

Book reviews

Comprehensive Organometallic Chemistry. (Editors Sir Geoffrey Wilkinson, F.G.A. Stone and E.W. Abel) in 9 Volumes, Pergamon, Oxford etc., 1982, 9369 pages, £1075.

The appearance of this much heralded and long awaited set of volumes is an important event in organometallic chemistry. It is thus appropriate to review it at some length in this Journal, even though in one sense detailed comments are unnecessary, since the near-adulatory praise elicited by the publishers for circulation with the very extensive pre-publication publicity is for once almost wholly justified. The choice of authors is excellent overall, and the great majority of the accounts seem to have appeared within a reasonable time from their preparation, a remarkable achievement for a work involving so many contributors. The books are very clearly printed, and the publisher's claim that they are "beautifully bound" is not greatly excessive. Even the general standard of the English is unusually high, possibly reflecting in some cases the wisdom of the choice of authors and in others the assiduity of the relevant editors.

Criticisms can be made about the allocation of space to various topics within and between volumes; for example, it is doubtful whether it is appropriate to give almost as much space in Volume 2 to carbacyclic silanes (excellent though the review of that topic is) as to the uses of organic derivatives of the alkali and alkaline earth metals in organic chemistry in Volume 7, but any such imbalance is of secondary importance. There is also some unnecessary repetition of material in two or more chapters, but it would have been very difficult to avoid that completely. The accuracy of the title of the set of volumes can be questioned, since a glance at truly comprehensive accounts of organometallic chemistry, such as the fine Gmelin volumes or the excellent annual surveys in or associated with the *Journal of Organometallic Chemistry*, shows how uncomprehensive this general account must necessarily be, even though it includes over 40,000 references. There is a slight danger that newcomers to particular fields, especially students, will be misled on occasions into thinking that what they are reading represents all that is known on a given topic, whereas it is frequently only a very small fragment, without that being apparent from the wording; the title *Comprehensive Introduction to Organometallic Chemistry* would be more correct. But this again is a very minor point, and the set of volumes is much more comprehensive within its field, and better in other respects, than its earlier companion sets of volumes on *Comprehensive Inorganic and Comprehensive Organic Chemistry*, valuable though those are.

The set is very moderately priced, and more so than is immediately apparent, since the large page size and the compactness of the printing mean that there is almost twice as much information on each page as in many specialist chemical books. Though the set is more than the sum of its parts, and in particular there is only one index, the individual volumes are valuable in their own right, and

there should be a substantial demand from organic chemists for some of them, especially Volumes 2, 7, and 8. It is to be hoped that when libraries have made their purchases of sets the publishers will make separate volumes available.

Comments on each volume appear below.

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COLIN EABORN

Volume 1 (754 pages)

This volume begins with a chapter on Structural and bonding relationships among main group organometallic compounds by M.E. O'Neill and K. Wade (42 pages, 207 refs.). This is followed by chapters on Organometallic compounds of the alkali metals (by J.L. Wardell (78 pages, 321 refs.), Beryllium by N.A. Bell (33 pages, 260 refs.), Magnesium, calcium, strontium and barium by W.E. Lindsell (98 pages, 635 refs.) and Non-cyclic three and four coordinated boron compounds, by J.D. Odom (59 pages, 591 refs.). These chapters contain many tabulated thermodynamic structural and spectroscopic data, with further references to the original literature as footnotes. The great volume of work published mainly over the last fifteen years on Boron in ring systems is summarised by J.H. Morris (62 pages, 484 refs.) and Boron ring systems as ligands to metals are described by G.E. Herberich (30 pages, 90 refs.). The next three chapters deal mainly with carboranes. The chapter on Polyhedral organoboranes by T. Onak (47 pages, 247 refs.) also covers compounds in which an organic group appears as a substituent in a polyborane skeleton. The chapter on Metallocarboranes and metallaboranes by R.N. Grimes (83 pages, 260 refs.), deals with compounds containing transition metals and, as expected, gives many structural data. The short chapter on Heterocarboranes by L.J. Todd (11 pages, 71 refs.) surveys the chemistry and structures of compounds in which the heteroatom is a main group element. The remaining chapters are on Aluminium by J.J. Eisch (128 pages, 742 refs.), Gallium and Indium by D.G. Tuck (40 pages, 282 refs.) and Thallium by H. Kurosawa (30 pages, 143 refs.). All three contain a number of tables of physical data with many further references to the original literature, and the chapter on aluminium has extensive discussion of reaction mechanisms, a field in which the author has a strong personal interest and in which he has made important contributions.

