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# Book reviews

## Supramolecular chemistry

J. W. Steed and J. L. Atwood
John Wiley & Sons Ltd, Chichester, 2000
xxvii + 745 pages. £29.95 (paperback)
ISBN 0-471-98791-3

This book is presented in ten chapters and 745 pages. It is designed as an introduction to supramolecular chemistry. The front cover of the cover is somewhat strange, depicting the Rosetta stone from the British Museum. This stone proved to be the key to understanding the ancient Egyptian writing of hieroglyphics. This book functions in much the same way, by unravelling and explaining the world of supramolecular chemistry. In short, this book is excellent. I have no doubt that it will prove itself to be one of the cornerstones of an undergraduate chemical education.

The book is extremely well written, the diagrams are clear and informative and the progression chosen to explain the topic is logical. The book contains up-to-date references to other key work in the area. A set of problems is included at the end of each chapter. Answers to the problems can be found at the web site www.ch.kcl.ac.uk/supramol/textbook.htm.

The book starts with an introduction to supramolecular chemistry and a definition of the subject. The role of the chelate and macrocyclic effects, preorganization and complementarity, thermodynamics and kinetic selectivity and host design are then presented. The other chapters of the book deal with (in order) the supramolecular chemistry of life, cation-binding hosts, binding of anions, binding of neutral molecules, crystal engineering, templates and self-assembly, molecular devices, biological mimics and liquid interfaces, liquid crystals and liquid clathrates. The authors have woven a very complex subject into manageable sections without losing the integrity of the subject. Students from a variety of chemistry, biology, materials science and polymer science backgrounds will find this book useful.

In the UK university system, the book would probably be most useful for final year undergraduates studying a course on supramolecular chemistry. Postgraduate students, however, will find the book an important read and a reference source for further study. This book is groundbreaking and will help to foster new courses at university level.

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## Technetium: chemistry and radiopharmaceutical applications

K. Schwochau
Wiley–VCH, 2000
xii + 446 pages. £115
ISBN 3-527-29496-1

Technetium ('artificial') is a man-made element, first made in 1937. There is no shortage of it today: a typical nuclear reactor in a power station produces about 10 kg of $^{99}$Tc per year from uranium fission. More important commercially than the long-lived isotope $^{99}$Tc (half-life $2 \times 10^5$ years) is the metastable isotope $^{99m}$Tc, a $\gamma$-emitter with a 6 h half-life. Over 80% of the radiopharmaceuticals used in a clinic are based on $^{99m}$Tc, and the proportion is increasing. Although the whole of Section B of the book is devoted to radiopharmaceuticals, it is only 50 pages long, the last chapter. Much of the chemistry described in the other chapters, however, is directly relevant to radiopharmaceuticals.

There is much clever chemistry going on in the radiopharmaceuticals area. The breakthrough in the late 1950s was the development of the portable $^{99m}$Tc generator in which the $^{99m}TcO_4^-$ is eluted from an aluminium oxide column loaded with $^{99}MoO_4^-$. The necessary redox and substitution chemistry must all then be done quickly in high yield in the hospital. By suitable choice of oxidation state and ligands, $^{99m}$Tc complexes can be synthesized that allow imaging of, for example, brain and heart perfusion, bone, the liver, kidney, and even specific cellular receptors.

Most of the book consists of Chapter 12 (208 pages), a comprehensive survey of compounds containing all the oxidation states from Tc(VII) to Tc(-1), including clusters and organometallic complexes. The weak $\beta$-radiation of $^{99}$Tc means that it can be handled easily in the laboratory without special precautions. There is good discussion of preparative and characterization methods and extensive tabulation of structural data, particularly for Tc(V) and the $(Tc{=}O)^{3+}$ core. The high stability of some Tc(I) complexes is remarkable (low-spin $d^6$), especially the octahedral hexakis(isonitrile) complexes used for diagnostic imaging and $[Tc(CO)_3(H_2O)_3]^+$ which shows promise as a $^{99m}$Tc-labelling agent.

