tion and it comes through in every chapter. Let us hope that he is still going strong when this excellent book itself gets out of date and a new edition is required.

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Synthesis of Organometallic Compounds A Practical Guide, S. Komiya (Ed), Wiley, Chichester, 1997, pp. 442, £65 hbk, ISBN 0471 97070 0, £29.95 pbk, ISBN 0471 97195 2

This book consists of four introductory chapters by the editor covering the fundamentals of organometallic compounds, ligands, and the manipulation of air-sensitive compounds, and 13 chapters by other Japanese authors on the organometallic compounds of groups 3-12, 1, 2, 13 and 14 of the Periodic Table. The chapters on specific groups have a common pattern consisting of a general account of the synthesis of organometallic compounds followed by procedures and practical details for the syntheses of individual compounds.

The preface states that 'This textbook is intended for undergraduate students starting organometallic chemistry and researchers who want to use organometallic compounds, but are not professionals in organometallic chemistry'. It may be that the teaching of chemistry at university level is structured differently in Japan but I am not sure that this book, which undoubtedly contains a lot of useful information, fits very well into the pattern in many European or North American universities. The introductory chapters describe some of the jargon of organometallic chemistry, e.g. the 18-electron rule, agostic interactions, *trans*-effect and -influence, fluxionality, oxidative addition, reductive elimination and insertion, in an admirably concise way but with a breathlessness that could overwhelm many undergraduates. A wide knowledge of general chemistry (e.g. HSAB, Taft σ^*, stability constants) together with a good grounding in inorganic chemistry and an even stronger one in organic chemistry, are assumed. The chapter on experimental methods is illustrated with simple diagrams but I am not sure that the techniques described could be made to work with really air- and moisture-sensitive materials without a good deal of further help from practitioners or more detailed texts. Similar points can be made about the group-by-group chapters. The summaries of the organometallic chemistry of the groups are fine, but are the syntheses of individual compounds, many of them quite tricky to manipulate, really adequate? The details of techniques are fuller than those commonly given in research papers but they are not as comprehensive as those in *Inorganic Syntheses* and there are no diagrams in these chapters. The references seem to be reasonably complete. The transition metal groups have been covered in greater detail than the main groups but in both sections the selection of individual compounds seems rather arbitrary. Are they intended to be the most important (with greatest potential for development by researchers), examples for students (which work reliably in inexperienced hands) or simply those with which the authors are most familiar?

Perhaps the readers most likely to find this book useful are those with first hand research experience, especially in organic chemistry, who wish to use organometallic compounds as synthons. They will find the detailed accounts of the reactions of organometallic compounds with organic substrates useful and have the laboratory experience and skills to benefit from the sections covering experimental methods.

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Molecular Symmetry and Group Theory, R.L. Carter, John Wiley, New York, 1998, pp. 299 + x, £17.99 (paperback), ISBN O 471 14955 1

For all the power of symmetry arguments, how best to introduce molecular symmetry and group theory is still a teasing problem to which no universal answer has been found. Many chemical texts now include group theory, but usually so briefly as to be of little help to the novice. Primers specifically devoted to group theory certainly exist—Cotton's *Chemical Applications of Group Theory* is an admirable example—but, whether for reasons of logical development, mathematical satisfaction or over-elaboration, presentation, or scope, none seems to this reviewer to provide the ideal treatment.

Now comes a new challenger. In a clearly written style Robert Carter aims to show the evolution of the ideas underpinning symmetry and group theory and to demonstrate the pivotal role of these ideas in relation to chemical problems of structure, bonding and spectroscopy. The core of the subject matter is presented in the first four chapters entitled, respectively, Fundamental Concepts, Representations of Groups, Techniques and Relationships for Chemical Applications, and Symmetry and Chemical Bonding; these span nearly half

the book. Projection operators are reserved for a later chapter on the representation of symmetry-adapted linear combinations, while the two concluding chapters treat vibrational spectroscopy and transition metal complexes. The most obvious comparison to be made is with Davidson's rather less ambitious but handy *Group Theory for Chemists* dating from 1991. Carter's book goes into considerably more depth than does Davidson's and is intellectually more satisfying; it also offers a more structured approach. It goes a long way towards its stated aim of bringing out the meaning and chemical significance carried by the mathematics of group theory without overdoing the mathematics itself. There are various appealing features, notably the adoption of a tabular method of reducing representations, as well as the use of group–subgroup relationships for dealing with infinite-order groups. Illustrations are bound to be important in any account of symmetry; the new book is not over-generous but the figures it does include are pertinent and workmanlike, while not inspired.

