favourite research interests, leading logically into Chapter 7 on supramolecular chemistry, including catenanes and helical molecules. This material is very well presented. There is enough here to form the basis of a specialised undergraduate course in supramolecular chemistry, and the author is to be congratulated on introducing this material into his book. I am not sure that this kind of chemistry is what many would understand by the "organic chemistry of metal complexes", but it most certainly is.

The final chapters, on reactions of aromatic and heterocyclic ligands, oxidation and reduction of "co-ordinated ligands, and a very brief discussion of some biological systems, are an anticlimax.

In summary, I liked this book. It is beautifully presented and is well written. Both teachers and students will appreciate it. I could not find the "numerous study problems" mentioned on the cover, and the emphasis will make it appeal to a wider group than "students and practitioners of organic synthesis". Certainly anyone interested in transition metal organometallic chemistry should find it useful.

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