

of the lesser Victorian poets, and of William McGonagle in particular, for it involves the same sense of period, of a mannered bygone age linked with an incredulity that such offerings were meant to be taken seriously. But let us consider the facts. It appears that an English edition of this book was first published in 1974 and subsequently this was 'thoroughly revised' to give rise to a second edition in 1977 from which the present translation was prepared for publication in 1979. The text is aimed at undergraduate students, but if the translator knew anything about the British educational system, he would have converted the units to SI. Stresses are given in a variety of CGS units.

As much of the underlying basis of heat treatment of alloys is to produce supersaturated solid solutions and then to decompose them in a controlled manner, it might reasonably be expected that a translator would have knowledge of the major technical terms related to the text he is translating. But no – supersaturated appears as 'over-saturated' whilst there is a widely used phrase 'surplus phases', the meaning of which is far from clear. *In situ* transformations are described as 'on the spot' transformations and weld beads have become 'weld seams'. One should not be too hard on an author for infelicities of his translator, but the terms used by Mr Weinstein could leave a young British student somewhat perplexed.

The study of physical metallurgy and its relation to heat treatment requires a detailed knowledge of the origins of microstructure and the factors influencing microstructural change linked to an understanding of the relationship between microstructure and mechanical properties.

Professor Lakhtin does not have a grasp of these topics. There are eleven electron micrographs; two look as though they are from thin foils and the remainder are from replicas, but the captions would not help those wishing to understand what is being illustrated. There are no scanning micrographs. It is stated that the book deals with the mechanical properties of alloys and up-to-date concepts of structural strength and failure. The majority of these concepts have been developed during the last twenty years from the observations made with various electron optical instruments, but it seems that the author has ignored much of this work. As just one example, stacking faults and stacking-fault energy are not even mentioned.

A British student who produced answers in his final examinations to the standard questions on the structure and properties of martensite, on the tempering of carbon steel and the relationship between structure and properties of solution-treated, quenched and aged Al-4% Cu alloys, based solely on knowledge gleaned from Professor Lakhtin's book, would not merit a classified Honours degree. A generous external examiner might just agree to an 'Ordinary' on the grounds that at least the student had read something. But the poor student would know very little about secondary hardening in alloy steels – the explanation given runs to three lines, and is wrong. Low-temperature temper embrittlement (blue brittleness) is attributed to 'the development of a three-dimensionally stressed state obtained in non-uniform decomposition of martensite'. It is difficult to know what this means – a masterpiece of metallurgical gobbledegook – but it is far removed from the views expressed by modern metallurgists. The explanation given for high-temperature temper embrittlement makes no reference to the extensive work carried out over the last fifteen years on Auger spectroscopy. The definition of overheating is that put

forward by Heyn in 1902 and this was found to be in error during extensive work in the 1930's. Burning is dismissed as being solely due to oxide-film formation and no reference is made to the work of Stead in 1915 who showed that phosphorus was partially responsible. The more recent studies showing the formation of a sulphide eutectic in a phosphorus-rich liquid region at the austenite grain boundaries have been completely overlooked.

There are lessons to be learnt from this book. The author, after paying tribute in the *Introduction* to the work of the renowned crystallographers von Laue, Bragg, Westgren and Phragmén, gives a bibliography at the end in which all but three of the many authors mentioned are Russian.

By ignoring work in Western Europe and the USA, the author has clearly got himself into difficulties. Are there areas of science and engineering where Western authors, through ignoring Russian contributions, could be equally guilty of misleading their readers and perhaps whole generations of students about the extent of knowledge?

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**Molecular interactions and activity in proteins.** Edited by RUTH PORTER and DAVID FITZSIMONS. Pp. viii + 279. Amsterdam, Oxford, New York: Excerpta Medica, 1978. Price US \$28.50, Dfl 64.00.

This volume is the proceedings of a symposium of the same title held in December, 1977, at the Ciba Foundation in London. The term symposium derives from the Greek tradition of drinking bouts laced with intellectual discussion – or *vice versa*. Although I wouldn't deny that elements of this ancient rite prevailed, these proceedings are more reminiscent of the modern American tradition of the 'pot-luck supper' in which a very tasty assortment of uncorrelated offerings are presented by each of the attendees and lively critical comments are then passed between the contributors.

Despite the fact that several notable potential contributors were absent and over half of the contributions were from England, the 24 participants – all outstanding scientists – presented a well balanced variety of experimental and conceptual approaches to the subject. Crystallography was well represented with a plurality of 30%. Applications of NMR, EPR and various optical techniques were reported and discussed, including three recent additions to the armory of protein probes: spin echo Fourier transform NMR which increases the sensitivity to local conformational changes; two-dimensional representation of NMR spectra which semi-orthogonalizes the display of multiplet fine structure and chemical shifts; and perturbed correlation of  $\gamma$  emission from radioactive metallic ligands – a technique which is purported to solve the problem of comparing dynamic information from molecules in viscous solution and in crystals. Theoretical analysis of protein stability and a strong representation in physical organic chemistry rounded out the program. If there was one regrettable omission it was the absence of any discussion of cryoenzymology and low-temperature crystallographic studies.

