context of the whole series. What I had expected when hearing about the series was a standard collection of reviews on the usual bio-inorganic favourites, e.g. iron–sulphur proteins, copper proteins, cytochromes etc. Instead, the series is an exciting, eclectic (in places even eccentric), mix of articles often covering less well-known systems such as the biochemistry of tungsten. This makes each of the three volumes refreshingly different. I am sure this must have been the intention of the editors and it is interesting that, apart from a few notable exceptions, most contributions come from European laboratories (for the Eurosceptic readers I include the UK in this).

So, this is a good series overall — but what about Volume 90? Well, this volume has the sub-title *Redox Centres* — a label which is not particularly useful for this collection of six articles. It kicks off with a review of the manganese site in the photosynthetic oxygen-evolving complex. The structural characterization of this complex is described in detail with the emphasis on results from X-ray absorption spectroscopy and electron paramagnetic resonance. However, as we discover, the precise structure of the oxygen-evolving complex still tantalizes us with its elusiveness. So, 'plenty of scope for future work' is the take-home-message from this article.

We then move on to a rather odd review which focuses on blue copper proteins and blue copper oxidases, with the first X-ray structure of a vanadium-containing enzyme bolted onto the end. The vanadium enzyme in question is chloroperoxidase (from *Curvularia inaequalis*, a fungus), which oxidizes halides to hypohalous acids. Although this enzyme is indeed of great interest it has little, or nothing, to do with the bulk of the review on copper-containing proteins. Still, these little eccentricities are what makes this series so nice. The main part of the review is a workmanlike description of the current state-of-play in the area of the small blue copper proteins and some multi-copper oxidases.

The next article presents a particularly well-illustrated, in-depth, description of the xanthine oxidase family of molybdoenzymes. The X-ray structure of aldehyde oxidoreductase from *Desulfovibrio gigas* (the first structure of such a molybdo-oxotransferase) is used as a model to aid the interpretation of the huge amount of research data available for xanthine oxidase and related molybdo-enzymes. Such structural insights have allowed major advancements in our understanding of these intriguing enzymes.

From molybdenum, we move to nickel and iron in the form of the [NiFe] hydrogenases. The structural and functional properties of these enzymes are described in another well-illustrated review. Anyone interested in biological electron transfer will find the possible electron-transfer route, from the Fe/Ni centre through three iron–sulphur clusters to the surface of the protein, particularly beautiful. The article certainly does justice to these fascinating enzymes which catalyse the reversible two-electron oxidation of hydrogen, a reaction which is at once both simple and complex.

The next review revisits an old favourite — iron–sulphur proteins — but with a new twist since this article focuses on how coordination sphere and protein environment control the functional properties of iron–sulphur clusters. The review contains a wealth of reduction potential data from a large number of iron–sulphur proteins. The variation of these reduction potentials is analysed in the context of the protein environment. In the case of the high-potential iron proteins (HiPIPs), for example, there is a rather nice correlation between the unit charge of the protein and the reduction potential, suggesting that the electrostatic nature of the protein is the main determinant of $E°$ in these proteins. This is only one of many other interesting insights into iron–sulphur proteins in what will prove a useful article to researchers in the field.

The volume ends with a review of the bio-inorganic chemistry of tungtsen. Much of the chemistry and just about all of the biology of tungsten are surveyed in this interesting report. It engenders a feeling of excitement over the prospects for future research into the biology of tungsten: how is tungsten acquired, transported, stored and incorporated into enzymes? Finally, for the wine connoisseur, we are informed that a bottle of wine accounts for one-tenth of our daily requirement of molybdenum and that there is about the same amount of tungsten also present. An amusing way to end the series and a great excuse to drink more.

I conclude by recommending this and the other two volumes of this stimulating series to all of you who want to look at biological inorganic chemistry from a slightly different perspective than usual.

STEPHEN K. CHAPMAN
University of Edinburgh

Transition Metal Oxides: Structure, Properties and Synthesis of Ceramic Oxides
C. N. R. Rao and B. Raveau
2nd edn. Wiley–VCH, New York and Weinheim, 1998
xi + 373 pages. £80
ISBN 0-471-18971-5

This is an up-dated and extended version of a very well-received book first published in 1995. The distinguished authors, Professor Rao from the Indian Institute of Science at Bangalore and Professor Raveau from the French Centre des Matriaux at Caen, note that the intense world-wide study of transition-metal oxides, their rapidly increasing range of applications and some important developments in the last few years combine to make a new version necessary.