This volume contains an enormous amount of information, and there is no doubt that it will be of immense value to those researching in main group organometallic chemistry. There is a well-judged balance between treatment of physical properties and chemical reactions and in the allocation of space to each element. Detailed applications to organic synthesis are covered in Volume 7. Inevitably there is some overlap, e.g. structural information on polyhedral boranes or organoaluminium compounds in Chapter 1 is repeated elsewhere. Inevitably there are some misprints but these are few.

A work of this kind is intended to last many years. It should be successful both in providing easy access to key papers in the original literature and in giving a readable and authoritative account of specific areas of organometallic chemistry as seen in about 1980.

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J. DAVID SMITH

Volume 2 (1020 pages)

Volume 2 ranges over elements mighty (silicon) and miniscule (cadmium, bismuth). The content is outlined in the Table, but the number of references in most chapters is greater than indicated, because additional references are appended to the Tables.

| Title | Author(s) | Pages | References | Tables |
|---|-------------------|-------|------------|--------|
| Organosilanes | D.A. Armitage | 204 | 752 | 7 |
| Carbacyclic Silanes | T.J. Barton | 100 | 415 | 12 |
| Silicones | F.O. Stark | 60 | 193 | 29 |
| | J.R. Falender | | | |
| | A.P. Wright | | | |
| Organopolysilanes | R. West | 34 | 136 | 8 |
| Germanium | P. Rivière | 120 | 716 | 8 |
| | M. Rivière-Baudet | | | |
| | J. Satgé | | | |
| Tin | A.G. Davies | 110 | 722 | 40 |
| | P.J. Smith | | | |
| Lead | P.G. Harrison | 52 | 419 | 8 |
| Arsenic, Antimony and Bismuth | J.L. Wardell | 28 | 179 | 7 |
| Copper and silver | J.G. Noltes | 56 | 187 | 7 |
| | G. van Koten | | | |
| Gold | R.J. Puddephatt | 58 | 227 | 13 |
| Zinc and Cadmium | J. Boersma | 40 | 163 | 16 |
| Mercury | J.L. Wardell | 116 | 545 | 36 |
| Environmental Aspects of Organo- metallic chemistry | P.J. Craig | 41 | 319 | 17 |

It is probably both inevitable and desirable that volumes of this type should exert a "levelling effect" on the reviews: minor elements tend to receive truly comprehensive treatment (Cu, Ag, Zn, Cd, Hg), whereas the major elements or topics, which will have received close attention in earlier reviews and in data lists, are treated by principle and illustrative example. References to the earlier sources are invariably given and they are usually to be found in the first section of each chapter. Since, however, for some elements they are crucial to the claim for comprehensive cover, a more uniform and prominent mode of presentation would have added convenience. By and large, the balance between detailed and illustrative cover has been well-struck and we have full detail wherever it is reasonably feasible, and we have useful summaries elsewhere.

The list of authors is a sufficient assurance of quality, so the reviewer confines his remarks to matters of presentation. The chapters on tin and lead com-

pounds make good use of diagrams with radial arrows to summarize reactions of typical compounds (e.g. the reactions of R_3SnCl on p. 557). This method could have been used with advantage elsewhere, particularly in the chapter on Germanium, where some of the sections on chemical properties are excessively sub-divided. In this chapter also, the distinction between illustrative and comprehensive cover could have been drawn more clearly, but authors who write in a language other than their first deserve our special thanks for facing that extra difficulty. The decision to omit π -bonded complexes of copper and silver is the more regrettable in view of the excellence of treatment of the σ -complexes, and the Tables in this chapter and that covering mercury deserve special praise despite the very high standard throughout this volume.

It is logical that a volume embracing arsenic, lead, mercury, and tin compounds should also deal with environmental aspects. The last chapter does so, with emphasis on toxicology in the general environment. Most users of these volumes would perhaps have more direct concern with hazards in the workplace, but this aspect receives little attention. Most of us would probably claim that organometallic chemistry benefits the community as well as its practitioners; whether we would wish to be followed to the grave by bis(tributyltin) oxide (p. 613) is another matter.

