THE HISTORY OF THE IUPAC SYMPOSIA ON PHOTOCHEMISTRY – A SUCCESS STORY [1]

Silvia E. Braslavsky
Max Planck Institute for Chemical Energy Conversion, Postfach 101365, 45413 Mülheim an der Ruhr, Germany
silvia.braslavsky@cec.mpg.de

The Symposia were started by the initiative of George S. Hammond (1921-2005) (Figure 1) in Strasbourg in 1964, a banner year for Photochemistry since it was the same year the first Gordon Conference on Photochemistry took place [2].

Figure 1. George Hammond (1921-2005)
(from: http://web.pdx.edu/~wamserec/Hammond/)

This historical review is intended to help us remember the persons who shaped the Symposia as well as to survey the main subjects treated over the years as I see them using my personal, certainly biased, glasses. Of great help for the writing of this paper have been the publication by Ugo Mazzucato about the history of the
European Photochemical Association (EPA) [3] and the reports written by many colleagues and published after each Symposium (with some exceptions) in the EPA Newsletters, after 1978.

In 1964 the meeting, already supported by IUPAC, was called the International Symposium on Organic Photochemistry and in size and style was reminiscent of a Gordon Conference. W. Albert Noyes Jr. (1898-1980) who was at the time the President of IUPAC, gave a talk on “Some aspects of transitions between electronic levels”; it was published together with I. Junger in Pure and Applied Chemistry [4]. Since 1967 the Symposium has been called the “IUPAC Symposium on Photochemistry” and is regularly held in even years usually at the end of July [5]. The Symposium was held outside Europe in 2006 in Kyoto, Japan [see Table 1 for the list of sites, chairmen (one a chairwoman) and local organizers] and is planned to be again in Japan in 2016. The Japanese photochemical community has been very productive and creative and it has strongly collaborated to finance the Symposia. As a result, the number of Japanese participants has significantly increased over the years. Since 1964 also quite generally the number of participants and countries represented have grown substantially, and the subjects discussed have incorporated all areas of research in which light is used, be it photophysics and its instrumentation, micro- and nanosciences, photochemistry, photobiology, the molecular basis of photomedicine, material sciences, solar energy conversion, photocatalysis, analytical chemistry, and so forth.

The photochemists more interested in the photophysical aspects and instrumentation already had two other series of meetings running: (1) One that later became the International Conference on Photochemistry (ICP), which started in 1962 [6] and (2) the Informal Conference on Photochemistry, initiated in 1952 by Francis E. Blacet (1899-1990) and held in North America every two years [7] until 2000 in San Juan, Puerto Rico [8].

The Chairperson of each IUPAC Symposium selects the Scientific Chairperson of the IUPAC Symposium to be held four years later, after adequate consultation. The selected Chairperson chooses a scientific Committee, the location and local organizer, requests the sponsorship by IUPAC (in general a patronage with no financing) and is responsible for the scientific standard and quality control of the Symposium.
Table 1: List of IUPAC Symposia on Photochemistry

<table>
<thead>
<tr>
<th>Year</th>
<th>Symposium Number</th>
<th>Site</th>
<th>Scientific Chairperson</th>
<th>Chair of Local Organizing Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>Organic Photochemistry, Part of a NATO series</td>
<td>Strasbourg, France</td>
<td>G. S. Hammond, USA</td>
<td>J. Levisalles</td>
</tr>
<tr>
<td>1967</td>
<td>II</td>
<td>Enschede, The Netherlands</td>
<td>W. G. Dauben, USA</td>
<td>E. Havinga and M. Kronenberg</td>
</tr>
<tr>
<td>1970</td>
<td>III</td>
<td>St Moritz, Switzerland</td>
<td>D. Bryce-Smith, UK</td>
<td>K. Schaffner</td>
</tr>
<tr>
<td>1972</td>
<td>IV</td>
<td>Baden-Baden, Germany</td>
<td>H. E. Zimmerman, USA</td>
<td>D. Döpp</td>
</tr>
<tr>
<td>1974</td>
<td>V</td>
<td>Enschede, The Netherlands</td>
<td>O. L. Chapman, USA</td>
<td>J. J. C. Mulder</td>
</tr>
<tr>
<td>1976</td>
<td>VI</td>
<td>Aix-en-Provence, France</td>
<td>K. Schaffner, Switzerland</td>
<td>J. Kossanyi and M. Julliard</td>
</tr>
<tr>
<td>1978</td>
<td>VII</td>
<td>Leuven, Belgium</td>
<td>N. J. Turro, USA</td>
<td>F. de Schryver</td>
</tr>
<tr>
<td>1980</td>
<td>VIII</td>
<td>Seefeld, Austria</td>
<td>H. Dürr, Germany</td>
<td>J. G. Schantl</td>
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<tr>
<td>1982</td>
<td>IX</td>
<td>Pau, France</td>
<td>J. Joussot-Dubien, France</td>
<td>E. Poquet and H. Bouas-Laurent</td>
</tr>
<tr>
<td>1984</td>
<td>X</td>
<td>Interlaken, Switzerland</td>
<td>D. J. Whitten, USA</td>
<td>A. M. Braun</td>
</tr>
<tr>
<td>1986</td>
<td>XI</td>
<td>Lisbon, Portugal</td>
<td>F. Wilkinson, UK</td>
<td>S. M. B. Costa</td>
</tr>
<tr>
<td>Year</td>
<td>Volume</td>
<td>Location</td>
<td>Organizers</td>
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<tr>
<td>1988</td>
<td>XII</td>
<td>Bologna, Italy</td>
<td>V. Balzani, Italy, F. Bolletta</td>
<td></td>
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<tr>
<td>1990</td>
<td>XIII</td>
<td>Warwick, UK</td>
<td>F. D. Lewis, USA, R. S. Davidson</td>
<td></td>
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<tr>
<td>1992</td>
<td>XIV</td>
<td>Leuven, Belgium</td>
<td>F. De Schryver, Belgium, D. De Keukeleire</td>
<td></td>
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<tr>
<td>1994</td>
<td>XV</td>
<td>Prague, Czech Republic</td>
<td>J. Michl, USA, I. Stibor</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>XVI</td>
<td>Helsinki, Finland</td>
<td>J. Wirz, Switzerland, H. Lemmetyinen</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>XVII</td>
<td>Sitges, Spain</td>
<td>R. A. Caldwell, USA, J. Font</td>
<td></td>
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<tr>
<td>2000</td>
<td>XVIII</td>
<td>Dresden, Germany</td>
<td>S. E. Braslavsky, Germany, T. Wolff</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>XIX</td>
<td>Budapest, Hungary</td>
<td>H. D. Roth, USA, J. Nyitrai</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>XX</td>
<td>Granada, Spain</td>
<td>M. A. Miranda, Spain, B. Quintero</td>
<td></td>
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<tr>
<td>2006</td>
<td>XXI</td>
<td>Kyoto, Japan</td>
<td>M. Irie, Japan, A. Osuka</td>
<td></td>
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<tr>
<td>2008</td>
<td>XXII</td>
<td>Gothenburg, Sweden</td>
<td>D. Gust, USA, B. Albinsson</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>XXIII</td>
<td>Ferrara, Italy</td>
<td>F. Scandola, Italy, C. Chiorboli</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>XXIV</td>
<td>Coimbra, Portugal</td>
<td>H. D. Burrows, Portugal, A. J. M. Valente</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>XXV</td>
<td>Bordeaux, France</td>
<td>D. M. Bassani, France, A. del Guerzo and N. McClenaghan</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>XXVI</td>
<td>Osaka, Japan</td>
<td>T. Majima, Japan</td>
<td></td>
</tr>
</tbody>
</table>
Although the Symposia have all been held in Europe (with the exceptions mentioned above, i.e., in 2006 in Kyoto and the next one in 2016 in Japan), 10 of the first 20 Scientific Chairmen were from the USA, alternating with those from European Countries (see Table 1; the local organizer was always a photochemist at or near the site of the Symposium). The more recent change in this practice reflects both declining USA participation, mainly due to the reduced support by the USA funding agencies, as well as a simplified logistics when the Scientific Chairperson lives near the conference site.

During each Symposium, as well as during the International Conference on Photochemistry, there is usually a regular meeting of the Sub-Committee of Photochemistry (formerly the Commission on Photochemistry) of IUPAC to discuss ongoing projects and consider new ones, as well as to choose new members of the Sub-Committee.

A very well attended exhibition of instruments has been organized at most of the Symposia and, needless to say, an impressive number of posters has been presented each time by very talented young and not-so-young colleagues active in the field.

EPA holds its biannual assembly on one of the evenings during the week of the Symposium. This is one of several reasons to hold the Symposium in Europe. In short, the other reasons are (i) the Gordon Conference on Photochemistry is held in North America every two years, (ii) the American photochemists (Inter-American Photochemical Society, I-APS) hold their annual meeting every start of the year (usually January 1 – 4) in Florida and once every five years in Latin America, so far four times, namely 1996 in Foz de Iguazú (Brazil), 2001 in Ascochinga (Argentina), 2006 in Salvador de Bahia (Brazil), and 2011 in Mendoza (Argentina), [evidently, the American photochemical community has sufficient opportunities to meet near home], (iii) the Asian and Oceania Photochemical Association meets annually in their own area, (iv) there is so far no other pan-European Conference on Photochemistry, and (v) the “other” Photochemistry Congress (ICP) travels the world, the last one was held in Leuven in 2013 and the next one is scheduled for Jeju Island, Korea, in 2015.