Overall, this book is an excellent reference work for

anyone interested in the chemistry of technetium. It is well illustrated with structures and data tables, and comprehensive lists of references (over 1000 in all). It is clearly a book that all good chemistry libraries should buy.

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## Organic synthesis workbook

J. A. Gewert, J. Gorlitzer, S. Götze, J. Looft, P. Menningen, T. Nobel, H. Schirock and C. Wulff
Wiley–VCH, Weinheim, 2000
xii + 274 pages. £22.50 (paperback)
ISBN 3-527-30187-9

Intended primarily for use by postgraduates, although of benefit to a much wider audience, this is an excellent book. Sixteen recent total syntheses of natural products (allowing for one aglycone portion), some of which are alkaloids, others terpenes or macrocycles, but all carefully selected, are presented in the form of problems to be solved, in an order of more or less increasing complexity. Each synthesis is dealt with in the same format: a brief introduction outlining the significance of the compound and previous synthetic approaches (where applicable); the problem section (the overview) that comprises a sequence of steps in which some of the reagents or structures are omitted; a section entitled synthesis; a summary of the synthetic strategy; and lastly, a set of useful references that are cited within the body of the text.

In the overview section, the reader is invited to fill in the gaps. Each gap is discussed in the synthesis section that comprises a re-statement of the problem, followed by a section of tips, of increasing information and hinting towards the answer. One should then attempt the problem before looking at the third section, the solution. A discussion section is used in the relevant places to provide additional detail or background material of general importance. Having thus worked through all the steps (problems), one has considered the total synthesis of the target molecule.

The idea of using selected syntheses as a means of imparting both interest and understanding is not new, and was used to great effect in *Selected Organic Syntheses* (I. Fleming, Wiley, 1972) with which the present book has part of its format in common. In *Organic Synthesis Workbook*, the reader is confronted with how to perform key reactions, but is given useful tips for each problem. This is an effective way of helping one to reason towards the answer. In many cases, a good postgraduate will have some idea of the answer, and may well reflect: 'I should have known that', even when the answer is not completely obtained without recourse to the tips as prompts. In only a few cases are several steps conflated, thereby giving rise to too many possibilities to consider. At each stage along the synthetic pathway one is exposed to just the right amount of information, enabling a sound understanding to be gained in a short while. In this way, many essentials of modern organic synthesis are introduced with minimum effort, by seeing them in context; asymmetric reductions, epoxidations and dihydroxylations, together with modern carbon–carbon bond forming protocols, are but a few of the key reactions any of which could be relevant at technical interviews. The index proves most effective in locating key reagents, reactions and concepts, and one can then readily obtain greater detail by consulting the references provided. The brevity and clarity of style, and the clear layout all contribute to ready assimilation. Mechanisms are provided in a way that leads to a clear understanding of the major principles. As would be expected, issues of stereochemistry must be constantly addressed, but handling them is usually not a problem because of the clarity of the presentation. Any organic postgraduate student can gain much from this book, and should own a copy. The level of the problems is well pitched, with plenty to challenge the able postgraduate, although without a daunting complexity to which synthesis can be prone. For those seeking an understanding, rather than a detailed work of reference, this book succeeds admirably in explaining in context many important principles of contemporary organic synthesis. This book is reasonably priced and I recommend *Organic Synthesis Workbook* to you highly.

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## Modelling molecular structures

A. Hinchliffe 2nd edn.
John Wiley & Sons, 2000
xviii + 336 pages. £34.95 (paperback)
ISBN 0-471-48993-X

Is experimental chemistry old hat? Couldn't we — shouldn't we — be doing it all by computer nowadays? Well, up to a point: it all depends of course what you want to find out. For small molecular systems, there is no doubt that a very wide range of properties can now be computed better in both accuracy and precision than they can be measured. Moreover, the computations can give insight into the behaviour of selected electronic and vibrational states rarely visited by experiment and, indeed, into chemical species not readily accessible synthetically. With larger systems then, as usual, the bigger the canvas, the broader the brush that is required.

The basic theoretical principles underlying such