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ALAN PIDCOCK

Volume 3 (1384 pages)

This volume reviews in detail some of the most important areas of contemporary growth in organometallic chemistry. Its 10 chapters, numbered 19 to 28 inclusive, by fifteen authors, alone or jointly are profusely illustrated by well presented structural formulae. Chapters 19 and 20 are on General topics and 21 to 28 specifically concerned with the Organometallic chemistry of the transition elements of Groups III, IV, V, including the lanthanides and actinides.

Chapter 19 (89 pages, 551 refs.) by D.M.P. Mingos is a masterly and comprehensive account of Current state of the theory of bonding of unsaturated organic molecules (including carbon monoxide) to transition metals. It concerns atomic and molecular orbital interactions, orbital symmetry and their implications for the understanding of the stereochemistry of hydrocarbon complexes and the mechanisms of such characteristic reactions as oxidative addition, alkene metathesis, epoxidation, polymerisation etc.

Chapter 20, Non rigidity in organometallic compounds by B.E. Mann (84 pages, 185 refs., excluding those in tables) concerns fluxional processes and the methods of determining the fluxionality of ligands around a metal centre, in polynuclear complexes, between different points or modes of attachment to the metal, etc. It is highly comprehensive, with 30 tables of pertinent experimental data and references.

The remaining chapters detail the rapidly developing and highly topical organometallic chemistry of the early transition metals. Chapter 21 on Scandium, yttrium and the lanthanides and actinides is by T.J. Marks and R.D. Ernst (98

pages, 437 refs.). Chapter 22, on Titanium by M. Bottrill, P.D. Gavens, J.W. Kelland and J. McKeeking is in five substantial parts, Introduction (10 pages, 39 refs.), Low valent complexes of titanium (50 pages, 180 refs.), Anionic π -bonded derivatives of titanium(IV) (102 pages, 336 refs.), σ -Bonded hydrocarbyl complexes of titanium (42 pages, 120 refs.), and Ziegler-Natta catalysis (74 pages, 139 refs.). Chapter 23, on Zirconium and hafnium by D.J. Cardin, M.F. Lappert, C.L. Rastin and R.I. Riley is in three parts, Introduction (10 pages, 73 refs.), Cyclopentadienyl and other π -ligand complexes of zirconium and hafnium (76 pages, 313 refs.), and Zirconium and hafnium complexes free from anionic π -ligands (12 pages, 54 refs.). Chapter 24, on Vanadium is by N.G. Connelly (58 pages, 590 refs.). Chapter 25, on Niobium and tantalum is by J.A. Labinger (78 pages, 222 refs.). Finally chapters 26, 27 and 28 treat the Organometallic chemistry of chromium, molybdenum and tungsten, each in two parts. The first parts, by S.W. Kirtley, concern η^1 -carbon ligands (Cr, 170 pages, 362 refs., Mo, 70 pages, 123 refs., W, 66 pages, 160 refs.) and the second parts, by R. Davis and L.A.P. Kane-Maguire, the η^2 - η^5 -carbon ligands (Cr, 126 pages, 599 refs.; Mo, 106 pages, 406 W, 64 pages, 263 refs.).

Chapters 21 and 23-28 are of similar type. They concern elements whose organometallic chemistry has diversified substantially or developed almost wholly within the past decade. They tend to take on somewhat the character of the Annual Reports of the Royal Society of Chemistry, extremely useful but not necessarily coherent. Chapter 22 on Titanium is particularly interesting. It is entirely appropriate that this chapter should come from authors in an industrial laboratory who are to be congratulated on their treatment of the vast amount of information and misinformation that has accumulated in the patent and chemical literature.

This volume is essential reading for anyone needing a detailed overview of the above topics, but the speed of development in the area is so great that its subject matter will soon become a part of history.

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Volume 4 (1064 pages)

This volume (chapters 29 to 33 inclusive) provides reviews of the organometallic chemistry of the elements of the manganese and iron sub-groups by 15 internationally known authors. Although metal carbonyl chemistry dates back to the last century the great variety of organometallic derivatives considered here are essentially a product of the past 30 years, mainly of the past ten, and are excellently reviewed.

