Chapter 4 deals with organometallic compounds as a source of carbanions. I consider that a brief summary of Grignard reactions would have been valuable (e.g., as a model for the M–C bond-breaking step in hydroboration or hydrozirconation).

Chapter 5 treats effectively the reactions of coordinated ligands, but I am not entirely convinced that the space devoted to this relatively minor topic is justified.

Chapter 6 is headed "The Coordination Chemistry of Organometallic Compounds" and, despite this rather curious title, is really concerned with basic organometallic reactions such as oxidative addition.

Chapter 7 is concerned with the role of carbenemetal complexes in organometallic chemistry, and Chapter 8 describes "Stoicheiometric Applications of Organometallic Compounds to Organic Chemistry". While the latter is certainly useful, I would have expected the topic of hydroboration, in particular, to warrant a more detailed discussion.

Chapter 9 is entitled "Catalytic Applications of Organometallic Compounds" and deals with fairly predictable reactions and processes. However, the potential energy diagram shown on p. 215 is surely misleading, in that the reader would infer that the role of the metal is simply to lower the activation free energy for a process, rather than to do so partly as a consequence of there being discrete and distinct organometallic intermediate or intermediates.

Despite the above criticisms, this is a valuable book and, arguably, the best single slim text on this area of chemistry.

School of Chemistry & Molecular Sciences,
University of Sussex, Brighton BN1 9QJ (Great Britain)

MICHAEL F. LAPPERT

Bond and Structure Models. (Structure and Bonding 63), Springer-Verlag, Berlin, Heidelberg, New York, Tokyo, 1985, v + 205 pages, DM98. ISBN 3-540-15820-0.

This volume contains four reviews, three of which clearly fall under the general heading of bond and structure models. The fourth and last review, describing the chemistry of chromium(IV) and chromium(V), is uncomfortably out of place here.

The first article is a detailed and lucid exposition of a new stereochemical model, the complementary spherical electron density model (D.M.P. Mingos and J.C. Hawes; 63 pages; 98 refs.), which treats molecules as interpenetrating spheres of electron density and tries to unify the inert gas rule and molecular orbital formalisms. It is built upon the assumption that the wave functions of ligands can be expressed in terms of spherical harmonics, and can interact in a complementary manner with the valence orbitals of the central atom to give a complete set of molecular orbitals, which then emulate those of an inert gas, both in number and in nodal characteristics. The model thus explains the stereochemistries of both main group and transition metal complexes. This is a novel and unique approach, and it is too early yet to assess its general utility, but this excellent review will do much to help it become established.

The second review (J.C.A. Boeyens; 37 pages; 122 refs.) deals with molecular mechanics and the structure hypothesis, and opens with this splendid quote from Casimir, "There is an analogy between complex nuclei and complex molecules, but there is a fundamental difference too: for molecules the first principles from which we cannot calculate their properties are far better known." This article is fascinating and provocative. Whilst recognizing that chemical theories are often a fusion of classical and quantum concepts (e.g. the coupling of molecular orbital theory with VSEPR theory), having components of essentially incompatible schemes, it discusses the approach of completely discarding all classical or empirical concepts as redundant, on the assumption that any observable molecular property can in principle be derived from a quantum mechanical model. Molecular structure is taken as the most basic of classical concepts. ("Molecular structures are observed only in order to simplify the interpretation of chemistry and not because they exist.") The review concludes that this approach is unsatisfactory, and that chemical theory relies equally on classical and quantum mechanical concepts.

The third review (S.-C. Tam and R.J.P. Williams; 49 pages; 54 refs.) discusses electrostatics and biological systems. Prof. Williams is perhaps one of the finest chemical writers around, and has a gift for making even the most difficult of subjects comprehensible. This gift is well evident here, and this article clarifies many complex problems, clearly stating what are the problems still to be tackled, and where current models can hide the specificity of biological interactions. This article is not only an excellent research document, but could also be used to great effect in teaching third year undergraduates.

If this volume had consisted of only these three chapters, it would have been excellent value. Indeed, I am sure that all three reviews will feature heavily in Citations Index, and I believe that this book should be on the personal bookshelves of most transition metal chemists, as well as being in all chemistry libraries. In that sense, I suppose it does not matter that the final review of the chemistry of chromium(IV) and chromium(V) (K. Nag and S.N. Bose; 45 pages; 278 refs.) is so unsatisfactory; it is neither comprehensive nor well written, and whilst being a moderately useful data compilation, one gains little insight into the fascinating chemistry of these unusual oxidation states by reading this account. However, one cannot help but feel that this volume would have been improved if this final review had been omitted.

School of Chemistry and Molecular Sciences,
University of Sussex, Brighton BN1 9QJ (Great Britain)

KENNETH R. SEDDON