The titles of the contributions to the first Symposium in 1964 show a strong interest in photochemical studies of carbonyl-containing molecules, and some interest in compounds with conjugated double bonds. The titles and authors of the papers published in Pure and Applied Chemistry (PAC), the Scientific Journal of IUPAC [1,4], are listed in Table 2. All plenary lectures and some
invited lectures after the initial Symposia were published in \textit{PAC}. Later on, due to several reasons, not all of the lectures were published in \textit{PAC}. I have included in this presentation the complete list of papers published in \textit{PAC}, as it is found in the webpage of IUPAC, for each Symposium. For the sake of consistency, I am including the initials of the names of the authors, although in the \textit{PAC} indexes, the authors are sometimes listed with full names and other times with initials.


\begin{center}
\begin{tabular}{l}
\textbf{W. A. Noyes}, Jr. and I. Unger, Some aspects of transitions between electronic levels \hfill \\
E. J. Bowen, Chemiluminescence in solution \hfill \\
\textit{M. Mousseron}, Isomérisation photochimique de systèmes polyéniques \hfill \\
H. E. Zimmerman, Report on recent photochemical investigations \hfill \\
G. Porter and P. Suppan, Reactivity of excited states of aromatic ketones \hfill \\
K. Gollnick and G. O. Schenck, Mechanism and stereoselectivity of photosensitized oxygen transfer reactions \hfill \\
H. M. Frey, Photolysis of the diazirines \hfill \\
\textit{W. G. Dauben} and \textit{W. T. Wipke}, Photochemistry of dienes \hfill \\
O. Jeger, \textit{K. Schaffner} and H. Wehrli, Photochemical transformation of \(\alpha,\alpha\)-epoxyketones and related carbonyl systems \hfill \\
\textit{M. D. Cohen}, Photochemistry of the organic solid state \hfill \\
\textit{R. C. Cookson}, Stereospecificity in photochemical reactions of ketones \hfill \\
\textit{O. L. Chapman}, Photochemistry of unsaturated nitrocompounds \hfill \\
\textit{N. C. Yang}, Photochemical reactions of carbonyl compounds in solution: Paterno-Büchi reaction \hfill \\
\textit{P. de Mayo}, Photochemical reactions of dicarbonyl compounds \hfill \\
\textit{G. Quinkert}, Photochemistry of non-conjugated ketones in solution
\end{tabular}
\end{center}

The second Symposium in Enschede was chaired by William G. Dauben (1919-1997) (Figure 2), and organized by M. E. Kronenberg and Egbert Havinga (1909-1988) (Figure 3).

\footnote{1}{The name of the presenter has been underlined. In few cases I could not identify the speaker.}
Figure 2. William (Bill) G. Dauben (1919 -1997)
From Guest Book, Max Planck Institute for Radiation Chemistry

Figure 3. Egbert Havinga (1909-1988)
From http://www.kncv.nl/chemie-historische-groep-%28chg%29/geschiedenis-van-de-chemie/h-biografieen-nederlandse-chemici.117066.lynkx

D. H. R. Barton, The use of photochemical reactions in organic synthesis
H. Prinzbach, Photochemical reactions with non-conjugated dienes
D. Bryce-Smith, Photoaddition and photoisomerization reactions of the benzene ring
R. Srinivasan, Mercury (\(\text{P}_1\)) sensitized photoreactions of furan: Details of the primary processes
K. Schaffner, Cyclic ketones: Photolytic eliminations and reductions
S. Sato, Photosensitized isomerizations of di deutero ethylenes
P. Yates, Photochemistry of cyclic ketones in solution
A. Weller, Electron-transfer and complex formation in the excited state
L. M. Stephenson and G. S. Hammond, Fate of the excitation energy in the quenching of fluorescence by conjugated dienes
E. Havinga and M. E. Kronenberg, Some problems in aromatic photosubstitution
E. Müller, Mechanism of the Tübingen photooximation reaction
J. Régaudy, Photooxydation des dérivés aromatiques
P. D. Bartlett, R. Helgeson and O. A. Wersel, Singlet and triplet states in cycloaddition to conjugated dienes

Figure 4. Derek Bryce-Smith (1926–2011)
Table 3 shows the titles of the published contributions arising from that symposium. The lecture by Albert Weller (1922-1990) on “Electron-transfer and complex formation in the excited state”, presented a then novel aspect which later became fundamental to our understanding of many photoinduced reactions. In the excellent book “Photochemistry” authored by Jack G. Calvert and James N. Pitts Jr. (1921-2014) (Wiley, 1966) there is no mention yet of any electron transfer processes or of the existence of ion radicals. Shin Sato from Tokyo University presented excited-mercury photosensitization [excitation by (3P1) Hg, then a frequently used technique in the gas phase] for photosensitized isomerizations, and searched for other photosensitizers (e.g., benzene).

The third Symposium in 1970 in Saint Moritz was chaired by Derek Bryce-Smith (1926-2011) (Figure 4) and locally organized by Kurt Schaffner (Figure 5).

Figure 5. Kurt Schaffner
Private photo collection (SEB)
Table 4. IIIrd IUPAC Symposium on Photochemistry – St Moritz – Switzerland, 1970. All Plenary Lectures were published in [9].

<table>
<thead>
<tr>
<th>Title</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T. Förster</td>
<td>Diabatic and adiabatic processes in photochemistry</td>
</tr>
<tr>
<td>A. W. Adamson</td>
<td>Recent advances in the photochemistry of coordination compounds</td>
</tr>
<tr>
<td>M. A. El-Sayad</td>
<td>Multiple resonance techniques in the study of the magnetic, radiative and non-radiative properties of the triplet state</td>
</tr>
<tr>
<td>H. Labhart, W. Heinzelmann and J. P. Dubois</td>
<td>On the search for the mechanism of photoreactions of some heterocyclic compounds</td>
</tr>
<tr>
<td>J. Meinwald, J. W. Young, E. J. Walsh and A. Courtin</td>
<td>Photochemical transformations of divinyl arenes</td>
</tr>
<tr>
<td>D. R. Arnold, A. B. Erwin and L. A. Karnischky</td>
<td>The electronic excited states of small ring compounds: heterobicyclopentanes</td>
</tr>
<tr>
<td>R. Hoffmann</td>
<td>Geometry changes in excited states</td>
</tr>
<tr>
<td>P. J. Knip</td>
<td>Photochemistry of alkenes in solution</td>
</tr>
<tr>
<td>A. A. Lamola</td>
<td>Triplet photosensitization and the photobiology of thymine dimers in DNA</td>
</tr>
<tr>
<td>F. McCapra</td>
<td>The chemiluminescence of organic compounds</td>
</tr>
</tbody>
</table>

Triplet photosensitization (Angelo A. Lamola) was a relatively novel subject at that moment (only twelve papers were in the literature until 1970) and certainly the field had an impressive development afterwards. The contribution by Theodor Förster (1910-1974) reflects the effort to classify the photochemical reactions based on the moment of transition between potential energy surfaces of ground state reactants through excited-state surfaces to ground-state products. Jakob Wirz (who was present at that Symposium) says that the young Josef Michl presented an impressive talk on the mechanism of the photochemical formation of pleiadene (see below). There was also a well-attended evening workshop on biradicals in which Roald Hoffmann and Josef Michl were active participants. Years later, when Josef Michl was a member of the IUPAC Commission on Photochemistry and we (I was also a member of that Commission) elaborated the first version of the Glossary of Terms used in Photochemistry [10], he took enormous care to ask a large number of photochemists about the biradical definition.

Howard Zimmerman (1926-2012) (Figure 6) chaired the fourth Symposium in 1972 and brought it to Baden-Baden in Germany with
the local organization in charge of his former post-doctoral collaborator Dietrich Döpp and his wife Heinrike Döpp (Figure 7)

J. A. Barltrop, The photoreduction of aromatic systems
W. G. Dauben, M. S. Kellogg, J. I. Seeman, N. D. Vietmeyer and P. H. Wendichub, Steric aspects of the photochemistry of conjugated dienes and trienes
K. Gollnick and H.-U. Stracke, Direct and sensitized photolysis of dimethyl sulphoxide in solution
H. Hart, The photochemistry of cycloheptadienones
A. Padwa, M. Dharan, J. Smolanoff and S. I. Wetmore, Jr, Recent advances in the photochemistry of the carbon-nitrogen double bond
G. Quinkert, Photochemistry of linearly conjugated cyclohexadienones in solution
L. Salem, Diradicals
K. Schaffner, Recent results on some photochemical rearrangements
N. (Nick) J. Turro and P. Lechtken, Thermal and photochemical generation of electronically excited organic molecules. Tetramethyl-1,2-dioxetane and naphthvalene
A. Zweig, Photochemical generation of stable fluorescent compounds (photofluorescence)

Figure 8. Orville L. Chapman (1932 - 2004)
From https://www.chem.ucla.edu/dept/Organic/OLC_Brochure.html

J. Cornelisse, Photosubstitution reactions of aromatic compounds
A. Devaquet, Avoided crossings in photochemistry
B. Blank, A. Henne, G. P. Laroff and H. Fischer, Enol intermediates in photoreduction and type I cleavage reactions of aliphatic aldehydes and ketones
C. S. Foote and T. R. Darling, Decomposition of dioxetanes: a unique probe into mechanism and energy transfer processes
J. Michl, Model calculations of photochemical reactivity
M. Pape, Industrial applications of photochemistry
D. I. Schuster, Energy wastage processes in ketone photochemistry
W. R. Ware, Photophysics of exciplexes: some kinetic aspects
F. Wilkinson, Quenching of triplet states of organic compounds by coordination complexes
M. S. Wrighton, D. S. Ginley, M. A. Schroeder and D. L. Morse, Generation of catalysts by photolysis of transition metal complexes

Figure 9. Chris Foote (1935 – 2005)
From Guest Book, Max Planck Institute for Radiation Chemistry
Nick Turro’s (1938-2012) lecture on dioxetane and naphthvalene reflected the large influence of his group’s research in the development of photochemistry. The papers on the thermal generation of excited molecules have received a very large number of citations.

In 1974 the Symposium returned to Enschede in The Netherlands and was chaired by Orville L. Chapman (1932-2004) (Figure 8) and locally organized by J. J. C. Mulder. The calculations of trajectories of excited molecules started gaining importance (Devaquet and Michl). Very timely was the analysis of the photophysics of exciplexes by time-resolved and steady state fluorescence techniques presented by W. Ware. I would like to pay a tribute to Chris Foote (1935-2005) (Figure 9) and his contributions.

Figure 10. Jean Kossanyi (1933 – 2004)
From http://pubs.rsc.org/En/content/articlelanding/2003/pp/b301834m/unauth#divAbstract

In 1976 the Symposium was held in Aix-en-Provence, France; the Scientific Chair was Kurt Schaffner (see Figure 5) and the organizer Jean Kossanyi (1933-2004) (Figure 10).

N. C. Baird, What can photochemists expect from *ab initio* calculations now and in the near future?

F. C. De Schryver, N. Boens, J. Haybrochts, J. Daemen and M. De Bruckelaire, Photochemistry of bichromophoric compounds: scope and expectations

J. E. Guillet, Studies of energy transfer and molecular mobility in polymer photochemistry

P. J. Wagner, Misleading sigmas and neglected geometries: the effects of methyl substitution on rates of triplet state hydrogen abstraction by the benzoyl group

J. J. Turner, J. K. Burdett, R. N. Perutz and M. Poliakoff, Matrix photochemistry of metal carbonyls

T. Mukai, T. Kamagai and O. Seshimoto, Photochemical and thermal reactions of some heterocycles containing C=N-O or N=C-O group

J. Streith, The photochemistry of aromatic-N-ylides. Rearrangement and fragmentation patterns

P. Courtot, R. Rumin and J.-Y. Salaun, Photochemistry of polyenes. Control by orbital symmetry and ground state conformations?

