First steps in spectroscopy

K. A. McLauchlan

Interpretation of NMR Spectra: An Introductory Audiovisual Programme.

By J.D. Coyle, E.J. Haws, K. Miller and K. Norton.

Wiley: 1984. £199.

WILEY's new audiovisual programme comes in a striking package, a large boxed folder which contains four tape cassettes and four boxes (in which are a total of 164 coloured slides), and also 20 booklets. Each tape deals with a particular subject — the chemical shifts of protons, the spin-spin coupling of protons, use of proton spectra for structural assignment and all three of these topics applied to ^{13}C spectra — and is complemented by the slides. Run freely each tape lasts for about 40 minutes, although the package is designed to be interactive with the student so that he may stop and start the tape at will so as to suit his own pace of learning. This is best accomplished with a dedicated slide-tape machine, but an ordinary tape recorder and a slide projector can be used if necessary.

Two types of booklet are supplied, ten of each, together with a correlation chart of proton chemical shifts and a listing of proton coupling constants. The latter is inadequate, even at this level, as is the correlation chart for ^{13}C shifts which is found inconveniently on a slide. One booklet is a very simplistic introduction to NMR spectroscopy. The other is a workbook which has well-defined learning objectives, and in which the student is encouraged to write his replies to answers posed on the tapes and the slides. Answers are supplied on the succeeding slides.

The course has been put together with a great deal of care; the presentation on the tapes is clear and slides are beautifully presented. The coordination of the material between booklet, slide and tape is excellent, too — in theory; my programme did not run properly but that could be a quirk of the review package. The tape cues in the operation of the slide-tape machine and the mechanism changes the slide one is looking at to correspond to what is being said, while the tape stops at pre-ordained places to allow the student to think before he goes on.

The material itself is extremely elementary, aimed primarily at trainee technicians but also perhaps at students at the school-university interface or at first-year undergraduates in organic chemistry. In its determination to be straightforward — it is after all an introductory course — it contains slight inexactitudes and half-truths which might worry the better student. Worse, however, is that the package represents the state of knowledge of the subject as it was about 20 years ago.

At this level it forms a very basic introduction to the subject which might well build confidence in the student, but if one is going further the background needed would have to be more thorough — Fourier transformation, double resonance, 2D spectroscopy and the various pulse sequences all lie beyond the scope of the Wiley course.

It is initially attractive to think of replacing myself in all those tutorials each week with a magic box, but what are its disadvantages? The publisher extols the virtue of being able to hear the commentary and see the slides at the same time, rather than have your eye skip rapidly from text to diagrams as in a book — fine, provided everyone has a slide-tape machine in his own room! More importantly, this form of teaching seems to be based upon the precept that a student learns in the classroom, but one of the aims of education

should be to free him from this restriction. A student should be inquisitive, but how is this virtue encouraged by sitting before a machine which cannot answer questions and which has been programmed by someone else's narrow concept of what should be taught?

Nuclear magnetic resonance is, at best, a subtle, exciting but challenging subject which repays real effort in learning. I am afraid that there is no substitute for a live tutor willing and able to discuss its depths and its applications, to maintain this interest and sense of involvement with developing science on many frontiers. For myself, the Wiley package offers no respite from tutorials, but teachers of the subject at technical colleges may well find it a helpful adjunct to their lectures. □

K.A. McLauchlan is a Lecturer in the Physical Chemistry Laboratory, University of Oxford.

Tigers and calotypes

Brian Coe

Beyond Vision. By Jon Darius.

Oxford University Press: 1984. Pp.224. £15.

IN RECENT years there has been something of a glut of books of historic photographs. As a rule, either the photographs have been chosen to illustrate the history and development of the photographic process, or, based upon the dubious proposition that photography is Art, pictures have been selected for their supposed aesthetic merits. Very few photographs have been presented for their scientific importance — yet, as Dr Darius makes clear in his introductory essay, from its inception photography has been employed to great purpose by scientists. The collection of 100 historic scientific photographs, well reproduced in *Beyond Vision*, is therefore all the more welcome.

Dr Darius has applied very rigid criteria in selecting the photographs, the most important being that each should be unique and should show only what cannot be seen by the unaided human eye. Since the book is presumably intended for a lay readership, it might be argued that slightly less rigid demarcations might have provided greater variety; well over 60 per cent of the illustrations are of astronomical subjects or specialized aspects of physics. In any case, some of the subjects shown appear to fall outside the limits set. The record of the Tasmanian tiger, now extinct, is still no more than a fascinating document of a subject visible to the unaided eye. And the rather pretty colour photograph of the H-bomb test at Eniwetok is no more than a plain record; why were the extraordinary sequence photographs of the first micro-seconds of the fireball made by Dr Edgerton's highspeed camera not chosen?

The inclusion of the contentious Skaife "instantaneous" photograph of a mortar shell in flight is also a little odd. The picture has clearly been retouched, and even if it is authentic its purpose was not scientific but promotional. There are questionable omissions, too. For instance, no example of the forensic use of ultra-violet and infra-red photography is included, and there is not a single scanning electron micrograph of any sort, despite the exceedingly wide range of applications in science and industry. To be fair, in reducing the entire output of 140 years of scientific photography to 100 examples, the author could not expect to please everyone.

The introductory essay is lucid and informative but is marred by several errors. The skeleton outline of photographic processes is misleading; it makes no mention of the key fact that the calotype process made paper negatives which could be printed. To use the description "coated with emulsion" to cover such diverse processes as the Daguerreotype (a silver surface sensitized by iodine vapour), the calotype (paper impregnated with silver salts), the collodion process (a glass plate coated with halide-containing collodion and sensitized in silver nitrate) and the dryplate process (a suspension of silver salts in melted gelatin coated onto glass or paper) is carrying simplification too far. Talbot's early photomicrographs, c. 1837, were not calotypes, but were made by his earlier "photogenic drawing" process.

Seen against Dr Darius's achievement in bringing these photographs together, these are minor criticisms. Overall, the book is a most valuable contribution to the literature on the history of photography. We must hope that it will be sufficiently successful to be followed by a second selection revealing more of the wonders of scientific photography. □

Brian Coe is Curator of the Kodak Museum at Harrow, Middlesex.