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Principles of Molecular Photochemistry: An Introduction/Modern Molecular Photochemistry of Organic Molecules

3 December 2009

Timely revision of a classic work

The awarding of the 2008 Nobel Prize in Chemistry to Martin Chalfie, Osamu Shimomura and Roger Y. Tsien for the discovery and development of green fluorescent protein highlights the relevance of photochemistry to many applications in biology, medicine and technology (eg, solar cells and light-emitting diodes). Thus the publication of the revised version of Nicholas Turro's 1978 classic text on molecular photochemistry in two volumes (which have the first seven chapters in common) is timely. I learnt most of my photochemistry from the 1978 edition, so I was enthusiastic about the new edition. The distinguishing feature of the first edition was the emphasis on mechanisms presented via molecular orbital or valence bond theory and potential energy diagrams and this feature has been retained.

In the past 30 years, advances in the theory of the photochemical funnel (conical intersections) and the development of ultrafast (femtosecond) laser spectroscopy have led to a revised paradigm for the mechanistic aspects of photochemistry. The new theoretical concepts of the photochemical funnel are now discussed in depth in chapters five and six and throughout the book. The authors could have incorporated more details of the many molecular structures corresponding to the photo-chemical funnel characterised in theoretical computations over the past 20 years.

Chapters one to seven correspond to the shorter book, Principles of Molecular Photochemistry: An Introduction, and form the first part of the full text of Modern Molecular Photochemistry of Organic Molecules. These chapters discuss the conceptual framework of organic photochemistry and provide the basis for understanding and investigating photochemical phenomena using molecular structure and dynamics. All the central concepts of photochemistry, such as radiative and non-radiative phenomena, electron configurations and spin states, are well illustrated using many examples. The plan of the first seven chapters is similar to the 1978 book. The coverage is truly comprehensive and these chapters alone could provide the basis of a final-year undergraduate course in photochemistry in the UK or a graduate course in the US.

The second part of Modern Molecular Photochemistry of Organic Molecules, chapters eight to 14, focuses on the photochemistry of the functional groups of organic chemistry as well as special topics (supra-molecular chemistry and molecular oxygen reactions). This section is truly encyclopaedic, covering carbonyl compounds, olefins, aromatic molecules, etc. The chapter on mechanistic organic chemistry is a book in itself, covering 120 pages, and includes modern methods such as time-resolved spectroscopy. There could have been more on photobiology, but the book is already more than 1,000 pages.

While I received a hard copy of the shorter book, I had only a PDF of the longer title to review. Clearly, there are a

few things to fix still.

Who is it for? Experimental and theoretical chemists with an interest in non-adiabatic phenomena (photochemistry and energy transfer). The book could be an undergraduate text as well as an encyclopaedic reference work covering the breadth of photochemistry.

Presentation: A comprehensive collection spanning the diversity of photochemistry but unified through the mechanistic approach. Would you recommend it? A must for newcomers to the field and as a reference for established practitioners.

Principles of Molecular Photochemistry: An Introduction

Authors: Nicholas J. Turro, V. Ramamurthy and J.C. Scaiano

Edition: First

Publisher: University Science Books

Pages: 450

Price: £42.99

ISBN: 9781891389573

Modern Molecular Photochemistry of Organic Molecules

Authors: Nicholas J. Turro, V. Ramamurthy and J.C. Scaiano

Edition: Second

Publisher: University Science Books

Pages: 1,100

Price: £48.99

ISBN: 9781891389252

Reviewer :

Mike Robb is professor of chemistry, Imperial College London, with an interest in the applications of theoretical chemistry to photochemistry.