K. Nakanishi, Photochemical studies of visual pigments

T. Rosenfeld, B. Honig, M. Ottolenghi, J. Hurley and T. G. Ebrey, *Cis*-trans isomerization in the photochemistry of vision

H. D. Hartzler, Aromatic aldehyde-leuco dye photoxidation

P. B. Gilman, Jr., A review of the electrochemical boundaries for the photochemistry of spectrally sensitized silver halide emulsions

D. G. Whitten, F. R. Hopf, F. H. Quina, G. Sprintschnik, H. W. Sprintschnik, Photochemistry of organic chromophores incorporated into fatty acid monolayers

H. E. Zimmerman, Recent mechanistic and exploratory organic photochemistry

The first of the many reports to the IUPAC Symposia by Frans De Schryver’s group on the work with multichromophoric systems was offered on this occasion, as well as two talks related to the photoisomerization of visual pigments, i.e., the retinal-containing proteins. An interesting lecture by Colin Baird was intended to convince the photochemists already in 1976 of the possibilities of *ab initio* calculations of the energetics of excited states. Koji Nakanishi entertained the guests at the banquet with some of his magic tricks.
The seventh Symposium was chaired by Nicholas (Nick) Turro (1938-2012) (Figure 11) and organized by Frans De Schryver (Figure 12) in 1978 in Leuven, Belgium. This was the first IUPAC Photochemistry Symposium I attended.

The first of numerous contributions of the Bologna group (Balzani et al.) to the IUPAC Photochemistry Symposia was presented as well as another one from the productive Bordeaux group [Jacques Joussot-Dubien (1928-2009) et al.]. A special workshop on the properties of biradicals was organized by Péter Wagner (1939-2009) and another one on new techniques was also held (see report of the Symposium in *EPA Newsletter*, [15]). Studies with monolayers such as, e.g., Langmuir-Blodgett films, attracted considerable attention. This Symposium generated the first report of an IUPAC Symposium on Photochemistry in the *EPA Newsletter*. The Newsletters themselves started to be published on a regular basis in January 1978.
(see [3]). From that date on, there was almost always a report of the Symposium in the *EPA Newsletter*.

![Frans De Schryver](image)

**Figure 12.** Frans De Schryver
From: EPA Newsletters, 62, p. 23


<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Photochemical approach to the synthesis of natural products</em></td>
<td>J. Kossanyi</td>
</tr>
<tr>
<td><em>Thermal chemistry as an exercise in photochemistry!</em></td>
<td>G. Genack and C. David</td>
</tr>
<tr>
<td><em>The photo-oxidation of polymers. A comparison with low molecular weight compounds</em></td>
<td>S. Farid, P. A. Martic, R. C. Daly, D. R. Thompson, D. P. Specht, S. E. Hartman and J. L. R. Williams</td>
</tr>
<tr>
<td><em>Photochemistry of some three-membered heterocycles</em></td>
<td>J. Joussin-Dubien, R. Bonneau, P. Fornier de Violet, R. Kousini, R. Lapouyade, J. Joussin-Dubien and H. Görner</td>
</tr>
<tr>
<td><em>Comparative kinetic study of the reactivity of molecules in their excited singlet and triplet states in the cases of an electron abstraction and an intramolecular photocyclization reaction</em></td>
<td>D. Schulte-Frohlinde and H. Görner</td>
</tr>
</tbody>
</table>

*Eis-nitrostilbenes*
V. Balzani, F. Bolletta, F. Scandola and R. Ballardini, Excited state electron-transfer reactions of transition metal complexes
O. L. Chapman, Photochemistry of diazo compounds and azides in argon
H. Kuhn, Electron transfer in monolayer assemblies

Heinz Dürr (Figure 13) chaired the eigth Symposium in 1980 in Seefeld; the local organizer was J. G. Schantl (Innsbruck).

Figure 13. Heinz Dürr
From: Guest Book, Max Planck Institute for Radiation Chemistry

Electron transfer and radical ions were prominently represented (D. Arnold et al., N. Sutin and C. Creutz), the Bordeaux organic photochemistry group reported results its with photochromic materials (H. Bouâa-Laurent et al.), Waldemar Adam offered one of his very attractive lectures on the thermal generation of excited states, solar energy conversion started seriously engaging the scientists in a very multidisciplinary manner (H. Gerischer, 1919-1994), and the first plenary lecture on picosecond spectroscopy in a Photochemistry Symposium was offered by Robin Hochstrasser (1931-2013). Günther Ohloff (1924-2005) of Firmenich S.A. described the use of molecular singlet oxygen in organic synthesis for the industrial production of chemicals. The Japanese colleagues (T. Matsuura et al.) impressed the audience with their extraordinary creativity and productivity. Three
Workshops were organized: one on “New Techniques” by Kurt Schaffner, one on “Magnetic Fields in Photochemistry” by Albert Weller (1922-1996) and another one on “Photoimaging” by Ed Chandross (Bell Labs) with the participation of Irena Bronstein-Bonte from Polaroid Corporation, G. Delzenne from Agfa-Gaevert, Samir Farid from Kodak, and H. Hartege from Dupont. This was an impressive industrial participation! See EPA Newsletter for a report of the Symposium [17].


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<td>W. Adam, Thermal generation of electronic excitation with hyperenergetic molecules</td>
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<td>D. R. Arnold, P. C. Wong, A. J. Margulis and T. S. Cameron, Radical ions in photochemistry. 12. The photoaddition of olefins to cyano aromatic compounds in polar solvents</td>
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<td>P. S. Engel and C. J. Nalepa, Photochemical decomposition and isomerization of aliphatic azo compounds</td>
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<td>H. Bouas-Laurent, Alain Castellan and J.-P. Desvergne, From anthracene photodimerization to jaw photochromic materials and photocrowns</td>
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<td>H. Gerischer, Heterogeneous electrochemical systems or solar energy conversion</td>
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<td>A. Gilbert, The inter- and intramolecular photocyclo-addition of ethylenes to aromatic compounds</td>
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<td>N. Satyu and C. Creutz, Light induced electron transfer reactions of metal complexes</td>
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The Bordeaux research groups organized the ninth Symposium in Pau. The Scientific Chair was Jacques Joussot-Dubien (1929-2009) (Figure 14) and the local organizers were Elisabeth Pocket and Henri Bouas Laurent (Figure 15). In Figure 16 a group of prominent photochemists is seen to enjoy a pre-banquet drink in Pau.
Figure 14. Jacques Joussot-Dubien (1928 – 2009)  
From: EPA-Newsletter 62, p. 23

Figure 15. Elisabeth Poquet and Henri Bouas Laurent (left)  
From: H. Bouas Laurent private collection.
Figure 16. In Pau (1982), (from left) Bill Dauben, Stanley Cristol, W. C. Agosta and Ken Houk. From: H. Bouas Laurent private collection.

Photoinduced electron transfer was in 1982 an omnipresent mechanism (the Nobel Prize in Chemistry was awarded to R. Marcus in 1992 for the theory of electron transfer) and applications in artificial photosynthesis became important (Iwao Tabushi). The lecture by Horst Kramer (co-authored by Rainer Traher and Peter Hemmerich, untimely deceased in October 1981) on electron transfer with triplet flavins represents a milestone in basic flavin photochemistry, the biological importance of which would appear 15-20 years later (ca. 2000) when it was discovered that the chromophore in the blue-light photoreceptors (phototropins) in plants is a flavin. The mechanism of action of phototropins in vivo involves the photoproduction of the long-lived flavin triplet state, which reacts through an electron transfer mechanism with a cysteine from the apoprotein hosting the flavin, producing a long-lived covalent compound and a concomitant change in the protein structure leading to the transmission of a signal [19]. See EPA Newsletter [20].

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<th>Author(s)</th>
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<td>I. Tabushi</td>
<td>Artificial photosynthesis. Mechanism and application</td>
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Figure 17. David Whitten, From: Guest Book Max Planck Institute for Radiation Chemistry, and Figure 18. David Whitten running

David Whitten (Figures 17 and 18, which shows him performing his preferred activity: running) chaired the tenth IUPAC Symposium
on Photochemistry in Interlaken in 1984. The local organizer was André Braun (Figures 19 and 20).

**Figure 19. André Braun**

**Figure 20.** During the free afternoon in Interlaken, 1984, from left: Marie Therese Maurette, Esther Oliveros, André Braun and Diego Armesto.

- **S. E. Braslavsky**, The photophysics and photochemistry of the plant photosensor pigment phytochrome
- **R. A. Caldwell**, Intersystem crossing in organic photochemical intermediates
- **G. Cilento**, Generation of electronically excited triplet species in biochemical systems
- **D. F. Eaton**, Electron transfer induced photofragmentation as a route to free radicals
- **E. Haselbach and T. Bally**, Light induced processes in organic molecular ions
- **A. Henglein**, Catalysis of photochemical reactions by colloidal semiconductors
- **W. H. Laarhoven**, Aspects of the photochemistry of aryl ethylenes
- **J. P. Malrieu, I. Nebot-Gil and J. Sánchez-Marín**, Neutral versus ionic excited states of conjugated systems; their role in photoisomerizations
- **N. Mataga**, Photochemical charge transfer phenomena – picosecond laser photolysis studies
- **S. Tazuke and N. Kitamura**, A strategy for mimicking photosynthesis
- **M. A. Winnik**, Fluorescence in structured media: a look at polymer colloids
- **J. Wirz**, Spectroscopic and kinetic investigations of conjugated biradical intermediate

Figure 21. Dick Weiss during the excursion on Wednesday, Interlaken, 1984, private collection SEB

Egbert Havinga opened the Symposium with a lecture on the history of the Symposia on the occasion of the 20th anniversary and
there was a concert offered by the photochemists David Schuster, piano, and Frank Mallory, clarinet. George Hammond gave an overview lecture with the title: “Where are the Horizons of Photochemistry Now?” Many talks dealt with photoinduced electron transfer reactions and the mimicking of photosynthesis continued to engage photochemists (again a group from Japan). A workshop on lasers and their applications chaired by Jacques Joussot-Dubien attracted many participants. There were workshops also on “Mechanisms of isomerization of olefines and polyenes” organized by Jack Saltiel, “Micellar and related systems as a medium in photochemistry” organized by A. Lattes, “Self-organization in photochemical systems” organized by J.-C. Micheau, and “Determination of photochemical quantum yields” by Günter Gauglitz. Richard (Dick) Weiss (Figure 21) evidently enjoyed the Symposium and also the excursion day thoroughly. See EPA Newsletter [22].

