High performance liquid chromatography

Applications of High Performance Liquid Chromatography. By A. Pryde and M. T. Gilbert. Pp. 255. (Chapman and Hall: London, 1979.) £10.50.

THE authors of all compilations of the applications of any analytical chemical technique have to contend with two basic problems. In the first place only a very small part of the text will be of direct interest to any particular reader, and secondly in the case of any rapidly developing method such as high performance liquid chromatography (HPLC), there is a danger that much of the described methodology will be outdated even during the time required for publication.

The present authors have skilfully avoided both these pitfalls, the first by confining their main coverage to three fields of wide general interest—pharmaceutical analysis, biochemical analysis and methods for monitoring environmental pollution. Some other miscellaneous topics are also treated briefly. The second problem—of current relevance—has been met by providing a very complete review of the literature up to Spring, 1977. Publication delays being what they are at present, this must be considered very good.

A very short but good summary of the relevant theory, a similarly brief account of the currently available instrumentation, and a more extended and valuable section on the practice and principal modes of operation of HPLC lead into the major sections of the book.

Within the selected topics the coverage provided is excellent. For example, the 48 pages devoted to pharmaceutical analysis includes most of the classes of drugs now in general use, from antibiotics to diuretics (including a section on analysis for drugs of abuse). In many cases examples of methods of HPLC analysis for the drug metabolites are included.

The major 61-page section on applications of HPLC to biochemical analysis is particularly thorough, and includes sub-sections on lipids (including steroids and prostaglandins), polycarboxylic acids of metabolic importance, carbohydrates, biogenic amines, amino acids and proteins, nucleic acid derivatives porphyrins, and the common vitamins. It is very encouraging to find some space devoted to HPLC of proteins, as in my view the HPLC of biological macromolecules has lagged behind the much easier HPLC of small molecules, many of which can readily be fractionated by easier (and much cheaper) methods. The intrinsically high resolution of HPLC methods should be particularly valuable for the separation of large nucleic acid and protein fragments (or even subunits) which are required for the sequencing of the intact molecules.

The brief sections on applications of HPLC to environmental monitoring and various miscellaneous separations, including stereoisomers, provide adequate coverage for their purpose.

The book concludes with a series of appendices listing in considerable detail various types of packings for HPLC columns, and finally with a very useful specific index of compounds mentioned in the text, which greatly enhances its value as a reference book. The scope of this very useful book is illustrated by the 876 quoted references, mostly subsequent to 1970. The production of the book is excellent at its price, and there are very few misprints, although I found the use of the word "colourimetric" throughout the book mildly irritating.

C. J. O. R. Morris

C. J. O. R. Morris is Emeritus Professor of Experimental Biochemistry, formerly at the London Hospital Medical College and Queen Mary College, University of London, UK.

Molecular photoelectron spectroscopy

Photoelectron Spectroscopy and Molecular Orbital Theory. By R. E. Ballard. Pp.192. (Adam Hilger: Bristol, 1978.) £18.

THE author of this book has appreciated the value of molecular photoelectron spectroscopy as a teaching aid in chemistry. Other books on the subject have tended to emphasise its contribution to the advancement of knowldege and have been directed primarily at researchers. He recalls the late Professor C. A. Coulson's remark about the impact of photoelectron spectroscopy: "The single result of most significance is the complete vindication of the molecular orbital description of a molecule". Molecular orbital theory is taught throughout university chemistry schools, sometimes with the clarity which the late Professor Coulson used to demonstrate, all too often, however, as a beautiful mathematical theory; that in some ways is good for the undergraduates to master, but which many find sterile because of an over-emphasis on exactitude. The aim of the present book clearly is to demonstrate that photoelectron spectroscopy and especially helium I photoelectron spectra of vapours have an important part to play in introducing undergraduates rather painlessly to some of the essential concepts of molecular orbital theory.

In order presumably not to overburden the student, a number of topics which a specialist would think essential have been omitted; notably no discussion is given of the interpretation of spectra based upon ionic states, to which reference must always ultimately be made. The author is content to emphasise only the relationship between occupied orbitals and the bands in the photoelectron spectra. This is attempted by assembling the spectra for a rather limited range of simple molecules falling into groups of increasing complexity and then discussing these in some detail. These comparative chapters are preceded by a more general introduction to the necessary molecular orbital concepts. Some use has been made in the comparative chapters of the computer-generated drawings of Jorgensen and Salem (*The Organic Chemists' Book of Orbitals*, Academic: New York, 1973) to provide an insight into the geometrical factors which are often implicit in the details of the photoelectron spectra. This is often a most revealing juxtaposition and the reviewer feels that even more use could have been made of this to advantage. The detailed comparisons are quite restricted in their coverage, ranging from diatomics, through triatomics, molecules related to ethylene, and some tetrahedral and octahedral molecules. Within these groupings are, however, to be found a number of examples of substances whose electronic structure will have been a puzzle at one time or another to most chemistry undergraduates.

The importance of the finer detail in the spectra is not treated in depth. The section on vibrational fine structure is perhaps less well illustrated in certain respects than other areas, both with regard to selection of examples and more particularly the quality of reproduction of some of the spectra. In this area in particular spectral resolution and the fineness of detail which can be read into many spectra are of fundamental importance; their proper discussion requires both well reproduced examples and a proper treatment of the concept of the ionic state manifold, which, as remarked above, is a significant omission.

D. W. Turner

D. W. Turner is Reader in the Physical Chemistry Laboratory, University of Oxford, UK.