*and Interstellar Matter*, a translation with minor updatings of *Bau und Physik der Galaxis* (1982).

A few of these subjects are covered as well or better in other books. But Scheffler and Elsässer's unique contribution is to have presented the whole subject on a single canvas. They provide detailed, up-to-date information that is not accessible elsewhere in so digestible a form, covering such topics as positional astronomy, Galactic distribution of gas and dust, light scattering by dust, spiral wave theory and interstellar chemistry, as well as exposing the observational results and theoretical arguments with care and thoughtfulness. The translation is quite accurate and reads well apart from a few oddities of nomenclature (such as 'kernel' for 'nucleus', 'null-point' for 'origin' and 'nascent energy' for 'energy released'). The book is admirably illustrated with informative tables, diagrams and historical comments — it is good that this useful survey has now been made more accessible to English-speaking readers.

Nuclear astrophysics lies at the heart of our understanding of stellar evolution and the origin of the chemical elements. Neutrino observations have provided one of the subject's most dramatic triumphs in the case of Supernova 1987A, but also a long-standing dilemma in the low flux of high-energy neutrinos from the Sun; as Willy Fowler reminds us in his foreword to *Cauldrons in the Cosmos*, "We humans are mostly (90%) oxygen and carbon. We understand in a general way the chemistry and biology involved, but we certainly do not understand the nuclear astrophysics which produced the oxygen and carbon in our bodies".

What we do and do not understand is the subject of clear and authoritative descriptions by two active researchers in the field. The book covers the theory of nuclear reaction rates, the techniques of their measurement in the laboratory (which involves special difficulties due to the need to extrapolate to low energies) and the resulting characteristics of successive nuclear burning stages in stars. It provides also a lively and reasonably complete account of the astrophysical context in which they occur, and brief reviews of some current issues such as the solar neutrino problem, nuclear cosmochronology and isotopic anomalies in meteorites. Assuming a good background in nuclear physics and quantum mechanics (relevant parts of which can be obtained from D.D. Clayton's *Principles of Stellar Evolution and Nucleosynthesis*), one could not wish for a better account of the current state of knowledge (and uncertainty) about nuclear reactions in stars. □

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# Initial prospects in spectroscopy

*Peter K. Trumper*

**Laboratory Guide to Proton NMR Spectroscopy.** By S.A. Richards. *Blackwell Scientific: 1988. Pp.229. Pbk £10.50, $26.50.*

**Organic Spectroscopy.** By D.W. Brown, A.J. Floyd and M. Sainsbury. *Wiley: 1988. Pp.250. Hbk £22.50, $44.55; pbk £9.95, $19.70.*

**Interpreting Spectra of Organic Molecules.** By Thomas N. Sorrell. *University Science Books, 20 Edgehill Road, Mill Valley, California 94941/Oxford University Press, UK: 1988. Pp.175. Pbk $18, £15.*

FEW things in the organic chemist's world have changed more dramatically in the past decade than has the arsenal of spectroscopic methods available. Nuclear magnetic resonance techniques, which less than eight years ago were known only to physical and analytical chemists, are now accessible to undergraduate students who pass a bar code pen over a few labels. In mass spectrometry, soft ionization allows large, polar and non-volatile molecules to display molecular ions. Fourier transform infrared spectroscopy, and hyphenated techniques such as GC-MS, GC-IR and even LC-MS, can now be carried out on affordable instruments. The time has come for undergraduate texts to reflect the widespread use of these new approaches.

Richards's *Laboratory Guide to Proton NMR Spectroscopy* is a work with a refreshingly casual yet informative style, offering a wealth of handy hints for obtaining and interpreting proton NMR spectra. There is a good discussion of sample preparation and solvent selection. The material presented is easy to understand, and meets the author's stated goal of guiding the relatively inexperienced chemist through the proton NMR spectrum in the real world.

Unfortunately, the real world here is a decade old. Suggestions about how to interpret NMR spectra are mainly directed to those obtained on continuous wave spectrometers; the comments on the use of the spectrometer are often irrelevant to the user of a modern instrument; only brief mention is made of FT techniques and of two-dimensional spectroscopy; and although NOE spectra are included, and subtraction techniques are discussed, the NOE spectrum shown uses integration instead. All in all, the author seems to have been reluctant to enter the modern era.

In their book, Brown, Floyd and Sainsbury direct themselves towards providing students with a training in the basics of organic spectroscopy. The fundamental physical processes involved in the common techniques are nicely explained at a level appropriate for advanced undergraduates, while the exercises include relevant problems and provide IR, MS, proton and carbon NMR spectra, and ultraviolet–visible and combustion data. It would, though, have been good to see structures in the answer keys, as students are likely to have difficulty with some of the (proper) heterocyclic nomenclature.

The preface advertises recent advances in instrumental methods, but these are only mentioned in passing in the text. Soft-ionization techniques such as CI and FAB are described, but no spectra are given as examples (although a few appear in the exercises). Fourier transform NMR is briefly explained, but the examples and exercises use continuous-wave proton spectra almost exclusively. DEPT spectroscopy is the only multiple-pulse FT technique mentioned.

Sorrell's *Interpreting Spectra of Organic Molecules* is designed as a companion text for the usual introductory organic chemistry course. In that role, it succeeds very well. NMR, IR and mass spectra are discussed; the omission of ultraviolet–visible spectroscopy seems timely. The information is presented concisely, and the explanations of the physical processes involved in spectroscopy are pertinent and clear. The author effectively emphasizes problem-solving techniques. NMR spectra from a high-field FT spectrometer are taken as illustrations; this is a welcome change after the spectra from 60 MHz libraries used in the other two texts. The chapter on $^{13}C$ NMR spectroscopy does well in explaining decoupling and the NOE, though no DEPT spectroscopy is covered.

Sorrell has done an exemplary job of showing how to integrate information from different spectroscopic techniques. His book will be entirely appropriate for introductory organic chemistry courses, and should fit in well with any laboratory programme. No problems or exercises are included in the text, but some are available as instructional software for an MS-DOS microcomputer. □

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• Published by Pergamon towards the end of last year was *Problem Solving in Analytical Chemistry*, by Themistocles P. Hadjiioannou and colleagues at the universities of Athens and of Washington. The subtitle declares the volume to be a handbook containing over a thousand worked examples, problems and answers; intended uses for the volume are various, but the authors' general aim is to enable students to consolidate their theoretical knowledge by working through real problems.