# Book Reviews

JEREMY N. S. EVANS

**Biomolecular NMR Spectroscopy**

Oxford University Press, Oxford, 1995. Paperback £24.50. ISBN 0 19 854766 8.

There is no doubt that the application of NMR to biological macromolecules—proteins, nucleic acids, carbohydrates and membranes—has been one of the outstanding successes of NMR over the last 15 years. On the one hand, NMR has made considerable contributions to understanding structure–function relationships in these systems, and on the other these applications have stimulated the development of an impressive array of multinuclear multidimensional magnetic resonance experiments. There is therefore a desire among biologists to use NMR methods to help answer their problems, and among NMR spectroscopists to apply their favourite technique to some very challenging molecules. As the author points out, there has been a clear lack of modern textbooks in this area, and this accessible volume is a welcome addition to the literature.

It is divided into five parts: Theory, Proteins, Enzymes, Nucleic acids and carbohydrates and Membranes. The three theory chapters take the reader from the idea of nuclear spin to four-dimensional heteronuclear experiments and protein structure determination in 142 pages. The first chapter covers the basics of both solution- and solid-state NMR, including exchange effects, at a rather breathless pace. All the expected topics are covered, although in places in a surprising order; thus, the NOE is described before dipolar coupling, and the INEPT experiment before scalar coupling. In the second chapter, the product operator formalism, introduced in the first chapter, is used to describe a fairly comprehensive range of two-, three- and four-dimensional homo- and heteronuclear experiments, and the third chapter builds on this to describe the procedures used to determine three-dimensional structures by NMR, focusing particularly on the NOE-based method, but also describing the use of paramagnetic ions and solid-state methods. A range of examples of structure determination of proteins are presented, somewhat uncritically, in Chapter 4. The fact that this is not the author's own area of expertise is betrayed, for example, by the short but misleading sections on 'Quality of NMR structures—precision versus accuracy,' where the crucial distinction between precision and accuracy is not correctly made, and on 'Comparisons of NMR structures with x-ray structures.' Part 2 concludes with an outline of the use of a variety of NMR methods in the study of protein folding—an area of considerable current importance.

Part 3 presents a wide range of examples of the use of NMR to obtain information relevant to the understanding of enzyme mechanisms—not simply structural work, but also kinetic and isotope exchange experiments and the use of both solution- and solid-state methods to observe intermediates directly. Here the author's expertise shows through in well chosen examples of experiments which have been somewhat overshadowed by the enthusiasm for structure determination but which have a great deal to offer. Part 4 describes structural studies on DNA and RNA oligonucleotides and their interactions with proteins and, very briefly, studies of oligosaccharides; the structural work is again described rather uncritically, and this section has been largely overtaken by recent work. Finally, Part 5 presents a very useful summary of the kinds of solid-state methods which have been used so successfully to study both phospholipids and peptides or proteins in membranes.

The author emphasizes his belief that we learn best through example, with which I would agree, and the book does have a wealth of generally well chosen examples. In places, such as the description of resonance assignment and protein structure determination (Chapters 2–4), so many experiments and examples are presented that it is sometimes difficult to see the wood for the trees; clearer summaries of the strategies would have been helpful. In other places, fuller explanations of the examples, or simply better Figure captions, would have made them easier to understand.

This book is described as a personal view of biological NMR spectroscopy, and so it is. As indicated above, there are deficiencies in the presentation of the approaches to protein and oligonucleotide structure determination which mean that this cannot be recommended as the sole textbook for a course in biological NMR. On the other hand, the excellent coverage of solid-state methods and of experiments directed at catalytic mechanisms, topics often neglected, do make this a valuable volume for all involved in the active and exciting area of biomolecular NMR.

G. C. K. ROBERTS
University of Leicester

M. T. VLAARDINGERBROEK AND J. A. DEN BOER

**Magnetic Resonance Imaging. Theory and Practice**

Springer, Berlin, Heidelberg, 1996. Pp. xxiv + 350. DM128. ISBN 3 540 60080 9

When NMR was discovered, it was a method for physicists. Its use for chemistry, however, was soon recognized, and for more than four decades most people involved in NMR were chemists. With the invention of magnetic resonance imaging (MRI), the field of NMR rapidly gained significance in medicine and radiology, so that nowadays the majority of those dealing with NMR are involved in medicine. Given the still growing significance of NMR in medicine, it is surprising that there are only a few textbooks devoted to instrumentation, methods and applications of MRI which are attractive to graduate students in science and engineering.

This book by Vlaardingerbroek and den Boer is a textbook written for this group and all others interested in the principles and applications of clinical imaging methods. The contents are presented in seven chapters covering MRI and its hardware, conventional imaging methods, imaging methods with advanced *k*-space trajectories, steady-state gradient-echo imaging, transient gradient-echo imaging, contrast and signal-to-noise ratio and motion and flow. These chapters are supplemented by lists of image sets and terms and by a proposal for a unified nomenclature of imaging methods in an appendix. What is missing is a treatment of the biological effects of electric and magnetic fields, which could help to spread the scientific basis for evaluation of potential health risks of MRI.

The text assumes a familiarity with some basic NMR principles. However, the presentation reflects the authors extensive experience in teaching. The topics are treated in necessary and sufficient detail without going astray with extraneous information. For instance, the first chapter not only gives an initial outline of the vector model of NMR and


CCC 0749–1581/97/090656–02 $17.50