The first and longest section (224 pages) gives a detailed survey of structural types. Although it begins with binary compounds, it soon enters the much more difficult realm of tertiary, quaternary and even quinary oxides, many of which exist as defect or distorted structures. These are illustrated by a large number of diagrams, often in terms of arrays of linked polyhedra which, for the non-specialist, demand a good deal of careful study! Much attention is naturally given to three-dimensional structures and to superconducting cuprates, but one can also find reduced-dimensional arrangements such as pillared, ladder, lamellar and tunnel structures of varied compositions. The amount of detailed information available here reflects the great recent advances in X-ray crystallography and high-resolution electron microscopy.

Section 2 (94 pages) deals with properties and phenomena, and provides a very clear insight into the attractions which these compounds hold, not only for chemists but also for physicists, materials scientists and engineers generally. Here we find a vast range of electronic and magnetic properties, including insulating, semiconducting, metallic and superconducting behaviour as well as dia-, para-, superpara-, ferro-, antiferro- and ferri-magnetic, ferroelectric, giant magnetoresistance and electro-optic (but not non-linear optical) properties. These often show marked dependence on temperature and pressure. Many technological applications can take advantage of this rich behaviour, some examples being data storage devices, magnets, dielectric materials, fast ion conductors, catalysts and sensors.

Finally, there is a section devoted to synthesis. Besides high-temperature methods for bulk materials, some account is given of sol–gel and other low-temperature solution methods (so-called *chemie douce*), chemical vapour transport (but not chemical vapour deposition) and molecular beam epitaxy. For organometallic chemists, this excellent account of properties and applications could sharpen their perception of transition-metal oxides and enthuse them to develop new applicable metalorganic precursors for these valuable materials.

B. J. AYLETT
Queen Mary & Westfield College, University of London

Fundamentals of General, Organic and Biological Chemistry
John R. Holum
6th edition. John Wiley, New York, 1998
800 pages. £23.95
ISBN 0-471-17574-9

This book is aimed at North American students taking Life Sciences at University and assumes little prior knowledge of chemistry. It is one of a number of texts written by Dr Holum which are clearly successful in the States, and is the sixth edition since its original publication in 1978. With the changes to GCSE and A-levels in the English and Welsh educational systems and the greater proportion of young adults entering university, such textbooks become more relevant to chemistry courses for students in the Life Sciences in British Universities.

The text is written in a colloquial style and addresses the student directly. The first chapter is an introduction to the methods of science and to the basic ideas of measurement which should all be familiar to British students. It is lavishly illustrated, as is the rest of the book, and ends in a chapter summary followed by review exercises. There are worked examples throughout the book which usefully analyse the problem for the student before providing the solution. The margins contain further explanations or extensions of materials discussed in the body of the text. Most of these seem useful but some add very little to the text or appear to expect the reader to lack a grasp of the English language. Special topics, now called Interaction Units, are dotted about in an effort to show the student the relevance of chemistry to their main interest. The sequence of material is, from a traditional viewpoint, often unusual; the mole, for example, is introduced in Chapter 5 after a discussion of electron configuration in Chapter 3. The physical chemistry needed in a one-year course for biologists is all adequately covered and the student can readily find topics of interest, for example dialysis and the bloodstream in Chapter 7, which connect the chemistry in a meaningful way to biological problems.

The organic chemistry has been reduced in this edition but a completely adequate cover is provided. The author is clearly familiar with the problems that students have when starting this subject and although he initially uses square planar formulae he illustrates very well how these can confuse the students into formulating non-existent isomers. A problem with trying to be relevant does arise here, however, in that numerous biologically important molecules are drawn without any stereochemistry being shown. For example, the formula of cholesterol drawn in this way (p. 343) thus fails to indicate the importance of the unique three-dimensional structure of the molecule. The representations of glucose and fructose (p. 429) are meaningless, as is the aside in the margin. Since these are only being used as examples of compounds with carbonyl and hydroxyl groups, giving the correct stereochemical structure would surely not confuse the student. The arrow 'mechanisms' in this chapter are also incorrect and the 'arrows' would be better removed to leave just the equilibria. The carbohydrates are, in fact, later described with their correct stereochemistry but the steroids remain as unresolved isomers.

The last four chapters are biochemical. There are a number of appendices explaining mathematical concepts, providing nomenclature rules for inorganic compounds, giving three organic mechanisms with the correct 'arrows', and providing answers for the exercises in the text. There is a substantial index, which includes mad cow disease!

Altogether, this text provides a comprehensive coverage of the chemistry likely to be taught to biology students in a first-year course at university. It provides material found in A-level courses and is thus valuable for