Excited states

Mike Ashfold

Principles and Applications of Photochemistry. By Richard P. Wayne. *Oxford University Press: 1988. Pp.268. Hbk £30, $55; pbk £12.50, $24.95.*
Spectrophysics, 2nd edn. By Anne P. Thorne. *Chapman & Hall: 1988. Pp.390. Pbk £14.95, $32.50.*

MOST of the energy received by the Earth comes from the Sun in the form of electromagnetic radiation. The visible wavelengths are vital to processes such as vision and photosynthesis, while the ultraviolet radiation is crucial to maintaining the mantle of stratospheric ozone — which, in turn, protects us from these potentially damaging shorter wavelengths. As Wayne rightly comments in his preface: "Photochemical processes are of the greatest importance to life on Earth". They are also of fundamental interest. Photochemistry is largely concerned with processes involving electronically excited atoms and molecules; these have different electronic structures from those of the ground state species with which we are most familiar and, as a consequence, may exhibit very different chemistry.

Wayne's book is a major update of his earlier text, *Photochemistry*, which was published by Butterworths in 1970. As before, it is very much aimed at undergraduates. Thus the book contains qualitative discussion of the absorption and emission of radiation, and of the various modes of decay exhibited by electronically excited molecules — for example, fluorescence, phosphorescence, non-radiative intramolecular processes including photodissociation, and intermolecular (collisional) energy transfer. Ample illustrative examples are cited in each case. Other chapters are devoted to the role of electronically excited species in synthetic organic chemistry, and to photochemical techniques. Here, as in several of the preceding chapters, one cannot help but appreciate the revolutionary effects that lasers are having on studies of photochemical change.

The book concludes with an overview of "photochemistry in action" — topics covered include atmospheric photochemistry, photosynthesis, vision, photography, polymer photochemistry, solar energy storage, optical brighteners and some potential medical applications. This last section overlaps considerably with *Light, Chemical Change and Life* (Open University Press, 1982), but Wayne's text is uniquely valuable because of its complete and balanced coverage both of the physical principles underlying photochemistry and of their applications.

The advent of lasers, especially the tunable dye laser, has opened a new era of 'high resolution photochemistry' — an era in which gas-phase photochemical processes can be probed with quantum-state resolution. Such experiments have the potential to reveal the intimate dynamics of the photochemical event: they also serve to highlight the degree of convergence between the traditional fields of gas-phase photochemistry and spectroscopy. Anne Thorne's revamped *Spectrophysics* is distinctive in that (like the first edition) it provides a thorough grounding in the methods of experimental spectroscopy. It too is principally intended for undergraduates. It includes clear descriptions of the *modus operandi*, and the relative strengths and limitations, of grating and prism spectrometers, of interferometers and Fourier transform methods, and of laser spectroscopic techniques, and concludes with a good introduction to plasma spectroscopy.

Both books are eminently readable and contain pleasingly few typographical errors. Both are enhanced by the extensive recommendations for further reading listed at the end of each chapter, and by their comprehensive indexes. □

Mike Ashfold is a Lecturer in the School of Chemistry, University of Bristol, Bristol BS8 1TS, UK.

Little and large

John Mann

Organic Chemistry, 4th edn. By T. W. Graham Solomons. *Wiley: 1988. Pp. 1,186 plus indexes. Hbk £48.75, $54.95; pbk £18.95, $17.95.*
Organic Chemistry, 2nd edn. By G. Marc Loudon. *Benjamin/Cummings: 1988. Pp. 1,259 plus indexes. $58.25, £19.95.*
Intermediate Organic Chemistry. By John C. Stowell. *Wiley: 1988. Pp.268. £31.50, $35.95.*
Experimental Organic Chemistry. By Clark F. Most, Jr. *Wiley: 1988. Pp. 586. £31.45, $41.01.*

"ORGANIC chemistry is boring and difficult. It's all facts and named reactions." This is a perennial complaint from undergraduates, and one that the authors of big, general textbooks try to address. Over the years such books have become increasingly colourful and fact-enriched; but they all still approach organic chemistry by means of functional groups.

The two on offer this year (Solomons and Loudon) are new editions from well-established authors, and both boast notable changes. Solomons has now adopted full-colour, but it is used more to highlight names and titles than for mechanisms (as in Peter Vollhardt's *Organic Chemistry*, published by W. H. Freeman and reviewed here last year). The molecular orbital pictures and the diagrams in the chapter on nucleic acids and protein biosynthesis are, however, very pretty.

As before, certain topics are designated 'special', and are dealt with in isolation. This is a drawback of this and many other textbooks, because it encourages an unhealthy compartmentalization of chemistry. Thus organosulphur chemistry merits five pages as a special topic in Solomons, whilst Loudon (using various shades of green and grey) introduces the subject throughout his book whenever comparisons with the corresponding carbon–oxygen compounds can best be made. Similarly Loudon devotes a whole chapter to enolate chemistry and its applications in polyketide and fatty acid biosynthesis. Solomons relegates both topics to 'special' sections. The juxtaposition and comparison of similar chemistry is a positive feature of Loudon's book, and one reason why it makes more interesting reading.

Both volumes have been thoroughly updated, have more than adequate coverage of spectroscopic techniques, and contain extensive indexes and numerous problems (Solomons provides answers; Loudon does not, though he claims to include more problems than any other text). But do they present organic chemistry in a stimulating light? There has been a notable move away from lists of reactions towards understanding the chemistry through a mechanistic approach. Students will find both books informative but somewhat dull and ponderous.

One measure of readability is whether or not a book can be enjoyed in the bath. This would be physically impossible with Solomons and Loudon, both of which are weighty tomes, but John C. Stowell's *Intermediate Organic Chemistry* passes the test. The book is for students who have had an introductory course, and who then "pick up an issue of *Journal of Organic Chemistry* . . . and find the real world of the practising chemist to be . . . on a different level of understanding".

Much of the difficulty stems from chemical methodology or jargon that is beyond the standard textbooks, and Stowell's aim is to bridge this gap. He commences with an excellent guide to literature searching and to nomenclature, before plunging into functional group chemistry, carbon–carbon bond formation, and the planning of multi-step syntheses. The material is contemporary and fairly comprehensive, with research references up to 1985. But there is one big irritation. Stowell seldom provides any mention of the reasons for carrying out the chemistry. "Compound 6 is useful for the synthesis of hemlock alkaloids" is a typical statement; but how can the student tell,