

al chemistry — kinetics and thermodynamics in particular — which is so extensively used and so often misunderstood by the organic chemist.

It is now customary to teach a considerable part of organic chemistry from the molecular orbital point of view. Simple Hückel theory is limited to the properties of  $\pi$ -systems and the inclusion of the MO properties of  $\sigma$ -bonded compounds has awaited the availability of reliable high-level approximations, such as the various *ab initio* programs now widely available. The MO parameters used in *Pictorial Orbital Theory* are taken from the collection published by Jorgensen and Salem in 1973.

Using qualitative arguments, Tedder and Nechvatal describe the building of MO's from AO's and the application to simple molecules such as HF, H<sub>2</sub>O and methane. It is made clear that the two unshared pairs in water are of very different energies and symmetries, a fact often obscured by "rabbit ear" pictures. Frontier orbital pictures of larger molecules are then developed. Subsequent chapters deal with the use of frontier orbitals in the interpretation of some familiar reactions (the terms HOMO-gen and LUMO-gen, coined to replace "nucleophile" and "electrophile" will not meet with universal approval).

Radical abstractions are discussed in terms of HOMO-SOMO and LUMO-SOMO interactions, though mention of "polar factors" whose nature and origin are not explicit has meant the passages concerned are not as clear as they might be; perhaps the inclusion of atomic charges or of electrical potential contours would have been advantageous in this context. S<sub>N</sub>2 reactions are shown to lead to inversion, and for E2-eliminations the necessity of LUMO lobes of the same sign spanning C<sub>α</sub> and C<sub>β</sub> is apparent. Additions of electrophiles to alkenes are obvious HOMO-LUMO interactions, though I harbour doubts as to the actual existence of Br<sup>+</sup> in the reactions with bromine. Ambident reagents are discussed in the context of the hard-soft principle using Hückel MO's. The remainder of the book covers reactive intermediates, pericyclic reactions, benzenoid reactivity and aromaticity in a short and conventional treatment.

This will undoubtedly be a valuable book for all students of organic chemistry. Its particular strength lies in the inclusion of  $\sigma$ -bond reactions within the scope of MO theory, while the problems to be found in each chapter are very useful. On the negative side it suffers from being excessively brief, especially the later chapters which may be inadequate for an undergraduate course. □

Neil S. Isaacs is a Senior Lecturer in the Department of Chemistry, University of Reading, Whiteknights, Reading RG6 2AH, UK.

## Compound relations from the metal-carbon bond

R.J.K. Taylor

**Basic Organometallic Chemistry.** By Ionel Haiduc and J.J. Zuckerman. *Walter de Gruyter*:1985. Pp.488. Hbk DM 169, \$64.90; pbk DM 79, \$29.90.

**Metallo-organic Chemistry.** By Anthony J. Pearson. *Wiley*:1985. Pp.398. Hbk \$45, £36; pbk \$15.90, £9.95.

THE publication of *Comprehensive Organometallic Chemistry* (Pergamon, 1982) marked a milestone in organometallic research. What is now required is an equally inspiring textbook on the subject. The task of writing such a book is daunting, however, given the wealth and diversity of material available for inclusion — organometallic chemistry encompasses the structure, bonding and physical properties of all compounds containing metal-carbon bonds, as well as their reactions and applications. In both of these texts, the authors have limited their horizons but, despite the similarity of the titles, they have concentrated on very different aspects of the field.

*Basic Organometallic Chemistry* was originally published in Romania in 1974 as *Chimia Compulsor Metalorganica*, with Haiduc alone as the author. This English-language version has been updated by the inclusion of results published up to 1984. It is divided into three parts, the first of which includes a discussion of the classification and bonding of organometallic complexes, a list of important literature sources and a brief section on laboratory techniques (although, surprisingly, no mention is made of syringe/septum methods). In Part II the compounds of the main group elements are dealt with group by group; those based on B, Si and As are included, whereas those based on P, S, Se and Te are not. Part III, which is subdivided according to ligand type, describes organometallic compounds derived from transition metals.

In general, the coverage of structural types in Parts II and III is up to date and comprehensive. However, the authors have concentrated on the synthesis and structures of organometallic complexes and have included little on their spectroscopic properties, reactivity and applications. In-text references are not provided, and although the hardback edition contains an extensive (111-page) bibliography this has been omitted from the paperback. The illustrations are generally clear, although opportunities are often missed to present valuable stereochemical information. More serious failings are the lack of

consistency in depicting bonding arrangements and the relatively large number of erroneous structures (including the formula accompanying the cover illustration).

Overall, then, Haiduc and Zuckerman have compiled a useful, up-to-date survey of organometallic compounds, but one which lacks sufficient information on reactivity and applications to stand alone as the text to support an undergraduate course.

In *Metallo-organic Chemistry*, Pearson limits himself to the chemistry of d-block organo-transition-metal complexes with particular reference to their applications in organic synthesis. The book is aimed at advanced undergraduates and organic graduates, but will also be of great benefit to practising organic chemists trying to keep abreast of this rapidly developing area of research. The first chapter deals with bonding in transition-metal-organometallic complexes, assuming a basic knowledge of frontier molecular orbital theory, while the second reviews typical properties and reactions of organometallic complexes, and includes sections on fluxionality, oxidative addition, reductive elimination, olefin metathesis, insertion reactions and catalytic processes. The remaining chapters then deal sequentially with the various ligand types ( $\sigma$ -alkyl, carbene and carbyne,  $\eta^2$ ,  $\eta^3$  and so on).

No attempt has been made to provide a comprehensive catalogue of structural types; rather, attention has been concentrated on those complexes which are of most potential use in organic synthesis, and within this context the coverage is excellent and the examples well chosen. Observed reactivity patterns are clearly rationalized, the importance of spectroscopy (particularly NMR) is emphasized and synthetic applications are highlighted. Key references are given for each chapter, covering the literature up to 1982. The book is well illustrated, contains very few errors and a comprehensive index is included.

*Metallo-organic Chemistry* provides an excellent introduction to the subject from the organic chemist's standpoint. It should prove popular both for general reading and as a recommended text to accompany a lecture course. □

R.J.K. Taylor is a Lecturer in the School of Chemical Sciences, University of East Anglia, Norwich NR4 7TJ, UK.

### Spring books supplement

The next review supplement to appear in *Nature* will be Spring Books, on 17 April.

Among the books to be reviewed are *Memoir of a Thinking Radish* (by P.B. Medawar), *Bird of Passage* (by Rudolf Peierls), *QED* (by Richard Feynman), *Unfinished Synthesis* (by Niles Eldredge), *The Case for Animal Experimentation* (by Michael Allen Fox) and *Problems of Biology* (by John Maynard Smith).