global development of bioinformatics. Many of the biological tools that form the key informatics infrastructure are freely available on the World Wide Web, and URLs are given throughout the text and citation lists. Each subject is critically reviewed, and while most chapters give an acceptable summary, several chapters are truly excellent in their even-handed treatment of their subject matter. These include, for example, the reviews of drug database screening by Stahl, Rarey, and Klebe, and of modeling of protein–protein and protein–DNA docking by Sternberg and Moont, and the truly eye-opening chapter by Thomas Werner describing the analysis of regulatory regions of genomes.

In contrast, some chapters are quite impenetrable, and although they will probably make useful reference sources for practising bioinformaticians, they may cause some headaches for the intended readership. Not enough attention has been given to the base-level knowledge required of the intended reader. For example, abbreviations and acronyms, (ORFs, SDP, *z*-score, SDS) and concepts (pseudogenes, frozen approximations, NP-hard and NP-complete, dynamic programming) are often introduced with little or no explanation. Indeed, the contributions of informatics and statistics to bioinformatics are given only a very cursory treatment. For example, hidden Markov models (HMMs), neural nets, and dynamic programming are introduced without explanation in several chapters, and although the appendix to Book 1 does attempt definitions, these are so superficial as to be of little instructive use.

What is the final impression that the two volumes have left with this reviewer? (who might be described as a practising cheminformatician). We now have the galleys of the book of life. We will soon have the first edition. The book will have little punctuation, and while we have some knowledge of where the punctuation may be, this knowledge is not complete. So the automated identification of genes within the genome is still uncertain. Even with the gene, the next jump from genome to protein is still very large. With structural genomics just beginning on its task of identifying all the possible protein folds, the prediction of protein structure from sequence is a very difficult task. While homology modeling can be successful if one can find good sequence homology between a protein of unknown structure and one that has been previously determined, a change of a single amino acid between two otherwise homologous proteins can cause major changes in binding affinity for common ligands. Homology models may never have sufficient resolution to critically guide drug design. Even with an experimentally determined protein structure (from X-ray crystallography or NMR spectroscopy), the jump from protein to potent ligand is also very large. The docking and scoring of ligand potency, either for small ligands or by the docking of a second protein to the target protein, is still a very inaccurate science. Even where a protein structure has been determined experimentally with high resolution, uncertainties in the structure itself (in atomic positions, presence of water molecules, the protonation state of ionizable amino acid side chains, the thermodynamics of drug receptor interactions within a particular active site, and the extent of induced fit) still make docking and scoring a very significant challenge. Finally, the leap from ligand to drug is also very large. This area of medicinal chemistry is hardly mentioned, and our understanding of the physicochemical properties governing absorption, distribution, metabolism, and elimination, not to mention toxicology, is still developing. We have a long way to go, but we are making significant progress in all these areas.

The aims of these two books are laudible, and I fully support the concept of the books, as a primer for scientists who may benefit from our current bioinformatics tools. They are definitely worth a read, although for several of the chapters two or three readings may be necessary. But, with the text of the book of life now in our hands, the disciplines of bioinformatics, cheminformatics, chemistry, and biology need to come together much more closely than this book suggests, or even appreciates, if we are to stand any chance of mapping a direct path from genome to drug.

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Organobismuth Chemistry. By *Hitomi Suzuki* and *Yoshihiro Matano*. Elsevier Science, Amsterdam 2001. 639 pp., hardcover $ 131.50.—ISBN 0-85404-637-2

Bismuth is the heaviest stable (namely nonradioactive) element of the Periodic System. This may be the reason why it remained in the background of awareness for many chemists. That is certainly not justified, as was already well known long before the appearance of the book *Organobismuth Chemistry*. The introduction to this book is alone sufficient evidence of that. It contains knowledge about the element bismuth in a very concentrated but nevertheless thoroughly informative presentation. This introduction could be used without hesitation as a basis for a lecture on the element bismuth. Everything important is presented briefly, starting with historical aspects, and continuing on to metallurgy and finally pharmaceutical applications.

The main theme of the book is, as the title states, the organic chemistry of bismuth. This is interpreted very broadly: it is taken to include $Bi(OR)_3$ and related compounds, as well as $BiCl_3$ arene complexes, thereby increasing the number of literature citations to more than 1600. There is the impression that the authors have tried to include every relevant original publication. I could not find any omissions, even in those chapters on topics with which I am especially familiar. On the other hand, I also detected gaps of my own knowledge there.

So the book is comprehensive, perhaps even to the extent of the Gmelin publications that have now ceased. It contains many preparative procedures, very much in the style of the Houben–Weyl works. They number about 150, so the book also provides an introduction for experiments. Physical data, including IR, MS, NMR, and UV spectral data, are collected together in tables, and here again the impression of completeness and accuracy of the numerical data is striking. There is clearly a demand for such comprehensive efforts, and if, as here, the result is a book that is easy to read in spite of the wealth of data, thus providing more than a pure reference book, then it is especially welcome.