The eleventh Symposium was chaired by Frank Wilkinson (Figure 22) in Lisbon. Local organizer was Silvia M. B. Costa (Figure 23)


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<td>C. Paq</td>
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A. Roloff, K. Meier and M. Riediker, Synthetic and metal organic photochemistry in industry
J. C. Scaiano and L. J. Johnston, Photochemistry of reaction intermediates
T. B. Truong, Effect of solvent reorganization on the electron transfer (ET) reaction between donor-acceptor pairs in solution
J. W. Verhoeven, Through-bond charge transfer interaction and photoinduced charge separation
R. O. Lavigne, A.-M. Hsu, C.-K. Hsiao, G. Baranyi, P. Kazmaier, Organic photoconductive materials

Figure 22. Frank Wilkinson, 1986.
**Figure 23.** left: Silvia Braslavsky, right: Silvia Costa, Lisbon, 1986

**Figure 24.** Vincenzo Balzani

*George Porter* (Chemistry Nobel Laureate in 1967) (1920-2002) elaborated on the studies with fast spectroscopic methods on
photosynthetic units and antennas. The results of many years of his group’s investigations of photoreactions in confined systems, in particular in zeolites, were reviewed by Nicholas (Nick) Turro. Jan Verhoeven presented the studies of his group on photoinduced charge transfer across donor-bridge-acceptor supramolecular systems with various types of interconnecting bridges. Four panels organized in two parallel sessions discussed “Photochemical reactivity, electron and proton transfer” chaired by Albert Weller, “Mechanistic aspects of organic photochemistry” chaired by Anthony Trozzolo, “Photochemical reactions in organized media” chaired by J. Kerry Thomas, and “Photoimaging, photoresists and photopolymerization” led by Ed Chandross. See [24].

**Figure 25.** Inauguration of the XIIth Symposium.
The twelfth IUPAC Symposium on Photochemistry, chaired by Vincenzo Balzani (Figure 24) in 1988 was a very special moment in the history of the symposia series and the photochemical community. The Symposium took place at the University of Bologna, which was commemorating the 900th Anniversary of its inauguration (Figure 25) and the Porter Medal, the highest Award in the photochemical community, presented by the EPA, the I-APS and the Asian and Oceania Photochemistry Association (APA), was instituted [25]. Lord George Porter (Figure 26) was the first awardee. Heinz Roth dedicated his lecture to the work of Giacomo Ciamician (1857-1922), the prominent photochemist of Bologna and one of the fathers of photochemistry. Coinciding with the Symposium, the University of Bologna presented the first Giacomo Ciamician Medal to Albert Weller [26]. Fabrizio Bolletta was the local organizer of this Symposium.

Figure 26. Lord George Porter (1920 – 2002)

H. D. Roth, Magnetic resonance methods in the mechanistic photochemistry of ketones, olefins, and oximes
J. D. Coyle, Electron-transfer photochemistry of organic amides and imides
J. R. Huber, Photodissociation of molecules: the microscopic path of a molecular decay
H. Michel and J. Deisenhofer, Structure and function of the photosynthetic reaction center from Rhodopseudomonas viridis
J. Michl et al, Solution photochemistry of poly(diallylsilanes): a new class of photoresists
F. Scandola and M. T. Indelli, Second sphere donor acceptor interactions in excited states of coordination compounds. Ruthenium(II) bipyridine cyano complexes
A. G. Schultz, New photochemistry of 2,5-cyclohexadien-1-ones and related compounds
R. G. Weiss, R. L. Treanor and A. Nuñez, Norrish II reactions of rod-like ketones in ordered media comprised of rod-like layered solvent molecules
A. Albini and E. Fasani, Interaction between photoexcited naphthalene-nitriles and dienes: addition and sensitization
M. A. Fox, Photoinduced electron transfer in arranged media and on semiconductor surfaces
F. W. Grevel, J. Jacke, W. E. Klotzbücher, S. Özkär and V. Skibbe, Photoreactions of group 6 metal carbonyls with olefins
T. Shimizu, T. Iyoda and K. Honda, Some aspects of electron transfer sensitization systems
H.-J. Timpe, Photoinitiator systems for concurrent radical and cationic polymerization
K. I. Zamaraev, S. V. Lymar, M. I. Khramov and V. N. Parmon, Vectorial phototransfer of electrons across lipid membranes

The Nobel Prize in Chemistry was awarded in 1988 to Harmut Michel, Johann Deisenhofer and Robert Huber for the determination of the structure of the bacterial reaction centre. The structure of PSII underscored the concept that one goal for achieving the mimicking of photosynthesis was (and still is) the compartmentalization of the various electron transfer steps and the control of the vectorial electron transfer process. Thus, several contributions focussed on the
behaviour of organized environments. Richard (Dick) Weiss showed how the order of the solvent environment influences the Norrish II photochemical reaction. Marye-Anne Fox demonstrated the possibility of photoinduction of electron transfer through thick layers using various types of structures and Kirill Zamaraev (1939-1996, president of IUPAC 1994 -1995) analysed the vectorial transfer across lipid membranes. Ahmed Zewail (Chemistry Nobel Laureate in 1999) showed the capabilities of femtosecond pulses and detection of transient absorption by a delayed beam (pump-probe as we call the technique today) to observe the dynamics of transition states. I believe that this was the first lecture on femtosecond spectroscopy in an IUPAC Symposium. There were again four panel discussions in two parallel sessions. Nick Serpone chaired the Panel on “Photochemistry and the Environment”, Howard Zimmerman led the Panel on “Interaction of Theory and Experiment in Organic Photochemistry”, Jean-Marie Lehn (Chemistry Nobel Laureate in 1987) chaired the Panel on “Supramolecular photochemistry”, and André Braun one on an “Up-date on the technology of preparative photochemistry”. For a report on the Symposium see [28].

Figure 27. Fred Lewis
From: Guest Book, Max Planck Institute for Radiation Chemistry

M. Kasha (Porter Medal), Four great personalities of science: G. N. Lewis, J. Franck, R. S. Mulliken and A. Szent-Gyorgyi

V. Balzani, L. De Cola, L. Prodi and F. Sandiolo, Photochemistry of supramolecular species

A. M. Braun and E. Oliveros, Applications of singlet oxygen reactions: mechanistic and kinetic investigations

H. Dürr, A new photochromic system - potential limitations and perspectives

N. P. Ernster, B. Dick and T. Arthen-Engeland, The primary photochemical reaction step of unsubstituted indolino-spiropyans

H. Hennig, D. Rebornek, R. Stich and L. Weber, Photocatalysis induced by light-sensitive coordination compounds

M. Irie, Properties and applications of photoresponsive polymers

E. Lissi, M. A. Rubin, O_2(Σ) and O_2(Δ) processes in microheterogenous systems

K. Maruyama and A. Osuka, A chemical approach toward photosynthetic reaction center

P. Mathis, Primary processes in photosynthetic reaction centers

T. Miyashi, H. Ikeda, A. Konno, O. Okitsu and Y. Takahashi, Photoinduced electron-transfer reactions of the cope and related systems

R. N. Perutz, S. T. Belt, A. McCamley and M. K. Whittlesey, C-H activation by organometallics: the role of matrix isolation studies

R. Z. Sagdeev and E. G. Bagryanskaya, Stimulated nuclear polarization - a new method for studying the mechanisms of photochemical reactions

J. C. Scaiano, V. Wintgens and J. C. Netto-Ferreira, Mechanistic studies of the photogeneration and photochemistry of ortho-xylenes

G. B. Schuster, Photochemistry of organoborates: intra-ion pair electron transfer to cyanines

J. P. Simon, Stereodynamics of molecular photodissociation

B. Srivastava, B. Beevers and K. G. Casey, Ultraviolet laser ablation and decomposition of organic materials

J. W. Verhoeven, Electron transport via saturated hydrocarbon bridges: 'exciplex' emission from flexible, rigid and semiflexible bichromophores


Fred Lewis (Figure 27) chaired the thirteenth IUPAC Symposium on Photochemistry in the University of Warwick, Coventry. R. S. Davidson was the local organizer - and for several years the editor of the issues of Pure and Applied Chemistry collecting the papers from the Symposia on Photochemistry. George Porter presented the Porter Medal to Michael Kasha (1913–2013) (Figure 28) [30], who gave a lecture on four major scientific personalities. Niko Ernsting showed the decay of photoproduced species with a time resolution of ca. 400 fs, using a pump-probe spectrometer with 260-fs pump pulses. K. Maruyama discussed the effect of orientation on the charge transfer after excitation of conformationally restricted dimeric porphyrins (as biomimetic models of photosynthetic units), using picosecond time-resolved transient absorption spectroscopy with a time resolution of 26 ps and fluorescence decay with a time resolution of 1 ns. Jan Verhoeven showed the variable interaction between chromophores linked by different bridges.
Figure 29. (from left) Jorge Tocho, Eduardo Lissi, Silvia Braslavsky, Miguel Neumann, Pedro Aramendía and Juan (Tito) Scaiano. University of Warwick, 1990.

Figure 30. Denis De Keukeleire, hopfen chemical expert. From http://belgium.beertourism.com/blog/professor-denis-de-keukeleire-hop-is-hip

During a coffee break a photographer from the company ICI, who was using a novel electronic camera, took a picture of the Argentinian group present. I cannot avoid showing it here (Figure 29). P. Gregory from ICI discussed the technique in a lecture within a
workshop with two additional industrial presentations, one on “Stereolithography”, and another one on “Colour Imaging”. For a review of the Symposium see [31].


