

Tectonics

The Dynamic Earth. By Peter J. Wyllie. Pp. xiv+416. (Wiley: New York and London, January 1972.) £8.20.

THE showing on BBC Television recently of a programme on "The Restless Earth" has drawn public attention in Britain to the exciting story of the revolution in the sciences of the solid Earth which has occurred during the past five years. Professor Wyllie was organizing at the University of Chicago during this period a first year graduate course aimed at giving students "a bird's eye review of geology, and a global geophysical framework within which they could locate their specialized research topics in mineralogy, petrology, or geochemistry". The book under review is based on this course and incorporates much material and many ideas generated by the new global tectonics up to the autumn of 1970, by which time the International Upper Mantle Project (which had stimulated so much interest in global problems) was about to be succeeded by the International Geodynamics Project. The volume and complexity of the intricately related phenomena (physical, chemical and biological) which are the subjects of study in the Earth sciences are such that it is still far too early to look for a completely unified and authoritative treatment of even one branch of the science (such as the physico-chemical aspects of the Earth's development). Professor Wyllie has successfully dealt with this problem by presenting synopses of the data and ideas of key protagonists in the developing story of the new tectonics. This gives the book considerable value in a period of rapid change. As would be expected from an author whose own research interests lie especially in experimental petrology, the book is weightier in the petrological fields to which four out of the 15 chapters are devoted. The chapter on magma generation is thought-provoking. The emphases of the book make it particularly useful to those who are not petrologists, and especially to solid earth geophysicists.

S. A. F. MURRELL

Quantum Chemistry

Semi-empirical Self-consistent-field Molecular-orbital Theory of Molecules. By J. N. Murrell and A. J. Harget. Pp. x+180. (Wiley: New York and London, January 1972.) £4.50.

THE purpose of this book is to introduce the non-specialist to recent semi-empirical methods of calculating molecular wave functions and properties. It is

addressed primarily to the experimentalist who wishes to employ quantum mechanics as an interpretive and predictive tool.

The authors aim to guide the consumer through the many products available (ZDO-SCF, CNDO, MINDO, and so on) and to give him a general awareness of underlying principles and approximations. This they do with considerable success. Wisely, they have avoided the *ab initio* methods which require the most powerful computing facilities and the most discriminating application: experimental chemistry is usually concerned more with concepts than with precise numerical values, and the simple schemes developed by Hückel, Coulson and Longuet-Higgins, Dewar, Pople, and others still serve to introduce such concepts and give them semi-quantitative substance, with a minimum of mathematical analysis and arithmetic effort.

After a brief review of Hückel theory and its redevelopment in semi-empirical self-consistent form, using a zero differential overlap approximation, the authors give a long and useful survey of the essentially similar approximation methods now widely used in all-valence-electron calculations. The literature is well covered and much attention is given to the many prescriptions for choosing parameter values. The remainder of the book (more than half) is concerned with applications to chemical reactivity and related topics, and to the general area of magnetic resonance spectroscopy—a welcome shift of emphasis from valence theory *per se*.

It is easy to find fault with a book which aims to present difficult and often controversial material, from a broad and developing area, to a wide and non-specialist readership: in some places the text inevitably reads like an annual report, lacking in critical appraisal; in others, oversimplified or fallacious arguments are presented without qualification, and jargon without explanation. But in spite of such blemishes the book succeeds in providing a compact introduction to semi-empirical methods. It should be prescribed reading for any chemist who wishes to operate quantum chemistry computer programs with a reasonable degree of understanding, and is a welcome addition to the literature.

R. MCWEENY

Preservation of Art

The Conservation of Antiquities and Works of Art: Treatment, Repair and Restoration. By H. J. Plenderleith and A. E. A. Werner. Second edition. Pp. xix+394+46 plates. (Oxford University: New York and London, March 1972.) £6.50.

THE first edition of this book appeared in 1956 under the authorship of Dr Plenderleith. In this revision he has been joined by Dr Werner, the present Keeper of the British Museum Research Laboratory and his successor to that post. The book therefore represents the code of practice of that laboratory and the choice of methods for inclusion—and examples of their use—reflects this.

As with the previous edition, the conservation of most materials used in antiquity, and in works of art, is dealt with in three main sections: "Organic Materials"; "Metals"; "Siliceous and Related Materials". There are some omissions. For example there is no reference to the conservation and lifting of Roman pavements or the reconstruction of Roman wall plaster.

The need for this new edition is a consequence of the developing nature of the subject. But, although it is said in the preface that the book has been partly rewritten, much of the text is familiar. The overall length has increased from 375 to 394 pages. New plates have been added, an approximately equal number of old ones retained and the overall total reduced in number. With the changing value of money the price has nearly trebled.

The revision reflects the introduction of new materials used in consolidation, new methods (for example consolidative reduction in the treatment of corroded silver and lead, or benzotriazole in the treatment of bronze disease) and new items of equipment.

Lack of change in some sections underlines the well-established values of certain procedures. The section dealing with waterlogged wood, however, illustrates that there is still a need for improvement in some aspects of conservation. Thus, although the introduction of the polyethylene glycol method has solved some problems, that of how to deal with large timbers still exists and the authors are forced to recommend wrapping in damp sacking followed by prolonged slow drying.

One aspect which might be given more emphasis and development in future editions is that of the collection of the associated evidence preserved in the corrosion products of excavated objects (that is, textile, wood, leather, insect remains, and so on); an activity which must precede treatment of the corrosion products. Also the statement that "only in rare cases can radiographic methods of examination be considered essential" does less than justice to a much-used method of exploring objects before conservation.

But these are quibbles and do not detract from what was and will remain a solid work of reference which carries an impeccable stamp of authority as befits its authorship. JOHN MUSTY