Preface

Photochemistry is a mature science. A characteristic hallmark of a consolidated scientific discipline is that it increasingly broadens its scope of interests from an initial central core toward the periphery where it interacts with other areas. Most of the current scientific research is characterized by an enriching multidisciplinarity, focusing on topics that combine backgrounds from different fields. In this way, the largest advances are taking place at the interphase between areas where different fields meet.

This multidisciplinarity is, I believe, also a characteristic feature of the current situation for photochemistry. Thus, photochemistry was initially focused on the understanding and rationalization at a molecular level of the events occurring after light absorption by simple organic compounds. Molecular organic photochemistry constituted the core of this discipline, and it largely benefited from advances in the understanding of the electronic states provided by quantum mechanics. Later, photochemistry started to grow toward areas such as photobiology, photoinduced electron transfer, supramolecular photochemistry, and photochemistry in heterogeneous media, always expanding its sphere of interest.

This context of increasing diversity in topics and specialization is reflected in this issue of *Pure and Applied Chemistry*. The contributors correspond to some of the plenary plus two invited lectures of the XXth IUPAC Symposium that was held 17–22 July in Granada, Spain. The program included plenary and invited lectures and oral contributions grouped in 13 sections covering femtochemistry, photochemistry of biomacromolecules, single-molecule photochemistry, and computational methods in photochemistry to nanotechnology, among others. These workshop titles give an idea of the breadth of themes that were included in this symposium. While it is obvious that the list of contributions correspond to different subdisciplines in photochemistry, all of them have a common scientific framework to rationalize the facts.

The purpose of the symposium was to present an overview of the current status of some research fronts in photochemistry. This issue begins with the 2004 Porter Medal Lecture awarded jointly by the Asian, European, and Interamerican Photochemical Societies that was given to Prof. Graham Fleming (University of California, Berkeley) for his continued advances in photosynthesis. Prof. Fleming's studies have constituted a significant contribution to the understanding of the interplay between the structure of photosynthetic centers of green plants and the mechanism of energy migration toward the photosynthetic centers. These events take place in a very short time scale and are governed by the spatial arrangement of the constituents.

Continuing with photobiology, the second article by Prof. Jean Cadet (Grenoble University) describes the type of photochemical damage and photoproducts arising from DNA UV irradiation. Knowledge of these processes is important for a better understanding of skin cancer and the possibilities for DNA repair. Closely related with DNA damage occurring upon irradiation, the article by Prof. Tetsuro Majima (Osaka University) provides an account of his excellent work on photosensitized one-electron oxidation of DNA.

The concept of "conical intersection", developed initially by Robb and Bernardi to rationalize the relaxation of excited states, led to the foundation of computational photochemistry, which has proved to be of general application to photochemical reactions. In this issue, Prof. Massimo Olivucci (University of Siena) shows that quantum chemical calculations can also be applied to photochemical reactions occurring in photobiology and, in particular, to the problem of vision. These calculations are characterized by the large number of atoms that are included and the fact that they have to estimate at a high calculation level and with high accuracy the energy of states differring in a few kcal mol^{-1}.

The next article corresponds to one of the two invited lectures included in this issue. The one given by Dr. Virginie Lhiaubet-Vallet (Technical University of Valencia) in the workshop Photophysical and Photochemical Approaches in the Control of Toxic and Therapeutic Activity of Drugs describes the

enantioselective quenching of chiral drug excited states by biomolecules. Moving from photobiology to free radical polymerization with application in microlithography, the article by Prof. Tito Scaiano (University of Ottawa) reports among other probes an extremely elegant approach to detect the intermediacy of radicals in photochemical reactions based on a silent fluorescent molecular probe containing a free nitroxyl radical.

Solar energy storage is a recurrent topic and a long-desired application of photochemistry. In her comprehensive contribution, Prof. Ana Moore (Arizona State University) summarizes the continued seminal contribution of her group to the achievement of an efficient solar energy storage system based on the photochemical generation of long-lived charge-separated states. Another possibility of solar energy storage consists of water splitting. In his article, Prof. Haruo Inoue (Tokyo Metropolitan University) deals with artificial photosynthetic methods based on the use of ruthenium porphyrins as photosensitizers for the two-electron oxidation of water with formation of dioxygen.

Also in applied photochemistry, Prof. Luisa De Cola (University of Amsterdam) reports on intramolecular energy transfer in dinuclear metal complexes having a meta-phenylene linker. The systems described by Prof. De Cola have potential application in the field of light-emitting diodes, since most of the complexes described exhibit electroluminescence.

The second invited lecture is by Dr. Alberto Credi (University of Bologna), one of Europe's most promising young photochemists. In his interesting article, the operation upon light excitation of a rotaxane molecular machine is described. A macro-ring acting as electron donor moiety in a charge-transfer complex is threaded in a dumbbell-shaped component having two viologen units with different redox potential. Light absorption produces the cyclic movement of the macro-ring from one viologen station to the other.

The last two contributions fall within the more classic organic photochemistry realm. Prof. Axel Griesbeck (University of Cologne) describes the multigram synthesis of antimalarial peroxides using singlet-oxygen photosensitizers adsorbed or bonded to polymer matrices. The last contribution comes from Prof. Heinz Roth (University of Rutgers), who has worked during his entire career in the fields of organic photochemistry and radical ion chemistry. Prof. Roth has summarized his vast knowledge in radical ion chemistry, reviewing the mechanism of triplet formation arising from radical ion pair recombination. This mechanism for triplet formation is currently gaining a renewed interest owing to the potential applicability to the development of phosphors.

I hope that the present selection will be appealing and attractive for a broad audience of readers interested in photochemistry and will give readers an idea of the state of the art of some current topics in this area.

Hermenegildo García
Conference Editor