K. Honda (Porter Medal), From Photoelectrochemistry to Photocatalysis
A. U. Acuña, J. González-Rodríguez, M. P. Liljo, C. R. Mateo, K. Raaj Naqvi, Micro and nanosecond detection of biomolecular dynamics by polarized luminescence
A. E. Johnson, N. E. Levinger, D. A. V. Klener, K. Tominaga, P. F. Barbara, Ultrafast experiments on the role of vibrational modes in electron transfer
K. W. Allen, E. S. Cockburn, R. S. Davidson, K. S. Tranter and H. S. Zhang, Some new developments in radiation curing
J.-P. Desvergne, F. Vayss, H. Bouaz-Laurent and P. Marian, Tunable photoresponsive supramolecular systems
J. M. J. Fréchet, The photogeneration of acid and base within polymer coatings: Approaches to polymer curing and imaging
Z. R. Grabowski, Electron transfer and the structural changes in the excited state
H. B. Gray and J. R. Winkler, Photoinduced electron transfer in ruthenium-modified cytochrome c
F. D. Lewis, D. M. Bassani and G. Dasharatha Reddy, Styrene-amine and stilbene-amine intra-molecular addition reactions
H. Matsubara, Laser microchemistry
R. W. Matthews, Photocatalytic oxidation of organic contaminants in water: An aid to environmental preservation
A. A. Lin, C.-F. Chu and W.-Y. Huang, Reactant preordering in solid photopolymers
I. Satin, Photochemistry of highly organized biomolecules: Sequence-selective photoreaction of DNA
A. Vogler and H. Nikol, Photochemistry and photophysics of coordination compounds of the main group metals
M. R. Wasielewski, M. P. O’Neil, D. Gosztola, M. P. Niemczyk and W. A. Svec, Ultrafast photoinduced electron transfer reactions in supramolecular arrays: From charge separation and storage to molecular switches
D. Andrew, D. J. Hastings, D. L. Oldroyd, A. Rudolph, A. C. Weeden, D. F. Wong and Boke Zhang, Triplet 1,4-biradical intermediates in the photocycloaddition reactions of enones and N-acylindoles with alkenes
U. P. Wild, S. Bernet, B. Kohler and A. Renn, From supramolecular photochemistry to the molecular computer

Frans De Schryver (see Figure 12) chaired the fourteenth Symposium. Denis De Kenkeleire (the beer expert in the crew) was the local organizer (Figure 30).

There were 450 participants in this Symposium (many of whom enjoyed great beer after the sessions) and I believe it was the first one in which parallel sessions of the invited lectures and selected oral contributions had to be arranged. The following Symposia all had parallel sessions to accommodate the presentations of the increasing number of participants.

Kenishi Honda received the Porter Medal from the hands of George Porter for his work on photochemistry, photography, and electrochemistry, as reviewed in the presentation address by Frank Wilkinson [33]. Harry Gray discussed their studies on photoinduced electron transfer from excited Ru(amine) complexes attached to histidine at various distances from the acceptor cytochrome c and of Zn-substituted cytochrome c. Urs Wild demonstrated the possibilities of data storage using hole burning techniques. The Bordeaux group presented their progress in the studies on supramolecular systems and Paul Barbara (1953-2010) showed the use of ultrafast techniques (pulse-limited to > 100 fs) to study intra- and intermolecular electron transfer processes. Hiroshi Masuhara demonstrated the use of a multi-beam laser scanning micro-manipulation system to study the reactions of isolated particles of various materials. One of the invited lectures was on the role of hydrophobic and lipophobic effects on photoinduced processes by C.-H. Tung from the Academia Sinica in Beijing. There were several presentations by scientists working in industrial environments, such as Ian Gould from Eastman Kodak, R. D. Miller from IBM (San Jose), K. Dietliker from Ciba-Geigy (Fribourg), and J. W. Ketellapper from Agfa-Gevaert. For a report on the Symposium see [34].
Josef Michl (Figure 31) was the Scientific Chair of the fifteenth Symposium in 1994 in Prague, Czech Republic. I. Stibor was the local organizer. This time 600 participants took part in the Symposium. There was a very strong participation of colleagues from the European “Eastern Countries”.


N. J. Turro (Porter Medal) Supramolecular organic and inorganic photochemistry: Radical pair recombination in micelles, electron transfer
M. Allan, What can electron impact spectroscopy offer to photochemistry? Triplet states, negative ions and intramolecular electron transfer
R. S. Becker, J. Seixas de Melo, A. L. Maçanita and F. Elisei, Comprehensive investigation of the solution photophysics and theoretical aspects of oligothiophenes of 1-7 rings
F. Bernardi, M. Olivucci and M. A. Robb, Following reaction paths in organic photochemistry: The special role of surface crossings on starburst dendrimers, and the use of DNA as a molecular wire
N. Buhler and D. Bellu, Photopolymers as a powerful tool in modern technology
R. H. Crabtree, Mercury-photosensitized reactions
C. Creutz, J.-S. Song and R. M. Bullock, Photoinduced atom-transfer reactions between transition-metal centres
J. Gebicki, Low barrier isomerization processes in radical cations
H. J. C. Jacobs, Photochemistry of conjugated trienes: Vitamin D revisited
L. J. Johnston and N. P. Schepp, Laser flash photolysis studies of the reactivity of styrene radical cations
N. Kitamura, K. Nakatani and H.-B. Kim, Spectroscopic and electrochemical analyses of electron transfer and mass transfer across the microdroplet/solution interface
W. Knoll, Integrated optics for the characterization of photoreactive organic thin films
K. R. Mang, A. M. Blough, J. L. Schrenk, R. S. Koefod, D. A. Freedman and J. R. Matachek, Mechanistic aspects of the photochemistry of [CpM(η6-arene)]+ complexes of Fe, Ru and Os
J. P. Mittal, Excited states and electron transfer reactions of fullerenes
H. Morrison, K. Agyin, A. Jiang and C. Xiao, Photochemical activation of distal chromophores by antenna substituents in polyfunctional molecules
D. Phillips, The photochemistry of sensitisers for photodynamic therapy
C. M. Prestat, Solvent effects on intermolecular electron transfer processes
J. Santamaria, Photoinduced electron transfer in organic synthesis: Application to alkaloids
M. A. El-Sayed, Jennifer Griffiths, L. Song and N. Zhang, On the molecular mechanisms of the rapid and slow solar-to-electric energy storage processes by the other natural photosynthetic system, bacteriorhodopsin
F. C. De Schryver, N. Boens, M. Van der Auweraer, L. Viaene, S. Reekmans, B. Hermans, J. Van Stam, M. Gehlen, H. Berghmans and M. Ameloot, Excited-state probing of associative and covalent macromolecules
H.-J. Wolff, D. Bürster and U. E. Steiner, Spin-orbit coupling controlled spin chemistry of Ru(bpy)32+: photooxidation: Detection of strong viscosity dependence of in-cage backward electron transfer rate
G. E. Johnson, K. M. McGrane and M. Stolka, Electroluminescence from single layer molecularly doped polymer films
J.-S. Taylor, DNA, sunlight and skin cancer
H. P. Tropper, A. Corral and L. von Llam, Spectral hole burning: Spontaneous and photoinduced tunneling reactions in low temperature solids
I. Yamazaki and N. Ohta, Photochemistry in LB films and its application to molecular switching devices
Figure 32. George Porter gives the Porter medal to Nick Turro. Foto: Jan Verhoeven

Figure 33. Tito Scaiano receiving the Porter Medal from George Porter. London, 1995. Private collection SEB.
George Porter himself handed the Porter Medal to Nick Turro (Figure 32), Nanda Sabbatini showed the results of studies with luminescent lanthanides performed in the group around Jean-Marie Lehn, and F. Bernardi explained some of the novel quantum chemical calculations made together with Massimo Oliveri and Mike Robb on reaction trajectories from excited states. Frans De Schryver demonstrated the use of various emission techniques for the study of inter- and intra-molecular interactions in complex media.

Photobiology was well represented in this Symposium. Mostafa El-Sayed presented mechanistic studies on bacteriorhodopsin, including subpicosecond transient absorption decay of the excited bacteriorhodopsin and some of its mutants. There were 45 papers focusing on photobiology including 4 of the plenary lectures. The 455 posters covered all areas of basic and applied photochemistry. A report on the Symposium was published in [36].

The Porter Medal has in general been awarded during the IUPAC Symposia, with one exception. In 1995, during the International Conference on Photochemistry held in London, the Porter Medal was awarded to Juan C. (Tito) Scialano, as well directly handed by George Porter (Figure 33) [37].


In 1996 Jakob (Joggi) Wirz (Figure 34) chaired the sixteenth IUPAC Symposium in Helsinki, Finland, with Helge Lemmettyinen (Figure 35) as the local organizer.
Figure 35. Helge Lemmetyinen (right) passes the duties to Richard Caldwell who would be the scientific chair of the 17th IUPAC Symposium on Photochemistry in Sitges, Barcelona in 1998. Private collection SEB.

Figure 36. Left: Henry Linschitz (1919 – 2014), a pioneer in Photochemistry, with Klaas Zachariasse in Helsinki, 1996. Private collection SEB.
Henry Linschitz (1919-2014) (in Figure 36 with Klaas Zacharias) showed a poster in which various mechanisms for benzophenone triplet quenching by metal ions and cyano complexes were described in detail. He also co-authored a lecture and chaired a session.

Table 17. XVI IUPAC Symposium on Photochemistry – Helsinki – Finland, 1996. Papers published in [38].

N. Mataga (Porter Medal), Development of exciplex chemistry: Some fundamental aspects
F. Kulzer, R. Kettner, S. Kummer and Th. Basché, Single molecule spectroscopy: Spontaneous and light-induced frequency jumps
M. A. El-Sayed and S. Logunov, On the molecular origin of the protein catalysis of the primary process in bacteriorhodopsin photosynthesis: Retinal photoisomerization
L. Peng, C. Colas and M. Gaeldner, Photocontrol of cholinesterase activity
L. B.-Å. Johansson and J. Karolin, Electronic energy migration and rotation within bichromophoric molecules
J. M. Kelly, M. M. Feeney, L. Jacquet, A. Kirsch-De Meester and J.-P. Lecomte, Photoinduced electron transfer between ruthenium complexes and nucleotides or DNA
M. Klessinger, Theoretical models for the selectivity of organic singlet and triplet photoreactions
G. Marconi and B. Mayer, Conformational and circular dichroism studies on cyclodextrin inclusion complexes
J. Mihi and Z. Havlas, Spin-orbit coupling in biradicals: Structural aspects
M. G. Neumann and M. J. Tiera, Photochemical determination of the interactions between surfactants and polyelectrolytes
A. Otsuka, N. Mataga and T. Okada, A chemical approach towards the photosynthetic reaction center
M. S. Platz, H. Huang, F. Ford and J. Toscano, Photochemical rearrangements of diazirines and thermal rearrangements of carbenes
H. D. Roth, H. Weng, D. Zhou and T. Herbertz, Electron transfer photochemistry of bifunctional strained-ring and unsaturated systems
M. Leibowitch, G. Olsson, J. R. Schaefer and J. Trotter, Absolute configuration correlation studies in solid state organic photochemistry
H. Shizuka, Photophysics and photochemistry of triplet exciplexes between triplet naphthalene derivatives and benzophenone
D. J. Stufkens, M. P. Aarnits, B. D. Rasenbaar and A. Vleek, Jr., A new series of Re- and Ru-complexes having a lowest σπ* excited state that varies from reactive to stable and long lived

H. Tomimaka, Matrix isolation study of reactive o-quinoid compounds: Generation detection and reactions

J. Troe, Towards a quantitative characterization photoisomerization rates

C. Wentrup, A. Reisinger, G. G. Qiao and P. Visser, Photochemistry of pyridyl azides and diazo ketones in matrix and in solution

F. Wilkinson, Quenching of electronically excited states by molecular oxygen in fluid solution

The recipient of the Porter Medal was Noboru Mataga (1927-2011) [39]. Waldemar Adam (Figure 39) presented an inspiring and entertaining plenary talk including the collaborations with several laboratories. Thomas Basché explained the possibilities of single molecule spectroscopy (SMS) to study host-matrix interactions in solids at low temperatures, whereas John Sheffer analysed the possibilities and methods used when studying photochemistry in solid samples. Martin Klessinger and Josef Michl showed in their respective presentations the advances in the capabilities of calculations of structures and trajectories.