Fortunately, the symposium was a masterpiece of disorganization. I say fortunately because any effort to treat such a massive topic comprehensively would have been hopelessly superficial and an attempt to treat a particular biochemical phenomenon would likely have resulted in the typically boring and parochial 'update' of interest only to the specialist. The participants simply presented what they considered to be interesting and relevant with no apparent consistency of format, content or style. For example, there was a comprehensive (35 pages plus 13 pages of discussion), ponderously detailed and highly informative account of the physical and chemical properties of lysozyme which summarized a long, well planned siege by the combined X-ray and NMR forces of Oxford on this little 14 000 dalton molecule. This was immediately followed by a short (5 pages) EPR study of the putative free radical mechanism of ribonucleotide reductase, a 160 000 dalton molecule for which there are no hard three-dimensional data.

Whereas the formal presentations vary in content and style to the point of distraction, the discussions which follow are uniformly lively, articulate, well edited and referenced, and very interesting. These discussions are the strength of the volume. Issues were raised and debated which represent many of the most critical problems that face molecular biophysics and biochemistry. Lipscomb set the tone for these discussions in the very first paper on model systems by trying valiantly to correlate the intuitive structural notions of enzymology with the hard numbers for the energetic and kinetic constants of catalysis. Thus glib clichés about 'conformational change', 'disorder', and other all-purpose caveats were poorly tolerated in favor of chemically meaningful statements. Concern was focused especially on a more precise understanding of conformational flexibility, leading to a constructive discussion on how one can use X-ray crystallography, NMR and other spectral tools in a complementary way to describe more accurately the dynamic aspects of molecular structure. There was a notable re-emergence of 'compactness' and thus of volume and surface as important parameters to exploit theoretically and experimentally in understanding stability in proteins.

On completing this volume one is left with the optimistic feeling that we have not yet begun to saturate our capacity to understand the structure and behavior of macromolecules and their aggregates. We have made good strides in beginning to extract the microscopic rules of the game but the global generalizations (if any) are yet to be realized. Most importantly we are beginning to define the problems in precise enough terms to understand the limits of our experimental techniques and what we ought to do next.

In order to read this book one requires a certain familiarity with the principles of protein structure and function; therefore this book is not for persons first entering the field – indeed, the neophyte will be discouraged if not irritated by the chaotic format. However, it should be read by serious students and practitioners of molecular structural studies in biology, crystallographers very much included.

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### **Coordination chemistry of macrocyclic compounds.**

Edited by G. A. MELSON. Pp. xiii + 664. New York and London: Plenum Press, 1979. Price US \$49.50.

This is a major book on the coordination chemistry of macrocyclic compounds written by and for chemists. Because X-ray crystal structure analysis is one of the most important techniques used in the investigation of the compounds and their complexes, the results are described in several of the chapters.

Familiar examples of macrocyclic complexes are the porphyrin rings in haem and chlorophyll and the corrin rings in vitamin B<sub>12</sub>. These biologically important macromolecules have in common a macrocyclic ring containing four donor nitrogen atoms complexed to a cation of radius less than 0.8 Å. Compounds, natural and synthetic, with four nitrogen donors have been investigated most extensively and, for the purpose of this review, I shall call them type 1. Macrocyclic rings do exist with other kinds and numbers of donor atoms; complexes of such compounds with transition-metal cations I refer to as type 2 and with other cations, such as alkali metals, as type 3.

In his introduction the editor, G. A. Melson, explains that each chapter is intended to stand alone so some necessary duplication is to be tolerated. This policy has resulted in a few inconsistencies. His intention that each chapter should provide a collection and correlation of a great deal of information has been realized. Most chapters contain extensive tables packed with information; these show what comparisons are available and also, frustratingly, what are not. The authors have been allowed enough space to develop their themes properly so that the chapters are readable as well as being valuable works of reference. The editor has suggested and illustrated a numbering scheme and nomenclature for monocyclic compounds, but has allowed the authors to retain the names in the current literature.

Apart from the last one, the chapters reflect the division of effort between different laboratories and particularly the dominance of compounds of type 1. For example, they occupy 67 of Melson's 116 page chapter on synthesis.

There are two chapters by L. J. Boucher exclusively on type 1, the phthalocyanins and the porphyrins; each has a small amount on the structural aspects. Types 1 and 2 also provide the subject matter for ligand-field spectra and magnetic properties (F. L. Urbach), for chemical reactivity (J. F. Endicott and B. Durham), and for a survey of structures by N. F. Curtis.

In this survey Curtis has divided the compounds into 11 classes for each of which he discusses the conformation, including the effect of substituents, the metal–donor bond distance (in pm) and the chelate angles; a listing of individual structures in each class follows. These listings show the formula, the daunting systematic name and Melson's suggested name for the macrocycle. For each crystal structure containing this macrocycle, the *R* value and number of observations, with a star rating for completeness of the original publication, is given with a brief description which may include bond lengths (to the nearest pm averaged over chemically equivalent ones), coordination geometry and ligand conformation. Because several chelate rings are formed on complexation, the possible combinations of conformations are formidable, but those formed appear to