and reactivity (C.C. Cummins; 151 pages, 211 references), which begins by limiting the target complexes to those containing anionic ligands and almost entirely to homoleptic systems. The aim is 'to stimulate new exploration involving these complexes', and a comprehensive review of the literature is provided.

'Metal–carbohydrate complexes in solution' (J.-F. Verchère, S. Chapelle, F. Xin and D. C. Crans; 108 pages, 470 references) begins with a nice survey of the possible conformations of carbohydrates and the techniques for investigating their metal complexes, with caveats on the use of solid-state methods to deduce behaviour in solution. Then follows a systematic review of data, largely for complexes of vanadium, molybdenum and tungsten. It is shown that chelate complexes are usually formed, and the possible applications are given.

The volume finishes with a cumulative index to Volumes 1–47, listing titles of articles under their authors.

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Chemistry of Arsenic, Antimony and Bismuth

N. C. Norman (ed.)
Blackie Academic and Professional, London, 1998
xii + 483 pages. £109
ISBN 0-7514-0389-X

Moscow State University has the interesting custom of designating each year a specific element as their 'Element of the Year' and are working their way through the Periodic Table. So far they have arrived at arsenic as the 1998 element and it is an interesting coincidence that this year also marks the publication of Dr Norman's new book on arsenic and the two heavier Group 15 elements. The Group 15 elements are an intriguing set; they begin with two that are essential for life, only to be followed by arsenic, one of the best-known poisons which still claims lives either accidentally or by design, and antimony, which is really no better in this respect. The general public, however, knows neither the element nor its toxic properties. Finally there is a return to more benign properties with the final member, bismuth.

First of all the book is going to be useful in providing a good, up-to-date introduction to the chemistry—in the widest sense—of these three elements. As in most multi-author works, some aspects seem to have been overlooked and there are some inconsistencies in presentation, but they are not particularly serious. The publishers, however, have failed to match the contents with the presentation, which has a very old-fashioned look about it.

Chapter 1 by N. C. Norman and C. Carmalt provides an exceedingly good introduction to the three elements; however, in Table 1.1 the authors should have decided what units to use for cell dimensions, and I cannot believe that the reserves of antimony are as low as 44×10^{-6} tonnes. Chapter 2 (I. J. Polmear) on the metallurgy of the elements, seems a little out of place, but it also gives a listing—still rather small—of the uses for these elements. Clearly, the electronic properties of gallium arsenide and similar 3/5 species are becoming important and there are also possibilities for superconducting compositions.

The next three chapters by S. M. Godfrey, C. A. McAuliffe, A. G. Mackie and R. G. Pritchard, authors with long experience in Group 15 chemistry, cover 'Inorganic derivatives', 'Coordination chemistry and solution chemistry', and 'Organoarsenic and organoantimony compounds', respectively. The first of these provides good coverage of transient and stable binary species and time is spent describing methods for generating the hydrides used in the electronics industry. Binary compounds with the Group 16 and 17 elements are given full treatment, and there is a good description of the rather complex oxyanion behaviour of these elements. Chapter 4 is quite a mixture but the variation of Lewis acidity of the halides in the +3 oxidation state leading to an increasingly complex series of halogenoanions as the group is descended is well treated. There is, however, a curious diagram in Scheme 4.6, supposedly of $[Bi_2Br_{10}]^{4-}$, which shows an octahedral BiX_6 unit.

Chapter 5, on the organic derivatives of arsenic and antimony, does less than justice to this subject and the 76 pages devoted to the topic should be compared with the 61 pages on 'Organobismuth compounds' in Chapter 6. Chapter 5 begins with synthetic methods; the authors provide guidance to practising chemists by drawing particular attention to those methods which they consider either to give good yields or to make use of readily available reactants. The chapter does seem to be dominated by the use of these compounds as ligands and I would have liked to see wider coverage of, for example, low-coordination-number species, which are barely mentioned, and the problems of the stereochemistry at five-coordinate arsenic and antimony centres.

The chapter on organobismuth compounds (H. Suzuki and Y. Matano) provides a more systematic approach and anyone wishing for an introduction to the area could well start here; it also contains a good account of the organic synthetic uses of bismuth compounds. Dr Whitmire's 'Organotransition metal compounds with element to transition metal bonds' (Chapter 7) similarly provides an excellent introduction to this rather specialized and complicated area. All three Group 15 elements (E) readily form bonds to a good number of transition metals. Some of the compounds produced are fairly uncomplicated, for example when ER_3 molecules behave as straightforward electron pair donors, but reactions are generally much more complex, as in that between $Co_2(CO)_8$ and $(AsPh)_6$ where the product, $[Co_8(\mu_6\text{-As})(\mu_4\text{-AsPh})_2(CO)_{16}]$, contains not only bridging AsPh groups but dephenylated arsenic bridges as well. Reactions leading to the

stabilization of otherwise unstable E_2 and RE=ER species are also highlighted.