Chapter 29, Manganese, by P.M. Treichel (160 pages, 649 + Table refs.) is an excellent comprehensive and timely overview of its relatively new subject. Essentially this is the chemistry of manganese carbonyl and its derivatives (alkyl, aryl, cyclopentadienyl, phosphine etc.) and of the few non-carbonyl organomanganese compounds. It makes extensive use of well-referenced Tables of

data. Chapter 30, Technetium and Rhenium, by N.M. Boag and H.D. Kaesz (82 pages, 53 refs.) follows the pattern and matches the quality of the previous chapter.

In Chapter 31, Iron, seven authors have shared responsibility of selecting material for inclusion in a comprehensive treatise from the vast quantity of available material relating to organoiron chemistry, and have produced a usefully comprehensive and coherent review in five parts as follows: Iron compounds without hydrocarbon ligands by D.F. Shriver and K.H. Whitmore (80 pages, 688 refs.), Mononuclear iron compounds with η^1 -hydrocarbon ligands by M.D. Johnson (46 pages, 155 refs.), Mononuclear iron compounds with η^2 - η^6 -hydrocarbon ligands by A.J. Deeming (135 pages, 523 refs.), Dinuclear iron compounds with hydrocarbon ligands by W.P. Fehlhammer and H. Slotzenberg (101 pages, 527 refs.), Polynuclear iron compounds with hydrocarbon ligands by J.L. Davidson (36 pages, 111 refs.).

Chapter 32, Ruthenium, is taken in eight parts after a nine page introduction by M.I. Bruce. These are: Ruthenium carbonyl and related compounds by M.I. Bruce (30 pages, 136 refs.), Mononuclear ruthenium compounds (130 pages, 664 refs.) and Dinuclear and polynuclear ruthenium non-cluster compounds (19 pages, 96 refs.), both by M.A. Bennett, M.I. Bruce and T.W. Matheson. The next four parts are by M.I. Bruce and entitled Chemistry and reactivity of dodecacarbonyltriruthenium (45 pages, 204 refs.), Polynuclear ruthenium carbonyl complexes (20 pages, 80 refs.), Ruthenium complexes containing Group IVB ligands (13 pages, 50 refs.), and Ruthenium complexes containing other metals (7 pages, 36 refs.). The final part by M.A. Bennett and T.W. Matheson is entitled Catalysis by ruthenium compounds (32 pages, 190 refs.).

The chapter on Osmium by R.D. Adams and J.P. Seleque (Chapter 33; 98 pages, 421 refs.) follows a similar pattern to the others, i.e. carbonyls, substituted carbonyls, hydrocarbon complexes etc. About half of the chapter is devoted to osmium cluster compounds, as befits this important aspect of osmium chemistry, and finishes with the remarkable symmetrical structure of $[\text{Os}_{10}\text{C}(\text{CO})_{24}]^{2-}$ and derived $\text{CH}_3\equiv\text{CCH}_3$ Os_6 derivative.

The above chapters range usefully over the organochemistry of the iron subgroup metals, the preparations of the compounds, their reactions and implications in the understanding of catalysis by transition metal complexes.

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Volume 5 (628 pages)

This is the slimmest of the nine volumes in the series. It comprises three chapters dealing with the elements Cobalt (276 pages, 809 refs.), Rhodium (263 pages, 1311 refs.), and Iridium (87 pages, 512 refs.). The authors are experts in their field: R.D.W. Kemmitt and D.R. Russel (Co), R.P. Hughes (Rh), and G.J. Leigh and R.L. Richards (Ir). An explicit statement is made in the cobalt chapter that the literature is covered to the end of 1979, although there are some (> 30) citations to the 1980 literature. No such statements are made

in the other two chapters, although for rhodium the coverage extends to 1980 with some (about ten) 1981 papers. In the iridium chapter, the cut-off point is probably 1978, even though there are about 15 references to the 1979 literature (and an isolated one to 1981). The texts are amplified by numerous Schemes: 187 for cobalt, 61 for rhodium, and 14 for iridium. Additionally, there are a large number of Tables: 48 for Co, 47 for Rh, and 15 for Ir. The chapters are amply provided with well-drawn illustrations of structural formulae: 585 for cobalt, 1057 for rhodium, and 177 for iridium.

