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Book review

Two-Dimensional NMR Methods for Establishing Molecular Connectivity; A Chemist's Guide to Experiment Selection, Performance and Interpretation, Gary E. Martin and Andrew S. Zektzer, VCH Publishers, 1988, xviii + 508 pages, ISBN 0-89573-703-5.

The range of new techniques available in two-dimensional NMR spectroscopy has been greatly extended in recent years, and to the novice, the acronyms alone can prove bewildering. This book is intended as a guide for the confused, particularly in the matter of choosing the appropriate technique for a particular problem.

Chapter 1 of the book is an introduction to two dimensional techniques, and also discusses the methods for the presentation of the data. It concludes with a discussion of pulse width calibration, and the use of specialised pulses. Although the specific mathematical discussion is limited, it is not easy going for the mathematically faint of heart, as many assumptions as to the reader's competence are made. Chapter 2, of about 100 pages, deals with the important problem of establishing proton connectivity. In this area, the COSY experiment has revolutionised the assignment of complex spectra. The variants of the technique are discussed in detail, with multiple quantum filtered experiments treated as a separate category. The second half of the chapter deals with "alternative" quantum methods for establishing connectivity. Most of the examples chosen to illustrate the techniques are drawn from natural product chemistry. The guides to the interpretation of data are particularly well presented, and seemed to me to be one of the best features of this book, since they can be used even by someone who finds the mathematics difficult.

Chapter 3 deals with the heteronuclear chemical shift correlation experiment. The organisation of the chapter is historical, moving from the classical Freeman–Morris experiment, through DEPT and INEPT, to long range correlations. All the examples were again drawn from organic chemistry, and dealt with C/H correlations. In Chapter 4 the subject of magnetisation transfer between spins (homonuclear and heteronuclear) which are not directly coupled is considered. The relayed coherence transfer experiments provide a starting point, and are followed by a discussion of multiple quantum coherence experiments. The homonuclear technique HOHOHA is discussed, and the second half of the chapter considers heteronuclear relayed coherence transfer. In Chapter 5 the INADEQUATE experiment is detailed, as a means of establishing the connectivity of carbon skeletons, which is particularly valuable in polycyclic aromatic compounds, where there are rather few protons.

Chapters 6 and 7 are devoted to problems and their solutions. These generally follow the order of material in the other chapters, and start relatively easy, but quickly become difficult. The reader is guided most carefully through the solutions, and anyone who works their way through all of these will have learned a great deal.

The book is well presented, there are few typographic errors, and there is a helpful index. Most importantly, both the structural diagrams, and the figures showing the spectra, are very well drawn. Some are a little small.

Much of this book would provide an excellent introduction to this topic for a graduate student or post-doctoral worker, intending to be a professional NMR spectroscopist. However, it seems to be aimed rather more at the organic or inorganic chemist, who needs to use these techniques on an irregular basis, to solve specific problems. This is a difficult audience, who often have little interest in getting to grips with the mathematics, or even the details, of the technique, but simply wish to obtain the required result in the optimal manner. For them this will prove a useful reference work; the mathematics may readily be skipped, and the guides to interpretation are excellent.

I could have wished that the examples chosen had not been so exclusively organic/natural product in character. Whilst these have certainly been most important applications of these techniques, there are also many useful applications in inorganic and organometallic chemistry. Overall, however, this is a good book, which libraries should certainly purchase.

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Corrigendum

Re: Design and application of a reflux modification for the synthesis of organometallic compounds using microwave dielectric loss heating effects; by D. R. Baghurst and D. Michael P. Mingos (*J. Organomet. Chem.*, 384 (1990) C57–C60).

Page C60, the following sentence should be added to the text:

The absence of bulk super-heating means that the kinetics of homogeneous reactions are not altered, but localised super-heating effects at interfacial boundaries may contribute to a reduction in the overall time required for a preparative or dissolution reaction.