A good deal more attention could have been given to some topics however. The vitamins, for example are covered in only 11 pages, with no mention of important modern aspects such as vitamin D metabolites and the tocotrienols, and little consistency in description of symptoms of deficiencies of individual vitamins. Again, although commendable efforts have been made to take examples from many countries, this has not always been achieved: in chapter 27 all tables of hay composition are taken from the United States.

The volumes are attractively produced and the text contains few typographical errors. Minor blemishes noted in volume 2 include reference to "some mineral, possibly pectin" (page 110) and an obvious omission on page 119 (par. 2). Arrangements of some tables could also be improved.

W. M. Ashton

NMR for enzymes

Nuclear Magnetic Resonance in Biochemistry: Applications to Enzyme Systems. By Raymond A. Dwek. Pp. xviii+395. (Clarendon: Oxford; Oxford University: London, December 1973.) £8.

During the past ten years many attempts have been made to apply nuclear magnetic resonance (NMR) techniques to problems of biological interest and the subject has reached the stage when a comprehensive textbook is required to summarise and appraise the advances in this area. Thus Dr Dwek's book is opportune and is all the more welcome because this first comprehensive text on the subject is also a very good book.

In the chapters devoted to protein spectra, protein-ligand binding and the use of paramagnetic probes in such systems, the book indicates the extent to which NMR spectroscopy can be used to obtain three-dimensional structural information in enzymes, to identify functional groups involved in enzymatic reactions and to investigate the role of metal ions and coenzymes in enzyme systems. Dr Dwek's book attempts to provide a balanced view of the usefulness of the NMR technique in some of these areas by considering both its possibilities and limitations.

Adequate background NMR theory is given to allow for the understanding of the many applications considered. Emphasis is given to the theory of relaxation, exchange and paramagnetic shifts and relaxation because many of the more successful applications rely heavily on these aspects of magnetic resonance. Fortunately, Dr Dwek's research interests are in these areas and this is evident in his authoratitive coverage of relaxation effects related to paramagnetic metals and spin-label probes.

The book is well illustrated throughout with clearly labelled diagrams (although the labelling on the AMX spectrum in Fig. 2.14 is incorrect).

It is a pity that the chapter on protein NMR spectra was not introduced with a detailed section on amino acids and peptides. The problems encountered in trying to determine conformational information for small peptides would have put into perspective Dr Dwek's statement that "in principle, it should be possible to obtain from the spectrum the complete structure of a protein in solution".

The chapter on carbon-13 studies neglected to indicate the potential for studying strongly bound ligands in slow exchange (using ^{13}C enriched ligands to overcome the protein background spectrum) and also the advantages of studying ^{13}C relaxation times.

These are however relatively minor criticisms of an excellent book which can be recommended to anyone interested in learning more about enzyme systems.

J. Feeney

Echo technology

Radar, Sonar and Holography. By Winson E. Kock. Pp. xvii+140. (Academic: New York and London, December 1973.) $9.50; £4.45.

This book is intended to introduce high school and college students to the technology of radar and sonar, the principles of holography, and the impact of holography on echolocation. Its explanations successfully avoid the use of mathematical concepts or formulations. The opening chapters introduce waves, coherence, interference, diffraction, near and far fields and zone plates, radiators and collimators. But the author does not, for example, derive the diffraction beamwidth of a slit from interference between its left and right halves, or explain the Rayleigh distance as the intersection of the near-field projected aperture and the divergent far-field beam.

Next the book outlines the principles of echolocation, and gives examples of conventional radars and sonars. There is, however, no mention of surface ducts, self or radiated noise, reverberation, or the uses of Doppler in sonar. There is a chapter on Doppler radar, but the Doppler effect is not explained. Though no reference is made to normal pulse-Doppler radars, dual-frequency systems are mentioned—without indicating that their Doppler effect is determined by the difference frequency.

Next the book introduces monochromatic optical, acoustic holograms, lucidly explained as a generalisations of the zone plate. This leads on to synthetic-aperture side-scanning aircraft radars, which are well described by analogy to sequentially-generated holograms. The basic commonality of different configurations could, however, with advantage, have been explained in terms of reciprocity and symmetry. The use of coherent optics to synthesise the high-resolution near-field radar picture is clearly delineated.

Thereafter the author introduces some rather dubious material: he implies that large-aperture real arrays are a special case of synthetic-aperture systems, and have become possible only with the advent of holographic processing. He suggests that the number of elements in a given array aperture can be reduced without loss. (A reduced hologram can cover the same total picture, but only with an appropriately reduced resolution and/or contrast.) He fails to equate the gain from a synthetic-aperture end-fire system to that from a conventional coherent Doppler integrator; indeed there is no reference to the equivalence of coherent integration in the space and time domains. After recognising the equivalence between moving target indication (that is velocity null generation) and end-fire directivity (that is, rearward directional null generation), the author spoils it by stating that MTI is restricted to targets moving directly towards the radar.

The book describes pulse compression —but fails to distinguish between power and energy, or to indicate how 'chirp' frequency modulation is handled in practice. The elegant technique of 'zone-plate' amplitude modulation for optical pulse compression is explained, but not the more usual pseudo-random modulation and correlation detection. In discussing phased-array systems, the author extols holographic techniques for receiver beam forming, without reference to the range dimension (echo delay), within-pulse scanning, real-time processing, or adaptive beam steering.

Though open to such criticisms in detail, the book is very readable and well illustrated. It gives clear concise explanations of some modern concepts which are not well covered in popular technical literature. There are a few slips in proof reading, editing, history and theory—but probably no more than usual.

I feel the link between holography and echolocation has been overemphasised. I would also have opted for a less catholic coverage of 'with-it' technology and assorted applications, to make room for more explanation of physical principles and practical constraints. But this may merely reflect my preference for a book aimed at a somewhat more sophisticated readership. The author has probably met his own objectives and those of his senior high school readers well enough.

Ralph Benjamin