electronics and coatings industries, and organometallic chemists have written countless research proposals claiming that the substances they planned to study would prove to be CVD precursors. Such proposals have however been plausible only when two-way communication has been established between materials scientists and device manufacturers on the one hand and chemists on the other. Successful exploitation of organometallic compounds as CVD precursors has required that problems encountered at the manufacturing stage be referred back to the precursor suppliers. The overall aim, to achieve controlled and coherent growth with abrupt changes in composition, critically depends on adjusting chemical factors such as volatility and thermal stability as well as process variables such as equipment configuration, flow rates and temperature.

This book is about metal CVD; it does not discuss production of thin films of semiconductors or other non-metallic materials. It comprises an introductory chapter which covers general points about manufacture of silicon devices and likely requirements for the year 2001, and compares CVD with techniques such as evaporation or sputtering for production of carbon-free metal films. This is followed by chapters on the CVD of aluminium, tungsten, copper, gold and silver, platinum, palladium and nickel. The remaining metals are considered in a further chapter and the book concludes with an excellent overview bringing together points from all the other chapters and articulating general themes. This final chapter contains tables showing precursors for particular metal films and tables of precursor types showing the range of metals for which they are available. There is also a general index and a glossary.

The editors have persuaded a number of experts, mainly from university departments but some from industry, to write the various chapters. They have imposed an unusual degree of editorial control so that the book has little of the incoherence and inconsistency that are so often characteristic of multi-author works. Each chapter begins with an abstract of about 100 words and ends with a section of one–two pages called Summary and Outlook. There are 100–300 references per chapter, many of them as recent as 1993. The editors themselves have written the concluding chapter and contributed to some of the others.

This book will be invaluable to all those thinking about the possibility that the compounds they have made can be used for CVD. It will also be useful to physicists and materials scientists who need to be familiar with the chemistry of the substances they are using in their CVD processes. There is a great deal of organometallic chemistry here — on aluminium alkyls and hydrides, tungsten carbonyls and organometallic compounds of silver, gold and the platinum group metals. The precursors for copper films are mainly β-diketone complexes and so contain metal–oxygen rather than metal–carbon bonds. There is also a good deal about techniques which is not readily available in other monographs on organometallic compounds. In short, this is a truly interdisciplinary book and the editors have undoubtedly achieved their aim to bring together the work of chemists, chemical engineers, materials scientists and electrical engineers in this important and intellectually demanding area.

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Photochemistry and Photophysics of Metal Complexes
D.M. Roundhill, Plenum, New York, 356 pages.
ISBN 0-306-44694-4

In an age of the multi-author, multi-chapter 'book', it is refreshing to see a *real* book by a *single* author. Professor Roundhill explains in his preface that inorganic photochemistry has become an extremely broad subject, too broad for a single volume to be encyclopaedic but broad enough to be an excellent topic for a special course. This book, therefore, is intended "as both a reference source and as a teaching text". There are nine chapters, each divided into subsections. Apart from an introductory chapter, the photochemical topics are divided into: first row metals; monomeric complexes of second and third row metals; dimeric and multimetallic complexes of these metals; $Ru(bpy)_3^{2+}$ and related complexes; transition metal carbonyls and isocyanide complexes; transition metal alkene, arene, alkyl, hydride and carbene complexes; lanthanide and actinide complexes; and finally, metal porphyrins, phthalocyanins and metal ions in supramolecular chemistry. Overall, a range of topics quite sufficient for special courses at senior undergraduate, starting postgraduate level.

