Book Review

P. J. HORE

Nuclear Magnetic Resonance. Oxford Chemistry Primers No. 32

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In most chemistry degree courses there is a clear, if not altogether helpful, division of the teaching of NMR spectroscopy into 'physical' and 'chemical' NMR. This book lies firmly in the 'physical' camp. An innocent student could safely read the entire text without suspecting that to many synthetic chemists, NMR spectra are 10 ppm wide and have an integral; indeed, the few integrals to be found here are in the equations. This does not, then, meet the need for a single, short, integrated text for undergraduate courses in NMR. About half of the material needed in a modern degree course is covered; a complementary volume of equal quality on the chemical application and experimental practice of NMR would make a very powerful combination.

What this text does offer is the best introductory account of the physical basis of NMR spectra (as opposed to NMR spectroscopy) that I have yet encountered. In less than 100 pages the author provides more insight into the mechanisms of the chemical shift, scalar coupling and relaxation than most books several times the length. The level of difficulty is, perhaps, a little high for some first-year students, assuming a basic familiarity with vectors and calculus, but the text is very clearly written and largely free from errors. Mercifully, the emphasis throughout is on pulse Fourier transform methods; far too many current texts still use CW spectra. Here the very sensible course adopted is to rely largely on synthesized spectra to illustrate simple spin systems. For the most part the figures are clear and well thought out, although the few experimental spectra are not always of the highest quality. Throughout the book the author is generous in recommending more comprehensive tests for further reading.

After a brief introduction, the core of the book consists of four chapters on the chemical shift, spin–spin coupling, chemical exchange and spin relaxation. These chapters are lucid, concise and comprehensive, covering everything that most students would need at first degree and first-year postgraduate level. The basic minimum of mathematical material is presented, but this is rarely essential to the argument, which rests wherever possible on a clear physical picture. Occasionally there are lapses, such as the assertion that strong coupling is an order of magnitude less common at 600 MHz than at 60 MHz, and is now largely a thing of the past. This is wrong—chemical shift differences are not randomly distributed, and no increase in field will make a strongly coupled AA′XX′ spin system weakly coupled! The description of the mechanism of the nuclear Overhauser effect is also rather muddled and misleading, and neither of the two different explanations given for the averaging out of dipolar effects in solution is very satisfactory. For the most part, however, these chapters are models of their sort, and give the reader an excellent grounding in the origins and significance of the basic NMR parameters.

The final chapter, on experimental methods, perhaps does not quite live up to the high standard of the remainder of the book. The description of the operation of a pulse Fourier transform spectrometer is cursory and a little careless, and in the introduction to the vector model the rotating radiofrequency field appears as if by magic. There is a useful short introduction to two-dimensional NMR, but no discussion of the changes that multiple pulse methods have wrought in the use of NMR for structure elucidation.

The few errors detract little from a book which deserves to be widely adopted in the teaching of NMR spectroscopy. At the subsidised price it should be within the budget of most students, and offers excellent value for money.

G. A. MORRIS
University of Manchester

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