Magnetic Resonance of Biomolecules

by P. F. Knowles, D. Marsh and H. W. E. Rattle
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This book aims to provide an introduction to the use of nuclear magnetic resonance (NMR) and electron spin resonance (ESR) spectroscopy in biology. Both techniques have been widely applied to biological problems in recent years and a number of specialist texts exist, but this is the first book to provide a unified general introduction to the use of both methods.

The physical basis of the magnetic resonance experiment is outlined in a qualitative way in the first chapter. The remainder of the book is in two sections, treating NMR and ESR separately, but with a parallel chapter arrangement in each section. Thus for each technique there is first a discussion of the relation between the spectroscopic parameters and molecular structure and dynamics. This is followed by description of the apparatus and methods required to obtain a spectrum, a survey of biological applications and finally a chapter on more advanced instrumental methods.

In both the NMR and ESR sections, approximately equal space is devoted to detailed descriptions of instrumental methods and to discussions of the biological applications of the techniques. This is perhaps not an ideal balance for an introductory book, since the student will most probably want to know what kinds of questions the technique can answer before concerning himself too much with the details of spectrometer operation. Nonetheless, the ESR section, particularly, is a very readable introduction to the field, describing studies of metalloproteins, spin-labels and natural free-radicals briefly but clearly. The discussion of the biological applications of NMR is less satisfactory. Although a good range of examples is presented (with the exception of small molecule-protein interactions), many of them are rather out-of-date and the discussion is often too brief. For example, a description of the assignment of the $^{13}$C resonances of oxytocin is followed by a picture of its proposed conformation, without any discussion of the arguments by which the existence of this conformation was deduced from the $^1$H and $^{13}$C NMR spectra.

In the theoretical section relaxation phenomena and chemical exchange effects — topics which are of considerable importance in the biological applications of NMR — receive rather cursory treatment. There are few errors of fact, but a rather annoying number of typographical errors.

A study of this book will clearly not allow the biochemist to go away and do his own NMR or ESR experiments. However, it will give him a feeling for the kind of information which can be obtained and should allow him to understand, in general terms, many of the NMR and ESR papers in the biochemical literature. As a very readable first introduction to the field it is to be recommended.

G. C. K. Roberts
Nuclear magnetic resonance (NMR) is associated with transitions, induced by radiofrequency (RF) irradiation, between energy levels of nuclei with nonzero spin quantum numbers in a magnetic field. Traditional “one-dimensional” (1D) NMR spectra are presented as a plot of signal intensity versus applied frequency and provide information about the chemical environment of magnetically active nuclei. Multidimensional NMR spectroscopy of biomolecules is usually done for samples in solution at millimolar concentration. Where experiments require the use of 13C or 15N frequencies, it is usually necessary to isotopically enrich the macromolecule with these nuclei to >90%. Research outputs, collaborations and relationships for Laboratory of Nuclear Magnetic Resonance of Biomolecules published between 1 December 2018 - 30 November 2019 as tracked by the Nature Index. Region: Global Subject/journal group: All. The table to the right includes counts of all research outputs for Laboratory of Nuclear Magnetic Resonance of Biomolecules published between 1 December 2018 - 30 November 2019 which are tracked by the Nature Index. Hover over the donut graph to view the FC output for each subject. Below, the same research outputs are grouped by subject. Click on the subject to drill-down into a list of articles organized by journal, and then by title. Magnetic resonance excels in non-invasive observations of functional molecules in living cells or organisms. In this study, we aim to develop technologies for analyses of functions, localizations and tertiary structures of proteins in cells or organisms by using MR imaging, multi-dimensional NMR, and magnetic resonance force microscopy.