I began reading the book with considerable optimism but, as I went on, I felt increasingly disappointed. My disappointment was two-fold. Firstly, the author has produced an extremely good imitation of a multi-authored book. Secondly, there is an abundance of material but relatively little critical comment. Like the multi-authored book, each chapter is essentially independent, each with its own set of references, albeit with a good citation of pertinent reviews. With a broad range of topics, there must obviously be some overlap between chapters but the opportunities of the single-authored book seem to have been missed. For example, the work of Rest and coworkers on $(C_5H_5)Cr(CO)_3Me$

in low temperature matrices (R.H. Hooker, K.A. Mahmoud, A.J. Rest and H.G. Alt, *J. Organomet. Chem.*, *419* (1991) 101 is covered twice, in schemes 6.31 and 7.8; not only is there no cross-referencing in the text but even the formula of the *same* intermediate is typeset differently in the two places, $(\eta^5\text{-cp})Cr(CO)_2Me$ and $\eta^5\text{-cpCr}(CO)_2Me$. The key point about this reaction is that it appears to involve formation of a methylidene hydride $Cr(=CH_2)(H)$, one of the few examples of α-migration. Given the teaching aims of the book, this seems an excellent opportunity at least to make a passing comment to link the photochemistry of carbonyls and alkyls, the topics of two chapters and also to give the reader some idea of the strength of the chemical evidence for the formation of this species.

It is the lack of critical discussion, which concerns me. By its very nature, much of the experimental evidence for photochemistry and photophysics comes from 'sporting techniques', such as matrix isolation or flash photolysis. Although such techniques can never have the same certainty as X-ray analysis of isolated products, the conclusions from some experiments are rather more tentative than others. Of course, an assiduous student ought to check all of the original references but, in a teaching text, I feel that the student might benefit from a guiding hand. Nevertheless, the author provides a good selection of references so the student is not left helpless. My greatest concern is the presence of a number of misprints in the formulae of compounds; for example $(\eta^5\text{-cp})_2W(CO)_3H$ instead of $\eta^5\text{-cpW}(CO)_3H$, which could seriously throw many students.

Despite my reservations, enterprise should not be discouraged. Professor Roundhill should be complimented on covering this topic singlehanded. I hope that a second edition will soon be forthcoming, without the misprints, with a degree of cross-referencing and, perhaps even a tenth chapter devoted to a few detailed case studies to show students how photochemists really tackle scientific problems.

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Gmelin Handbook of Inorganic and Organometallic Chemistry (8th Edition)
Os–Osmium, Organo-osmium Compounds, Volume B3, Springer, Berlin, 1994, 282 + xi pages, DM 1790.
ISBN 3-540-93697-1

Volume B5, Springer, Berlin, 1994, 389 + xi pages, DM 2290. ISBN 3-540-93698-X

These two volumes are concerned with tri-nuclear organo-osmium compounds, which are being dealt with in a strictly logical sequence, though this is not always evident from the date of publication. Volumes B2 and B4, which also deal with such compounds, would appear to have dropped behind schedule. The B series as a whole describes di- to poly-nuclear organo-osmium compounds.

The first volume covers tri-nuclear compounds that contain no carbon-bonded ligands other than CO, and discusses the literature up to at least mid-1993. The second volume covers compounds with single carbon-atom donors other than, or in addition to, CO. It is a companion to Volume B6 (the index for which it also contains), published in 1993, and describes the literature up to the end of 1993.

The Gmelin organisation is to be congratulated on the accuracy, quality and rapidity of publication. To produce a conventional book such as these are, including data considerably less than a year old at the time of publication, is a measure of the superb standard of these and of the related publications. The cost may appear high, but at just over DM 6 per page cannot be considered to be excessive compared with the real cost of other methods of sampling the literature. The presentation follows the usual user-friendly Gmelin format, and, for myself at least, it is preferable to scanning reams of computer printout, and each volume is, of course much more comprehensive than a simple list of references. I very much hope that Gmelin will continue to be a growing resource, available to as many chemists as need to scan the literature.

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Lithium Chemistry: A Theoretical and Experimental Overview
A.-M. Sapse and P. v. R. Schleyer (eds.), Wiley, New York, 1995, xi + 595 pages, £71.
ISBN 0-471-54930-4

There has been an upsurge in interest in recent years in the structures and other physical properties of compounds of the alkali metals, especially lithium, much of it stimulated by the increasing availability and reliability of appropriate computational techniques. Professor Schleyer, along with his colleagues, has played a major