I was asked to organize a workshop on “Photothermal Methods” within the frame of the Symposium. Contributors were R.
J. Dwayne Miller, Mathew Zimmt, Erich Vautey, Thomas Gensc, Cristiano Viappiani, and Reinhard Schmidt. The discussion was very lively. There were two other parallel workshops, one on “Photochemical Methods for the Oxidative Degradation of Organic Pollutants” chaired by Jim R. Bolton and André A. Braun and another one on “Photopolymerization” chaired by K. Dietliker and D. C. Neckers.

At the end of the Symposium a Round Table discussion on “The Future of Photochemistry” was organized by Ed Chandross who moderated the very participative discussion. As we know, the future is very unpredictable. The present (2015) very healthy and productive
(basic and applied, theoretical and instrumental, biological and in material sciences) photochemistry shows that its future was and still is very promising. A report on the Symposium was published in [40].

![Image](image_url)

**Figure 40.** Collaborators (former and contemporary) of Braslavsky in Helsinki, 1996. From left: Thomas Gensch, Pedro Aramendia, Cristina Martí, Claudio Borsarelli, Santi Nonell, Ana Paré. Private collection SEB.

The photo in Figure 40 shows my collaborators (former and contemporary) who attended the Symposium in Helsinki. After the Symposium, Claudio Borsarelli and I went hiking to the very North of Finland, to a National Park on the border between Sweden, Norway, and Finland. It was a wonderful week, camping and hiking on the way to the North, enjoying the long Finish summer nights, the lakes, the soft hills, the great huts, the saunas, the strawberries, and fighting the mosquitoes. I learned that several participants of the Symposium also enjoyed all the above wonders, including the mosquitoes.

Sitges, in the Catalan coast of Spain, was the site of the seventeenth IUPAC Symposium on Photochemistry, chaired by Richard (Dick) Caldwell (Figure 41) and locally organized by a group of Spanish photochemists led by Josep Font (see Figure 42) with José Luis Bourdelande, Santi Nonell, and Carmen Brosa. I attended this meeting in a
wheel chair, because I had broken a leg while hiking in Canada, some
time before the Sitges meeting. But that is another story.

Figure 41. Richard (Dick) Caldwell

Figure 42. From left: Josep Font, Guillermo Orellana, Ulises Acuña
in Helsinki, 1996. Private collection SEB.

F. C. De Schryver (Porter Medal), Time, space and spectrally resolved photochemistry from ensembles to single molecules
C. Heinemann, X. Xing, K-D. Warzecha, P. Ritterskamp, H. Görner and M. Demuth, An asymmetric induction principle and biomimetics with photons via electron transfer
A. Fujishima and T. N. Rao, Interfacial photochemistry: fundamental and applications
D. Gust, T. A. Moore and A. L. Moore, Mimicking bacterial photosynthesis
E. S. Medvedev and A. A. Stuchebrukhov, Dynamic effects in long-distance biological electron transfer reactions
R. N. Perutz, Metal dihydride complexes: Photochemical mechanisms for reductive elimination
J. Wirz, Kinetics of proton transfer reactions involving carbon

Franz De Schryver (Figure 12) [42] received the Porter Medal. Marye-Anne Fox and Franco Scandola presented invited lectures in a session dedicated to Francesc Trull, member of the organizing committee of the Symposium, a dear friend, and organic photochemist from Barcelona whose untimely early death in 1997 meant a sad personal and scientific loss. A session organized by Claus Seidel dealt with single molecule fluorescence spectroscopy and imaging (three lectures by Claus Seidel, Richard A. Keller, and Alfred J. Meixner) and fluorescence correlation spectroscopy (J. Widengren). Willi Sundstroem discussed the studies of his group on femto- and picosecond times of photoinduced reactions in small molecules and in chromophores of biological importance. Christoph Richter, from the Plataforma Solar de Almeria, reviewed the “Photochemical Applications of Sunlight for Fine Chemical Synthesis”, and Devens Gust summarized the studies from the group at Arizona State University towards man-made photosynthesis. William Wilson presented progress in volume holography and Jacques Delaire on photochromic polymers. In summary, great examples of applications of spectroscopy and photochemistry. Not all plenary and invited
lectures were published in *PAC*. A report on the Symposium was published in [43].

![Figure 43. Silvia Braslavsky](image_url)

I (Figure 43) had the pleasure of chairing the eighteenth IUPAC Symposium on Photochemistry in Dresden in 2000, with the enormous help of *Thomas Wolff* (Figure 44) as a local organizer.

![Figure 44. Thomas Wolff](image_url)

V. Balzani (Porter Medal)
H. D. Roth, Twentieth century developments in photochemistry. Brief historical sketches
D. E. Wetzler, C. Chesta, R. Fernández-Prini and P. F. Aramendía, Dynamic solvatochromism in solvent mixtures
F. Fages, S. Leroy, T. Soujanya and J.-E. Sohna, Photoactive pyrene-containing receptors for transition-metal ions
J. Fidy, M. Lazírny, B. Ulrich, L. Polgar, Z. Szótner, J. Gallay and M. Vincent, Tryptophan rotamers that report the conformational dynamics of proteins
L. Flamigni, Charge separation and energy transfer in multicomponent porphyrin arrays
R. H. Friend, Conjugated polymers. New materials for optoelectronic devices
G. I. Childs, D. C. Grills, Xue Z. Sun and M. W. George, Organometallic alkane and noble-gas complexes in conventional and supercritical fluids
B. Giese, M. Spichty and S. Westby, Long-distance charge transport through DNA. An extended hopping model
L. R. Gould, J. R. Lenhard, A. A. Muehler, S. A. Godlaski and S. Farid, New approach to silver halide photography using radical cation chemistry
M. Grätzel, Molecular Dynamics that mimic photosynthesis
A. R. Holzwarth, M. Katterle, M. G. Müller, Y.-Z. Ma and V. Prokhorenko, Electron-transfer dyads suitable for novel self-assembled light-harvesting antenna/electron-transfer devices
M. F. García-Parajó, J.-A. Veerman, L. Kuipers and N. F. van Hulst, Looking at the photodynamics of individual fluorescent molecules and proteins
Y. Inoue, Norimitsu Sugahara and Takehiko Wada, Vital role of entropy in photochirogenesis
M. A. Miranda, Photosensitization by drugs
G. K. Moortgat, Important photochemical processes in the atmosphere
M. Nowakowska, M. Kęczynski and K. Szczygielska, New polymeric photosensitizers
Y. Li, C. E. Whittle, K. A. Walters, K. D. Ley and K. S. Schanze, Photophysics of π-conjugated metal-organic oligomers
M. Terazima, Protein dynamics detected by the time-resolved transient grating technique
S. Tero-Kubota, Singlet and triplet energy splitting in the radical ion pairs generated by photoinduced electron-transfer reactions

R. de Vivie-Riedl, K. Kurtz and A. Hofmann, Coherent control for ultrafast photochemical reactions

P. Wan, Darryl W. Brousmiche, C. Z. Chen, J. Cole, M. Lukeman and M. Xu, Quinone methide intermediates in organic photochemistry

I. Willner and B. Willner, Molecular and biomolecular optoelectronics

V. Wing-Wah Yam, Molecular design of luminescent metal-based materials

Vincenzo Balzani received the Porter Medal and held a lecture entitled: “From Supramolecular Chemistry to Molecular-level Devices” [45]. The opening Plenary Lecture was by Itamar Willner. Jacqueline Barton gave a Plenary Lecture on “Charge transfer through the DNA pair stack” and shared the session with Bernd Giese who demonstrated in his Plenary Lecture the sensitivity of the charge transfer process in DNA to the particular arrangement of the bases.

After the session a very lively discussion evolved. The number of women offering lectures was larger than in previous Symposia; Jacqueline Barton, Lucia Flamigni, María García Parajo, Judit Fidy, Regina de Vivie-Riedle, Maria Nowakowska, Gudrun Hermann, and Vivian Wing-Wah Yam gave Plenary or Invited Lectures and a good number of women researchers were chosen to present oral contributions. There were three Workshops, one on “Theoretical Organic (Photo) Chemistry” organized by Martin Klessinger and held in memoriam of Mike Zerner, with the participation of Yehuda Haas, Michael Robb, and Tod Martinez, one on “Primary Processes in Biological Photoreceptors” organized by Tomas Gillbr with the participation of Philip Anfinrud, Martin Engelhard, Klaas Hellingwerf, Gudrun Hermann, and Vitaliy Sineshchekov, and one on “Solid State Photochemistry” organized by Miguel Garcia Garibay with the participation of Masahiro Irie, J. Michael McBride, Yushi Ohashi, and John Scheffer. The number of talks and posters dedicated to photobiology was very large. Still, there was a good balance of talks on all areas of photochemistry. Heinz Roth offered us a wonderful lecture on historical aspects of the development of photochemistry in the 20th Century and Kurt Schaffner gave us his recollections on the history of the IUPAC Symposia on Photochemistry. A report on the Symposium was published in [46].