The arrangement of the subject matter is somewhat different for the three elements. In the case of the cobalt and rhodium chapters, the sub-divisions are into (1) compounds without hydrocarbon ligands (principally carbonyls), and (2) complexes having hydrocarbyl or hydrocarbon (or perfluoro analogues) ligands of varying hapticities. For example, in Section 2, for cobalt there are 130 pages dealing with σ -bonded complexes, and 87 pages are devoted to π complexes; for rhodium the balance is somewhat different, monohapto- (including carbene and carbyne complexes) being covered in 43 pages. In the iridium chapter, the principal divisions relate to the number of metal atoms per molecule, with the major part (70 pages) being taken up by mononuclear complexes.

The elements of Group VIII B have a rich organometallic chemistry, and cobalt and rhodium, in particular, feature prominently in many important catalytic systems; however, the latter aspects are not covered, except in passing, in this volume but are dealt with elsewhere. Other aspects of the chemistry of these elements, to which attention is drawn in other volumes, relate to metallocarboranes and complexes having these metals attached to some other metal. For cobalt there is also a specific disclaimer by the authors with regard to the only naturally occurring organometallic compound, namely, coenzyme B₁₂, a cobalt(III) alkyl, 5'-deoxy-5'-adenosylcobalamin; thus they state that the topic is treated in Chapter 18 and they restrict themselves to a discussion of "model" systems. However, Chapter 18 actually does not deal with this subject at all, but does cover a few examples of the role of methylcobalamin in the environmental methylation of some heavy metals.

These three articles are extremely valuable and written with great authority. Some very minor errors have been noted in each chapter with regard to the odd author initial; however, the reviewer is convinced that there are few major mistakes. These contributions then provide detailed accounts and will be important source books to researchers in these fields. Spot checks on the degree of comprehensiveness, however, gave somewhat mixed results. For example, R.H. Crabtree, who has published much on some recent developments of iridium chemistry, including an extraordinarily active hydrogenation and dehydrogenation catalyst, is represented by only two citations in the iridium chapter (one with the wrong initials: carried through into the Index Volume), although in 1977 and 1978 he published at least six papers in this field. The depth of coverage may also be compared with that found in this Journal's Annual Surveys; the organometallic chemistry of Co, Rh, and Ir was covered by 353 references for the 1978 (R.D.W. Kemmitt) literature and 705 citations for the 1981 (J. Mague) period (J. Organomet. Chem., 242 (1983) 241; strangely, the years 1979 and 1980 have not been dealt with in J. Organomet. Chem.).

As in other areas of organometallic chemistry, so for the Group VIII B elements, these reviews are of outstanding importance and have great merit.

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Volume 6 (1114 pages)

This volume is concerned with two main themes (i) the organometallic chemistry of nickel, palladium and platinum and (ii) compounds containing either heteronuclear bonds between transition metals or involving transition metal--boron, --aluminium, --gallium, --indium, --thallium, --mercury, --cadmium, --zinc, --magnesium, --silicon, --germanium, --tin, or --lead bonds.

The coverage of organonickel compounds by P.W. Jolly follows the pattern established earlier by this author and G. Wilke in their well-known book 'The Organic Chemistry of Nickel', Academic Press, N.Y. 1976 Vol. 1. Topics covered include Nickel tetracarbonyl (12 pages, 139 refs.), Lewis-base nickel carbonyl complexes (22 pages, 216 refs.), Nickel hydride, alkyl and aryl complexes (65 pages, 425 refs.), Nickel alkene and alkyne complexes (45 pages, 285 refs.), η^3 -Allylnickel complexes (39 pages, 192 refs.), η -Cyclobutadiene-nickel compounds (5 pages, 27 refs.), η -Cyclopentadienylnickel compounds (40 pages, 272 refs.) and η -Arene complexes (3 pages, 22 refs.).