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It seems to me that every chemistry library should have this book, especially those serving laboratories which might consider using bismuth organic compounds for organic synthesis.

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Metal Oxygen Clusters. The Surface and Catalytic Properties of Heteropoly Oxometalates. By *John B. Moffat*. Kluwer Academic Publishers, Dordrecht 2001. 320 pp., hardcover € 170.00.—ISBN 0-306-46507-8

Heteropolyoxometalates are of considerable interest as catalysts for acid–base and redox reactions, and consequently this field continues to be studied intensively. Thus the book *Metal Oxygen Clusters* by John B. Moffat deals with a subject that is certainly topical at this time. The work is divided into eleven chapters. Chapter 1 gives a short account of the historical development of research on oxometalates. Chapter 2 discusses the synthesis of these compounds, but without giving detailed information. Chapter 3 is concerned with the physical characterization of oxometalates, describing the various methods used, with the help of examples. However, it is surprising that there is no mention of such important methods as Raman spectroscopy and inductively coupled plasma (ICP) spectroscopy. The structure of oxometalates and their bulk properties are described in Chapter 4, then Chapter 5 deals at considerably greater length with how their stability is affected by temperature and pH. Oxometalates are often used in the form of supported catalysts, and Chapter 6 describes the preparation, characterization, and properties of such systems for a wide variety of support materials. Chapter 7 is concerned with microporosity, sorption, and diffusion in metal–oxygen clusters, and with cation exchange processes. Special attention is given to the origin of microporosity and its dependence on the nature of the counterion. Oxometalates possess acidic and redox properties, and accordingly Chapter 8 describes the study of their acidic properties by physical methods and reactivity tests. This chapter also contains a short section on redox properties. Two fairly long chapters are devoted to acid-catalyzed processes and oxidation reactions using oxometalates. The reactions discussed in Chapter 9 (acidic catalysis) are: conversion of methanol to hydrocarbons (MTG reaction), reactions of alcohols, conversion of alkanes into alkenes, alkylations and Friedel–Crafts reactions, ring enlargements, and ring contractions. Chapter 10 discusses oxidation reactions applied to alkanes, alkenes, methacrolein, and isobutyric acid. Chapter 11 concludes the book with a brief description of the use of oxometalates in environmentally relevant processes.

This book by J. B. Moffat gives a broad survey of the published work on oxometalates up to the beginning of year 2000. In a monograph dealing with a narrowly defined subject area the reader expects to find a critical evaluation of the published work, but unfortunately that is absent or only very limited here. Also none of the chapters ends with a summary or conclusions. Often there is a reference to other parts of the book, in a phrase such as "noted elsewhere", without giving a page or section number. There are instances of unnecessary repetition in the text or figures—for example, Figures 5.4, 5.5, and 5.6 are identical to Figures 3.1, 3.2, and 3.3 respectively. SI units are not always used. Energies are usually given in kcal mol^{-1}, and only occasionally in the preferred unit kJ mol^{-1}. Many other lapses could be listed. For example, in Section 6.1.2 we read "…TiO_2 in the form of titania…", and the catalytic activities observed for different catalysts are compared without specifying the quantities used and how they were normalized. In the stoichiometric equations on page 170:

$$H_2(g) \rightarrow 2H^+(ads)$$

and on page 171:

$$D_2(g) + H^+(s) \rightarrow 2D^+(ads)$$
$$+ H^+(s) \rightarrow HD(g) + D(s)$$

the charge balance is incorrect. Also the book is unfortunately not free of printing errors, of which I give here just one example:

$$D_2(g) + 2H(s) \rightleftharpoons H_2(g) + 2C(s).$$

The quality of the figures is not up to modern standards. The labeling is not consistent (upper and lower cases mixed), and sometimes different symbols are used for the same quantity, for example the pore radius in Figures 7.5 to 7.8. The list of contents is quite inadequate.

However, despite these shortcomings the book can be recommended as a good survey of the literature in the area of oxometalates research. It is not very suitable for newcomers to the field.

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Extraction of Metals from Soils and Waters. By *D. Max Roundhill*. (Series: Modern Inorganic Chemistry.) Kluwer Academic/Plenum Publishers, New York 2001. 375 pp., hardcover € 127.00.—ISBN 0-306-46722-4

With the publication of this book on the extraction of metals from soils and waters, at last we now have a work which reviews the current state of research and development in this area from the viewpoint of inorganic and coordination chemistry. This third book by Max Roundhill in the *Modern Inorganic Chemistry* series provides a thoroughly competent treatment which will serve the needs of both researchers and users of the methods. As well as having a logical and systematic structure, the text is written in an easily readable style so that the contents can be assimilated quickly. The clear arrangement of the material according to the different methods and heavy metals will ensure that the above

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