In 2002 the Symposium in Budapest was chaired by Heinz Roth (Figure 45) with Josef Nyitrui (Figure 46) as the local organizer.
Figure 45. Heinz Roth, Guest Book, Max Planck Institute for Radiation Chemistry

Figure 46. Josef Nyitrai, Private collection SEB

- W. Lubitz, Photochemical processes in photosynthesis studied by advanced electron paramagnetic resonance techniques
- H. Tomioka, Triplet carbenes: From fleeting existence to attractive molecular units
- K. Mizuno, T. Hayamizu and H. Maeda, Regio- and stereoselective functionalization of electron-deficient alkenes by organosilicon compounds via photoinduced electron transfer
- D. M. Guldi, Molecular porphyrin-fullerene architectures
- O. A. Fedorova, Y. V. Fedorov, E. N. Andriyukhina, S. P. Gromov and M. V. Alfimov, Cation-dependent photochromic properties of novel ditopic receptors
- H. García, Photoresponsive porous organosilicas
- S. E. Braslavsky, Electron-transfer reactions studied by laser-induced optoacoustics: Learning about chromophore-medium (protein) interactions

Josef Michl (see Figure 31) received the Porter Medal and was introduced by Jakob (Joggi) Wirz [48]. The opening session started with the Plenary Lecture by Rudolf Rüger on “Stochastic processes and correlated events: Catalysis by single enzyme molecules”, followed by the Invited Lecture by Eric Vauthey about “Ultrafast spectroscopic investigations of intermolecular photoinduced electron transfer reactions”. There were two parallel workshops, one on “Fast Spectroscopy on Biological Systems” organized by Eric Vauthey with the participation of Mircea Catu, Abderrazek Douhal, Hiroshi Fukumura, and Bern Kohler and the other one on “Theory and calculations in Photochemistry” organized by Thomas Ball with the participation of Obis Castaño, James Hyner, Giorgio Orlandi, and Michael Kärzjin. The oral contributions were organized in three parallel sessions. Bob Liu reviewed his concept of “Hula-twist as a supramolecular photoisomerization mechanism.” Two-photon
excitation was the object of a talk by Seth Marder. The promising two-photon technologies and applications in medicine were obviously made possible in 2002 by the development of powerful lasers and nowadays of laser diodes. There was a Round Table discussion about the future of photochemistry with Ed Chandross, Heinz Roth, Frans De Schryver, Josef Michl, and Hiroshi Masuhara. Again (like 6 years earlier in Helsinki) the point was made that good applications only can arise from excellent research in basic science and good basic science education.

Figure 47 is a snapshot I made from a group of photochemists during the Wednesday excursion. A report on the Symposium was published in [49].

![Figure 47](image)

*Figure 47. From left: Norbert Hofmann, Horst Kisch, Helmut Görner, (front) Axel Griesbeck, Joachim Mattay, Hana Griesbeck and Heinz Roth. Budapest, 2002. Private collection SEB*

*Miguel Angel Miranda (Figure 48) was the Chair of the twentieth IUPAC Symposium on Photochemistry held in Granada. Bartolomé Quintero (Figure 49) led the local Organizing Committee.*
Figure 48. From left: Jeanne Weiss, Miguel A. Miranda, Miguel Neumann and Dick Weiss. Granada, 2004. Private collection SEB.

Figure 49. From left: Amalia Miranda (sitting), Tito Scaiano and wife Elda, Ana Moore and Bartolomé Quintero. Granada, 2004. Private collection, SEB.


J. Cadet, Sophie Courdelavault, J.-L. Ravanat and T. Douki, UVB and UVA radiation-mediated damage to isolated and cellular DNA

K. Kawai and T. Majima, Photosensitized one-electron oxidation of DNA

A. Sinicropi, T. Andruniow, L. De Vio, N. Ferré and M. Olivucci, Toward a computational photobiology

V. Lhiaubet-Vallet, Photosensitization by chiral drugs: Looking for stereodifferentiating photoprocesses in the presence of biomolecules


J. C. Scaiano, C. Aliaga, M. N. Chrétien, M. Frenette, K. S. Focsaneanu and L. Mikelsons, Fluorescence sensor applications as detectors for DNA damage, free radical formation, and in microlithography

H. Inoue, S. Funyu, Y. Shimada and S. Takagi, Artificial photosynthesis via two-electron conversion: Photochemical oxygenation sensitized by ruthenium porphyrins with water as both electron and oxygen atom donor

A. D’Aléo, S. Welter, E. Cecchetto and L. De Cola, Electronic energy transfer in dinuclear metal complexes containing meta-substituted phenylene units

A. Credi and B. Ferrer, Rotaxane-based molecular machines operated by photoinduced electron transfer

A. G. Griesbeck, T. T. El-Idreesy and A. Bartoschek, Photooxygenation in polymer matrices: En route to highly active antimalarial peroxides

H. D. Roth, Return electron transfer in radical ion pairs of triplet multiplicity

Graham Fleming (Figure 50) received the Porter Medal. In his lecture he showed how a combination of advanced time-resolved techniques (in transient absorption and emission) and computations provide an insight into the mechanisms underlying the rapid processes of energy transfer in the antennas of the photosynthetic units. John Polanyi (Chemistry Nobel Laureate in 1986) gave a Plenary Lecture on “Reaction dynamics a molecule at a time: Patterns of photochemical reaction at Silicon studied by scanning tunneling microscopy”. Three parallel sessions focused on the various aspects
of photochemistry. X. Sunney Xie presented a talk on “Single molecule studies of electron transfer in biological systems” showing data of transfer from a donor tyrosine to an acceptor flavin in the enzyme flavin oxidoreductase. Ana Moore took the audience through a tour of the several years of efforts to realize man-made bioinspired photosynthesis. Haruo Inoue also showed the advances in their efforts in the area of man-made photosynthesis. These talks and several other contributions showed that many groups were making progresses in the direction of biomimetic energy conversion. Massimo Olivucci elaborated on the impressive advances of the calculations of trajectories after excitation of chromoproteins. Paul Barbara described methods to measure charge mobility in photoconducting polymers at the level of single molecule. There was no report of this Symposium in the EPA Newsletters, since Jean Kossanyi (Figure 10), editor at the time of the EPA Newsletter, had passed away in 2004 [51] and it took some time to resume the regular publication of the EPA Newsletters. A report of the Symposium was published in the Newsletters of the I-APS [52].

![Figure 50. Graham Fleming](image)

The twenty-first IUPAC Symposium on Photochemistry was taken by its scientific Chairman Masahiro Irie (Figure 51) to Kyoto in April 2006 during the Cherry Blossom season (a wonderful time of the year!). The previous symposia (all in Europe) had been in general
at the end of July. Chairman of the local Organizing Committee was Atsuhiko Osuka (Figure 52).

Figure 51. Masahiro Irie

Figure 52. Atsuhiko Osuka.

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<td>H. Masuhara (Porter Medal), T. Azabi and Y. Hosokawa, Laser nanochemistry</td>
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<td>J. Hofkens, T. D. M. Bell, A. Stefan, E. Fron, K. Müllen and F. C. De Schryver, Probing molecular properties and the role of the environment at the single-molecule level</td>
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<td>K. Maeda, K. Teramura, N. Saito, Y. Inoue, H. Kobayashi and K. Domen, Overall water splitting using (oxy)nitride photocatalysts</td>
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<td>V. Lhiaubet-Vallet and M. A. Miranda, Drug-biomolecule interactions in the excited states</td>
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<td>S. Kanvah and G. B. Schuster, Oxidative damage to DNA: Inhibition of guanine damage</td>
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Figure 53. Howard Zimmerman

Howard Zimmerman (Figure 53) [54] and Hiroshi Masuhara (Figure 54) [55] received each a Porter Medal for their life work. The
Symposium was very well attended with 777 participants. Parallel sessions with a total of 278 presentations were organized. A total of 450 posters were presented.

Figure 54. Hiroshi Masuhara

William E. Moerner (Chemistry Nobel Prize in 2014) held the opening plenary lecture with the title “Single Molecules as Nanoscale Reporters in Biophysics, Chemistry, and Material Sciences”. Klaus Müllen introduced the new family of synthetic dyes derived from the commercial perylenetetracarboxydiimide, with optical, morphological and other properties, suitable for very different applications. Some of the studies with these molecules were explained by Frans De Schryver in his talk “Probing molecular properties and the role of the environment at the single-molecule level”. Mireille Blanchard-Desce talked about “Molecular engineering of two-photon absorbing molecules for bioimaging”. All these contributions show a high level of multidisciplinary collaboration. Paul Corkum offered a talk with the title: “Attosecond imaging: Asking a molecule to paint a self-portrait” and Lei Jiang talked about “UV-manipulated switch between superhydrophobicity and superhydrophilicity”. Nick F. van Hulst gave a talk about “Ultrafast femtosecond single molecule spectroscopy” and Monique Martin demonstrated that charge transfer is the driving force for the photoactivity of the PYP chromophore in solution. There were several presentations and many posters in the area of
photobiology. Masahide Terazima showed the power of photorefractive techniques in his talk on “Time-resolved studies of conformational changes of photo-response proteins in solution” and his group presented 5 posters with applications of the technique to various chromoproteins. Jacques Moser (with co-authors Bernard Wenger and Michael Grätzel) presented the initial talk in a Workshop on solar cells: “Dynamics of light-induced interfacial electron transfer in the dye-sensitization of nanocrystalline oxide semiconductors”.

During the workshop on solar cells Josef Michl was one of the scheduled speakers with the lecture: “Search for singlet-fission sensitizers for a more efficient solar cell”. In view of the technical difficulties to connect Josef’s laptop, he decided to give the talk without slides. We could really follow the wonderful explanations with no figures. Notwithstanding this, Josef was given the opportunity later during the Symposium to repeat his presentation, in this case with connected laptop!

Figure 55. Heinz Roth singing at the Banquet in Kyoto (April 2006)

One of the main goals of many research groups in photochemistry is obtaining long-lived charge-separated states capable of sustaining an electron transfer chain for solar energy conversion. In search of this goal, Sunishi Fukuzumi reported during
his talk the finding of a long-lived charge-separated state photoproduced in newly synthesized dyads containing the acridinium ion. In the same session, Jan Verhoeven, in his invited presentation, challenged Fukuzumi's interpretation of the data arguing that the long-lived states corresponded to the well known triplet states of the acridinium ion. A lively discussion followed the presentations.

Figure 56. Franco Scandola with a Geisha during the banquet, Kyoto, 2006

Figure 57. Hermenegildo García and Enrique San Román with a Geisha
During the banquet Heinz Roth entertained us with some beautiful singing (Figure 55). Figures 56 - 58 show various colleagues during the Symposium Banquet and with the Cherry trees. There was no published report on this Symposium.

Figure 58. From left: Klaas Zachariasse, Masahide Terazima, and Gabriel Andrés with Cherry trees

Figure 59. Devens Gust
The twenty-second IUPAC Symposium was chaired by Devens Gust (Figure 59) and held in Göteborg in 2008. The local Organizing Committee was chaired by Bo Albinsson (Figure 60).