Readers of this journal might be interested in Chapter 8 on 'Environmental and medicinal chemistry', by J. Reglinski. This is a short contribution but deals with general environmental problems, and particularly ways in which arsenic is incorporated via arsenosugars, lipid arsenates etc. into living matter. Section 8.4 begins with the sentence 'The Group 15 elements have a rich if somewhat dubious history of their use as medicines prior to the turn of the century'. Indeed the medicinal uses of arsenic and antimony have been declining for obvious reasons since then, but claims are being made for antimony therapy proving useful in the treatment of some parasitic diseases where resistance has been developed to standard organic therapies. The final chapter, by H. Onishi, is concerned with analytical methods, ranging from bench-top gravimetric and volumetric methods to more sophisticated mass-spectrometric, neutron-activation and atomic-emission methods.

Price dictates that this is a book for libraries but it should be made widely available as a ready source of information on elements in which increasing numbers of chemists have interests.

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Mercury and its Effects on Environment and Biology

A. Sigel, H. Sigel (eds)
Marcel Dekker, New York, 1997
648 pages. $250
ISBN 0-8247-9828-7

This is the latest volume (Vol. 34) of the important *Metal Ions in Biological Systems* series edited by A. and H. Sigel. Mercury seems to be the longest-running metal in the toxic metals and metalloids saga; it is coming up to 30 years since the famous Wood *et al.* paper suggesting methylation of mercury by methyl cobalamin.

As there is much recent research in the mercury field, the appearance of this volume is welcome. The book concentrates on *where* the various forms of mercury exist (Chapters 2, 3, 4 and 5) and *how* the various processes of mercury biogeochemistry and environmental chemistry occur (Chapters 3, 7 and 8). The role of mercury in food chains and webs is covered in Chapters 9 and 10. The vital questions of toxicity are covered in detail in several chapters (Chapters 11–16). Newer work on genetic aspects is covered in three chapters (Chapters 17–19).

It can be seen that the book provides a well-balanced and comprehensive coverage of the environmental mercury picture as it is currently understood. Bearing this detailed and up-to-date picture in mind, it is a disappointment that so little space was allowed for a summary of the current analytical situation for mercury and methylmercury. There have been numerous recent developments in the analytical chemistry of mercury and, with this in mind, it would have been more proportionate to the rest of the book if the author of Chapter 1 had been permitted more room to describe in greater detail the analytical work he mentions.

The book is good value for money. In any case, all workers in the mercury area will want to have it.

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The Systematic Identification of Organic Compounds

Ralph L. Shriner, Christine K. F. Hermann, Terence C. Morrill, David Y. Curtin and Reynold C. Fuson
ISBN 0-471-59748-1 Wiley–Interscience, New York, 1998, 7th edn xiii + 669 pages. £27.50

This book updates the sixth edition published 18 years ago, and is dedicated to the memory of R. L. Shriner, the major force behind the first edition in 1935. It is presented in 11 chapters plus appendices and covers the identification of unknowns, the classification of compounds by solubility, spectroscopic methods, chemical tests for functional groups, and synthesis of derivatives, separation of mixtures, problem exercises, and information on the chemical literature. In this edition, attempts have been made to modernize the text, and the chemical tests and spectroscopic methods have been separated.

The introductory chapter aims to justify the need for qualitative analysis, and gives a few basic safety instructions regarding the handling of unknowns. Chapter 2 then sets out to describe the strategy involved in identifying an unknown, and the options available. Although it mentions the use of (for example) NMR, it outlines its usage at a very basic level. This may be satisfactory for the beginner but it can be misleading; the reader would benefit from further information indicating the powerful nature of this technique. Chapter 3 begins the initial examination of the compound, including melting-point determination and the use of a polarimeter, although the equipment referred to is dated. Chapter 4, on elemental analysis, and Chapter 5, on the classification of solubility, are followed by a chapter on spectroscopic methods. This is a basic, concise and clear guide and the reference tables are good. Chapter 7, on the tests for functional groups, gives detailed experimental procedures, and is followed by a related chapter on derivative preparation. Both have had clean-up procedures added to this edition. Chapter 9 contains some useful problem exercises. Standard separa-