Following a short introduction (10 pages, 42 refs.), P.M. Maitlis, P. Espinet and M.J.H. Russel review Complexes of palladium(0) (21 pages, 192 refs.), Palladium(I) and cluster complexes (14 pages, 63 refs.), Compounds with palladium--carbon σ -bonds (69 pages, 466 refs.), Mono-olefin and acetylene complexes (13 pages, 84 refs.), Diene complexes (20 pages, 139 refs.), Allylic complexes of palladium(II) (56 pages, 364 refs.), Cyclopentadienyl and arene complexes (6 pages, 42 refs.) and Complexes derived from acetylenes (13 pages, 70 refs.). The review greatly extends the earlier coverage by Maitlis in *The Organic Chemistry of Palladium* (Academic Press, N.Y. 1971).

The organometallic chemistry of platinum is covered in a single long chapter by F.R. Hartley (292 pages, 1702 refs.) who is also the well-known author of the earlier book on *The Chemistry of Platinum and Palladium* (Applied Science, London 1973). The review is subdivided into sections dealing with platinum complexes of (a) carbonyls, isocyanides, carbenes and ylids, (b) σ -bonded compounds, metallation reactions and C--H bond activation (c) olefin, acetylene, allyl, diene, cyclopentadienyl and η^6 , η^7 and η^8 compounds. There are extensive tables of physical data. As expected all three sections on the organometallic chemistry of Ni, Pd, and Pt are of a high standard and authoritatively written by experienced practitioners in the field although inevitably there is some degree of overlap in the discussion of reaction types of the three metals.

Compounds with heteronuclear bonds between transition metals are discussed by D.A. Robert and G.L. Geoffroy (144 pages, 245 refs.) who summarise synthetic routes, physical methods of characterisation and reactivity of this class of compounds. Single crystal neutron and X-ray diffraction data for some compounds are presented and there is a very useful comprehensive listing of dinuclear, oligomeric and cluster complexes.

Compounds containing bonds between a transition metal and boron are described by K.B. Gilbert, S.K. Boocock and S.G. Shore (66 pages, 289 refs.) and the latter two authors also cover Compounds of transition metals with the other Group IIIb elements Al, Ga, In and Tl, (34 pages, 92 refs.). A feature of the compounds containing boron is the wide variety of structural units containing up to eighteen boron atoms and the emphasis is on syntheses and types of boron moieties in transition metal complexes rather than more general relationships concerning sizes, shapes and electron counting in metalloborane clusters which are treated in other Chapters of this series. There is some overlap with data in the early chapters of this volume.

J.M. Burlitch reviews the Chemistry of compounds containing bonds between transition metals and Hg, Cd, Zn or Mg (58 pages, 146 refs.) and provides extensive Tables of data for donor acceptor adducts, and di- and tri-metallic derivatives of Zn, Cd and Hg, and contains a wealth of synthetic and spectroscopic information.

The final chapter by K.M. Mackay and B.K. Nicholson (71 pages, 229 refs.) which covers Compounds with transition metal bonds to Si, Ge, Sn and Pb, deals with general synthetic routes prior to a systematic discussion of the early transition groups, compounds of the chromium, manganese, iron, cobalt, nickel, copper and zinc groups. Structural and bonding aspects are discussed, and there is an invaluable table containing structural information.

All the above chapters are expertly written by authors who have themselves contributed to the research activity in this area of chemistry, and maintain the overall high standard for Volume 6.

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JOHN F. NIXON

Volume 7 (729 pages)

This volume is devoted to the uses of Main Group organometallic compounds in organic synthesis. The five chapters deal respectively with derivatives of (a) the alkali and alkaline earth metals (B.J. Wakefield, 110 pages, 605 refs.); (b) B (see below, 253 pages, 1344 refs.); (c) Al (J.R. Zietz Jr., G.C. Robinson, and K.L. Lindsay (100 pages, 564 refs.); (d) Tl (A. MacKillop and E.C. Taylor, 49 pages, 231 refs.); (e) Si (P.D. Magnus, T. Sarkar, and S. Djuric, 144 pages, 713 refs.); (e) Zn, Cd, Hg, Cu and Au (W. Carruthers, 69 pages, 272 refs.). The balance of space allocated to the various elements seems well-judged. Although organo-lithium and -magnesium compounds are still easily the most important organometallics in organic chemistry their uses are so well known that it was appropriate to allocate more space to boron and silicon compounds. Again, although uses of organozinc and organomercury have a long history in organic chemistry, which might seem to justify an allocation of more than 23 pages, it is not obvious that what other parts of the volume could justifiably have been reduced to make way for an expanded account, except possibly the chapter dealing with organometallic compounds of aluminium, whose importance in organic chemistry may perhaps be exaggerated by the 100 pages devoted to them.

The chapters on compounds of B and Si seem to me outstanding, but none are less than good. The chapter on boron is divided into an unnecessarily large number of sub-chapters, each of which gives the false appearance of being complete in itself, and it is hard to see the justification for splitting the account of hydroboration (by M. Zaidlewicz) into four such sub-chapters and that of reactions of organoboron compounds (by E. Negishi) into six. This fragmentation could be misleading for those turning to the book to look up a specific topic, since they might not realize that each sub-chapter should be read along with the others on boron, and this gives rise to small difficulties, such as that the abbreviation 9-BBN is used in sub-chapters 45.4 and 45.6 without being defined in those sub-chapters. But this is a minor criticism, and the overall account of the uses of organoboron compounds is excellent; not surprisingly, the introductory survey by Herbert C. Brown presents a first-class summary, which is a model of what such accounts should be. The chapter on uses of organosilicon compounds is of very high quality, and is not just a summary of past results but also a creative contribution to the field in itself; the difficulty the authors faced in doing justice to a branch of chemistry which is of such recent and prolific flowering can be illustrated by the fact that the most recent annual survey of the application of silicon in organic chemistry, that covering the year 1980, lists 512 references (G.M. Rubottom, *J. Organomet. Chem. Library*, 13 (1983) 127).

Overall this volume is very good indeed. Organic chemists whose libraries cannot afford to take the whole set of volumes should certainly urge the publishers to make this one separately available, for without it they will be unnecessarily handicapped in their researches.

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COLIN EABORN

Volume 8 (1106 pages)

This reviewer found Volume 8 (Chapters 50–60 incl.) the most fascinating of the whole set. It is concerned with the variety of topical and important organic reactions which are catalysed by transition metal complexes. They must necessarily involve organometallic intermediates even if the complexes themselves are not organometallic, although most of them are; also it reviews recent developments in the use of organo-transition metal compounds in organic synthesis. Many of the catalytic reactions are not only of great interest or potential interests to chemical industry but also provide fascinating material for the study of reaction mechanisms and of bonding to transition metals. Its interest ranges over the whole of chemistry, as outlined by the titles of the following very useful chapters.

Chapter 50 concerns carbon monoxide and carbon dioxide in the synthesis of organic compounds and is in four parts: Parts 1, 2, and 3 by R.P.A. Sneedon are entitled Preparation and purification of carbon dioxide and carbon monoxide (17 pages, 44 refs.), Organic syntheses where carbon monoxide is the unique source of carbon (82 pages, 343 refs.) and Reactions of carbon dioxide (59 pages, 202 refs.); Part 3, Synthesis with carbon monoxide and a petroleum

product (123 pages, 185 refs.) is by I. Tkatchenko and is altogether a very nice review of an important subject from C.N.R.S. Villeurbanne. Chapter 51 by B.R. James, Addition of hydrogen and hydrogen cyanide to carbon-carbon double and triplet bonds (85 pages, 525 refs. + Table refs.) gives a useful summary of hydrogenation reactions (69 pages), the remainder being devoted to hydrocyanation; Chapter 52, Alkene and alkyne oligomerization, copolymerization and telomerization reactions (92 pages, 491 refs.), is by W. Keim, A. Behr and M. Röper. Chapter 53 by H.B. Kagan concerns the rapidly expanding field of Asymmetric synthesis using organometallic catalysts (36 pages, 125 refs.). Alkene and alkyne metathesis reactions (53 pages, 146 refs.) form the subject of Chapter 54, whilst Chapter 55, by C.U. Pitman Jr, considers the synthesis and characteristics of Polymer supported catalysts (59 pages, 346 refs.). Then follows a very full and authoritative treatment of Nickel-catalysed oligomerizations, coupling of organic halides, carbonylation etc. (Chapter 56, 185 pages, 1210 refs.) by P.W. Jolly of the Max-Planck Institut. Palladium is proving highly versatile in organic reactions involving olefinic compounds and aromatics, as described in Organopalladium compounds in organic synthesis and in catalyses by B.M. Trost and T.R. Verhoeven (Chapter 57, 140 pages, 805 refs.), a potentially very useful but complex area of chemistry.

The content of Chapter 58, Organoiron compounds in stoichiometric organic synthesis by A.J. Pearson (73 pages, 231 refs.), is adequately indicated by its title, as is that of Chapter 59, The organic chemistry of metal-coordinated cyclopentadienyl and arene ligands by W.E. Watts (59 pages, 355 refs.). Finally Chapter 60, Reactions of dinitrogen promoted by transition metal compounds by J.R. Dilworth and R.L. Richards (34 pages, 119 refs.) summarises reactions leading to the formation of N-H or N-C bonds by dinitrogen attached to or in the presence of transition metal entities.

I have looked in detail at Volumes 3, 4 and 8. I am highly impressed by their quality and thoroughly recommend them to libraries wherever organometallic chemistry is studied or used.

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JOSEPH CHATT

Volume 9. Indexes (1570 pages)

The publication of "Comprehensive Organometallic Chemistry" nearly coincided with the completion of that of "The Diary of Samuel Pepys" (Edited by R.C. Latham and W. Matthews, Bell and Hyman). Both appear in dark green covers, in many volumes (eleven for Pepys, nine for Organometallics), and each includes a powerful index. The two works make for an interesting comparison. The Diary covers about nine years of Pepys' life, and the writing occupied only a small fraction of his time. The definitive edition arrives more than three hundred years after the original, and many more man-years have been expended on the later scholarship than Pepys' original nine. Writing in Science seems to be the more convergent. There are over thirty thousand names in the author index of "Comprehensive Organometallic Chemistry" and if each name is equated to

one working man-year, there is a remarkable compression of "scientific history" in these volumes. "Organometallic Chemistry" has been compiled in parallel by many authors and it must have consumed more than twenty man-years in the making. In consequence, organometallic chemists have to hand an account that lags behind the original events by only a very few years.

The scholarship and thoroughness of the Companion and Index volumes of "Pepys" have been universally acclaimed and there is no doubt that the index volume to "Organometallic Chemistry" will find heavy use. It is more than a mere index. Michael Bruce provides us with a fully comprehensive list of structures determined by diffraction methods — an immense task even with the files of the Cambridge Crystallographic Data Centre available, and G. Brent Young has supplied an index of English language reviews to complement the lists published in the early seventies in *Adv. Organomet. Chem.*

The Formula index enters compounds under all metals present and the Author index uses the names of all the authors. The most difficult task undoubtedly faced the compiler of the Subject Index (J. Newton) and it would be unreasonable to be too dissatisfied with the result. It cannot, however, match the index of "Pepys", which appears to exceed the expectation of all reviewers. Thus, "Metallacyclopentadienes" nets only two references to the direct use of the term, instead of leading to all the references to this class of compounds. There are also some less pardonable quirks: American spelling is used for Al and S, but a few entries appear under "Sulph-", and of these some do not appear under "Sulf-".

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Spectroscopic Properties of Inorganic and Organometallic Compounds, Volume 15, (Senior Reporters: G. Davidson and E.A.V. Ebsworth), A Specialist Periodical Report of the Royal Society of Chemistry, London, 1982 xv + 387 pp., £70.00 (\$130.00).

This is the latest volume in a well-known and well-respected series, and covers the spectroscopic literature pertaining to inorganic and organometallic complexes from late 1980 to late 1981. Very few practicing chemists can be unaware of this series and the material it covers, but this seemed an appropriate opportunity to examine the standard of the current volume compared with that of a volume published ten years ago (Volume 5) in the same series. The critical parameters are summarised in the Table, and it is immediately apparent that (with the curious exception of NQR spectroscopy) the articles in the 1982 volume have been seriously shortened. The effect of this has been to almost completely eliminate the discussion and learned criticism by the authors which was central in the 1972 volume. To take a specific example, in 1972 Brian Mann devoted 38 pages to an invaluable treatment of 283 references concerning the stereochemistry of transition metal complexes, as investigated by NMR spectroscopy. In 1982, 39 pages were devoted to the same topic, but 827 ref-