Figure 60. Bo Albinsson


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<td>J. M. G. Martinho, T. J. V. Prazeres, L. Moura and J. P. S. Farinha</td>
<td>Fluorescence of oligonucleotides adsorbed onto the thermoresponsive poly(isopropyl acrylamide) shell of polymer nanoparticles: Application to bioassays</td>
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<td>Interaction of UV radiation with DNA helices</td>
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<td>D. Vobornik, D. S. Banks, Z. Lu, C. Fradin, R. Taylor and L. J. Johnston</td>
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<td>M. Irie and M. Morimoto</td>
<td>Photochromic diarylethene molecules and crystals</td>
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<td>J. A. Calladine, K. Q. Vuong, X. Z. Sun and M. W. George</td>
<td>Recent advances in organometallic alkane and noble gas complexes</td>
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The opening Plenary Lecture was delivered by Eric Vauthey on “Photoinduced electron transfer reactions: From basic questions to potential applications”. Michael Wasielewski (Figure 61) received the Porter Medal and gave a lecture on “Charge and spin dynamics in molecules and materials: from photosynthesis to spintronics”. The EPA conferred for the first time a prize to a young investigator (together with the Journal PPS) and one for the best PhD Thesis in Photochemistry. The awardees were Alexandre Fürstenberg (Geneva) and Maria Abrahamsson (Uppsala), respectively, each of whom delivered a lecture after receiving the award. Stefan Hell (Chemistry Nobel Prize in 2014) gave a lecture on “Far-field fluorescence nanoscopy”, sponsored by the Journal Photochemical and Photobiological Sciences. Harry Gray delivered a lecture on “Electron tunneling through proteins” and Vincenzo Balzani one on “Molecular devices and machines”. Many groups showed the progress on solar energy conversion in its various approaches, such as new types of solar cells, photocatalytic hydrogen formation, nanostructured electrodes, and others. Leif Hammarström offered a talk on “Biomimetic approaches to artificial photosynthesis. Controlling coupled electron transfer”. In the three parallel sessions contributions on single molecule spectroscopy as well as on nanodevices, analytical devices using fluorescence as well as on molecular aspects of photobiological processes and organic photochemistry were presented. Major progresses in calculations of excited species were shown. Josef Michl
demonstrated that new ways of solar energy conversion may be possible in his talk “Singlet fission – can it be harnessed?”. The Bordeaux group (Dario Bassani et al.) demonstrated an important progress in the collaborative work on supramolecular structures. There were 430 participants from 51 Countries. A report on the Symposium was published in [57].

The twenty-third IUPAC Symposium was chaired by Franco Scandola (Figure 62) in Ferrara in 2010, with the help of C. Chiurboli as head of the local organizing Committee.

D. Phillips (Porter Medal), Toward targeted photodynamic therapy


E. Oliveros, M. L. Dántola, M. Vignoni, A. H. Thomas and C. Lorente, Production and quenching of reactive oxygen species by pterin derivatives, an intriguing class of biomolecules

A. Kotiaho, R. Latitinen and H. Lemmetyinen, Photoinduced processes in chromophore-gold nanoparticle assemblies

K. Kam-Wing Lo, K. Yin Zhang and S. Po-Yam Li, Design of cyclometalated iridium(III) polypyridine complexes as luminescent biological labels and probes

J. Narasimha Moorthy, S. Samanta, A. L. Koner and W. M. Nau, Steady-state photochemistry (Pschorr cyclization) and nanosecond transient absorption spectroscopy of twisted 2-bromoaryl ketones

Y. Zhang, E. Galoppini, P. G. Johansson and G. J. Meyer, Homoleptic star-shaped Ru(II) complexes


K. Youaf, A. Belabka, A. Llanes-Pallás, D. Bounjari and N. Amourdi, Engineering supramolecular photactive nanomaterials by hydrogen-bonding interactions

David Phillips (Figure 63) was awarded the Porter Medal [59]. The opening Plenary Lecture was given by Tom Meyer on “Making solar fuels at interfaces”, followed by an Invited Lecture by Paul Barbara on “Sub-nanometer optical single molecule experiments on charge separation and trapping in conjugated polymers”. It was the last time the photochemical community enjoyed his brilliant lectures, since Paul passed away some months after the Symposium. Again in this Symposium there was a large number of presentations showing the various efforts to understand the natural photosynthetic processes and to develop better systems for solar energy conversion. In addition to the talk by Tom Meyer, Rink van Grondelle explained how using ultra-short time spectroscopies his group has found that “Conformational switching in plant light harvesting complexes regulates photosynthesis”, from efficient energy transfer under low intensity light to heat dissipation under elevated radiation conditions.

Daniel Nocera focussed his talk on the possibility of solar energy storage through a two-electron reductive elimination of halogen from a metal center. Massimo Olivucci showed how, based on their advanced computational studies, it is possible to start designing (and synthesizing) molecules mimicking the photoisomerization of retinal-proteins. Stefan Matile described the strategy to build “Supramolecular architectures for artificial photosynthesis” and Devens Gust explained how it is possible “Controlling light by light: From photosynthesis to molecule-based signal transduction”. The EPA-PPS prize was
conferred to Werner Nau, whereas the prize for the best thesis in photochemistry was given to Anne Kortiaho (Tampere, Finland) [60].

The twenty-fourth IUPAC Symposium on Photochemistry was held in Coimbra, Portugal, in 2012. Scientific Chair was Hugh Burrows (Figure 64) and head of the Organizing Committee was Artur J. M. Valente (Figure 65).

![Figure 65. Artur J. M. Valente](image)


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G. Yang, S. Li, S. Wang, R. Hu, J. Feng, Y. Li and Y. Qian, Novel fluorescent probes based on intramolecular charge- and proton-transfer compounds
S. Protti, D. Ravelli, M. Fagnoni and A. Albini, Smooth photogeneration of α,α-didehydrocorulenes (DHTs)
C. F. Sailer and E. Riedle, Photogeneration and reactions of benzhydryl cations and radicals: A complex sequence of mechanisms from femtoseconds to microseconds
S. Arumugam, S. V. Orski, N. Eric Mina, C. McNitt, G.-J. Boons, J. Locklin and V. V. Popik, Photo-click chemistry strategies for spatiotemporal control of metal-free ligation, labeling, and surface derivatization

Tom Meyer received the Porter Medal (Figure 66) [62]. The Symposium opened with Plenary lecture by Gregory Scholes on “Quantum mechanisms for light harvesting in photosynthesis” followed by three parallel sessions with Invited Lectures and later on with oral communications. There were 600 participants and a very wide repertoire of subjects. A novel aspect was presented in the talk by Maria João Melo about “Photochemistry of cultural heritage”. The talk by Tetsuro Majima treated the hole transport in DNA and Guillermo Bazán described the use of poly- and oligo-electrolytes in optoelectronics and bioelectronics. Anthony (Tony) Harriman and Franco Scandola (the latter in a lecture sponsored by the journal PPS) described strategies for the production of synthetic harvesting antennas and artificial photosynthetic units, respectively, whereas Ben Feringa reported the latest advances regarding the “Design, synthesis
and functioning of molecular systems with optical molecular switches and light-driven molecular motors”. The extended sessions on solar energy conversion devices, photovoltaic cells, and other improvements in this direction were very well attended. Several Invited Lectures were given by Chinese photochemists, underscoring the Chinese modern scientific development, and of course several Invited Lectures were from Japanese and South Korean colleagues. Sebastião Formosinho shared his talk with Luis Arnaut about “Rational design of photodynamic photosensitizers”. Ultrafast absorption and emission techniques, single molecule detection, cross-correlation emission, nanotechnologies, and micro- and nano-scopies have become regular techniques in several laboratories around the world. Reports about the use of these techniques were presented in oral communications and posters.

The EPA prize for the best thesis in photochemistry 2011-2012 was awarded to Karl Börjesson (Chalmers University). Mike Heilemann was the recipient of the EPA-Photochemical and Photobiological Sciences (PPS) Prize Lecture [63]. The Langmuir award for best presentation in the Young Photochemists’ session was given to Danielle Wilson (Victoria University, Canada) and special commendations were given to Laurence Pessoni (Université de Pau et des pays de l’Ardour, France) and to Marina Blanco-Lomas (Universidad de La Rioja, Spain).
The twenty fifth IUPAC Symposium on Photochemistry was held in Bordeaux in 2014. Scientific Chairman was Dario Bassani (Figure 67) and local Co-Chair organizers were André del Guerzo (Figure 68) and Nathan McClenaghan (Figure 69). The Symposium marked the 50 years of IUPAC Photochemistry, a proud anniversary celebration with 631 participants from 41 Countries.

M. Irie (Porter Medal) Making and breaking bonds with light: Discovery and development of photochromic diarylenes

J. Abe, Fundamentals and applications of fast photochromic materials

J. McCusker, Spin effects on energy and electron transfer processes

C. Adachi, Molecular design for high efficiency delayed fluorescence and their application in organic light emitting diodes

U. Pischel, Photochromic switches for advanced molecular information processes

M. García Garibay, Reaction yield amplification by quantum-chain photochemical reactions in crystalline solids

M. Fujita, Trapping reaction intermediates photochemically generated in a synthetic cavity

A. Ajayaghosh, Photoresponsive supramolecular assemblies and gels

V. Plyusnin, Photochemistry and photochemistry of the dithiolate Cu(III) and Ni(III) complexes. Processes from hundreds of femtoseconds to seconds

O. Wolfbeis, Chemical sensing and biosensing using advanced fluorescent (nano) materials

H. Misawa, Plasmon-assisted artificial photosynthesis systems

C. Turro, Excited states of inorganic complexes for applications in biology and sustainable energy

A. Credi, The ethernal youth of azobenzene: New photoactive molecular and supramolecular devices and materials

D. Leigh, Making the tiniest machines

C. Timmel, “A bird’s eye view” of cavity-based absorption spectroscopy of radical pairs

F. Odobel, Molecular systems to mimic the charge photoaccumulation and the Z scheme functions of biological photosynthesis

A. Griesbeck, Singlet oxygen reactions: new selectivity modes and synthetic applications

L. Flamigni, Functional arrays for light energy capture and charge separation

M. Shemyakin, Ultrafast relaxation dynamics in metal complexes: interplay of spin, electronic and structural rearrangements

L. Tolbert, Turn-on fluorescent sensors for biological applications

H. Uji, Sub-diffraction limited remote excitation of surface enhanced Raman/fluorescence spectroscopy

J. Zhao, Selective organic synthesis mediated by TiO2 photocatalysis

M. Kuimova, Mapping microscopic viscosity with molecular rotors: from live cells to atmospheric aerosols

J. Andreasson, Photochromic control of DNA-binding with added value

W. Skene, Autochromes: reversible polymers for fluorescence tuning
J.-M. Lehn, Towards adaptive chemistry. