illuminates the scanty public records of the parallel U.S. effort. The book reminds me again of the great difficulty OR workers had, in wartime, to pass on their findings to other OR groups. Waddington mentions several studies his group had completed—on depth charge depth settings and on radar disappearing contacts, for example—that our group in Washington had laboriously to redevelop. Vice versa, Waddington's book shows no awareness of any of the work our group was carrying out which would have benefited his group. Detailed comparative study might produce a convincing demonstration of the debilitating effect of overzealous secrecy on the waging of a war—or the development of science.

The book goes into detail on most of the technical problems encountered in antisubmarine warfare—depth charge attacks, radar and visual search, convoying, maintenance, and so on. It reemphasizes the fact, often forgotten nowadays, that successful operations research keeps close to actual happenings and does not lose itself in esoteric theories or computer simulations.

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Biological Uses of NMR

Nuclear Magnetic Resonance (N.M.R.) in Biochemistry. Applications to Enzyme Systems. RAYMOND A. DWEK. Clarendon (Oxford University Press), New York, 1973. xviii, 396 pp., illus. $25.75. Monographs on Physical Biochemistry.

The early chapters of this book present in a pleasantly readable, not excessively mathematical, form the basic principles of magnetic resonance spectroscopy, with considerable emphasis on relaxation phenomena. The effect of unpaired spins plays a large role in this initial discussion of basic principles, as seems reasonable given the focus of much of the subsequent material. There is a good, brief presentation of interactions that influence the chemical shift of resonances (particularly those of importance in proteins). A short chapter is devoted to extrinsic shift probes. This basic section comprises about 20 percent of the book. The last two chapters deal with some examples of the use of quadrupolar nuclei and some useful instrumental techniques. The large midsections present the application of these techniques to a number of biochemical systems; the discussion is organized according to resonance technique used rather than biochemical system studied.

The general principles of nuclear magnetic resonance (NMR) are well and clearly presented. As the authors themselves point out, this book cannot serve as a text for beginners, nor in general is it sufficiently detailed or sophisticated to give the exact theoretical recipes one will need to use in research. (Probably no book of reasonable length could.)

The application of techniques to biochemical problems discussed relies heavily on the use of nuclei with unpaired electrons to influence the NMR parameters of nearby, nonparamagnetic nuclei. (This is not primarily a book on electron spin resonance spectroscopy, though the effects of motion in the ESR spectra of spin labels are briefly discussed.) These techniques allow one to obtain considerable structural and dynamic information. The particular interests (for example, lysozyme) of the Oxford group receive (not surprisingly) considerable attention. Overall, however, this is a good presentation of these aspects of NMR spectroscopy applied to biological systems.

My major disappointment is that the book as a whole does not present a truly balanced view of those aspects of NMR that have potential for productive application to biological problems. To me the approach is too much "here are some techniques; how can we use them in biochemistry?" rather than "here are the biological problems; how can we solve them?" In many cases I find the emphasis misplaced. For example, I think the solution of protein structures in solution by extrinsic shift probes will tell us relatively little not already revealed by the x-ray diffractionist. Indeed, complexation of parts of the protein with the paramagnetic ion may alter the three-dimensional structure as much as, if not more than, the intermolecular forces of crystallization. Further, I think studies of other nuclei hold great promise. Time has already proved wrong the judgments expressed (p. 153) on the utility of ^{13}C as a probe of protein structure and function (^{13}C NMR has been productively used when this nucleus is incorporated not only in the ligand but also specifically, as well as in natural abundance, into the protein itself). ^{31}P spectroscopy has been usefully applied, ^{15}N is in the wings, and I shall be surprised if we do not see important utilization of ^{205}Tl as a magnetic resonance mimic for potassium. In short, NMR has much more to offer toward the solution of problems of central importance to biology than this book would indicate.

Nevertheless, this is a work of considerable scholarship. And, for its discussion of some of the ways of using NMR techniques to study some aspects of protein structure and function, it merits high praise.

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Lesser Moments in Astronomy

The Planets. Some Myths and Realities. RICHARD BAUM. Halsted (Wiley), New York, 1973. 300 pp., illus. $8.95.

This book by a British amateur astronomer has an engaging theme: the false starts and dead ends of planetary astronomy. Eight episodes are presented, most of them hinging on flawed observations performed before the modern era in astronomy.

Some of them are not very well known, such as the naked-eye observation in 1921 by the astronomers W. W. Campbell and Henry Norris Russell and—remarkably enough—Captain Eddie Rickenbacker of a bright point of light, not a planet, seen near the setting sun on one day only. They were admiring a sunset from a verandah of Campbell's house at Lick Observatory. A very bright and brief nova outburst, or a sungrazing comet on an unusual trajectory? No one knows.

There are also some details of 19th-century astronomy which are inadvertently wry, such as the publication in the *Times* (of London, it is true) on 14 October 1846 by William Lassell of the discovery of the rings of Neptune. Lassell is the discoverer of Triton, Hyperion, Umbriel, and Ariel: moons of Saturn, Uranus, and Neptune. Despite such rapid publication and confirming observations by other astronomers, there is no reason at all to believe in the reality of rings around Neptune, and Baum holds that this "discovery" had psychological rather