For all its virtues, the text is not without weaknesses. In places, the author's effort to be more rigorous has been at the expense of making the problem appear more difficult than it need be. For example, the burden of theory tends to mask the relative simplicity of working out the symmetries of vibrational modes. Similarly, the problem of combining the spin and orbital parts of a d^2 system to make the symmetry of the term arising from the e_g^2 configuration conform to the Pauli principle lacks context; in this particular connection, too, I cannot but regret the absence of any direct product tables in which antisymmetrised products are denoted. As a practising vibrational spectroscopist I found myself a little disappointed by the vibrational spectroscopy chapter. No effort is made to explain normal, internal or symmetry coordinates, and, although the normal modes of vibration of some simple molecules are portrayed in an appendix, there is no indication of how these might be derived. I am surprised that room has not been found for the symmetry-characterisation of bond-stretching modes; this, rather than the full vibrational characterisation, must be one of the most commonly applied criteria for appraising molecular symmetry. As a teaching primer the book would benefit from answers to the well conceived problems that appear at the end of each chapter, and from having some sort of bibliography making contact, say, with more rigorous treatments as well as literature highlighting the *other* side of chemical problems to which group theory is applicable (e.g. Ebsworth, Rankin and Cradock's book, *Structural Methods in Inorganic Chemistry).*

While falling short of my notional ideal, then, the book has much to commend it, and certainly deserves a place on the list of recommended reading for second- and third-year chemistry undergraduates; others for whom group theory has so far proved elusive are likely no less to profit from it.

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Application of Transition Metal Catalysts in Organic Synthesis, L. Brandsma, S.F. Vasilevsky and H.D. Verkruijsse, Springer Verlag, Berlin, 1997, pp. 335 + xix, DM 198, US$ 128, ISBN 3-540-62831-2

Anyone who has used the series of books written by Brandsma and collaborators will be very pleased to learn of the publication of a new volume which carries on the good work of this author. However, before extolling the virtues of this book I must make some critical comment on its rather general and misleading title. In the preface of the work, the authors note that their intention had been to cover a broader field of transition metal chemistry but that they felt that that was too ambitious a goal. Given the style of the book, I would agree with this decision, but feel that a more specific and informative title could and should have been used.

However, this is really my only criticism of what is an exceptionally useful manual, the primary function of which is to provide clear reproducible experimental procedures for carrying out copper-, palladium-, and nickel-catalysed coupling reactions. Ch. 1 starts with methods for the preparation of catalysts, ligands and reagents and, like the rest of the book, pays attention to detail. The section on Grignards includes critical evaluation of methods used and a discussion of commonly encountered problems that would be of considerable use to any synthetic chemistry group. Ch. 2 provides a summary of methods for the preparation of halogen-containing compounds and, given the synthetic importance of this group of compounds, this section is particularly welcome. Chs. 3, 4 and 5 cover various coupling reactions of alkynes, including aminoalkylation, oxidative dimerisation and diyne preparation. Ch. 6 is a very good chapter on copper-catalysed coupling of alkoxides with aryl and vinyl halides and the section on aromatic substitution methods is particularly informative. Ch. 7 describes copper-catalysed C–C bond formation including halide displacement, ring-opening of epoxides, and allylic and propargylic substitution reactions. Chs. 8 and 9 describe nickel catalysed iodo-dechlorination of sp^2 halides and cyanation of sp^2 halides and triflates, respectively. Ch. 10 covers coupling of sp^2 halides with acetylenes. This is a large and extremely informative section with numerous tables and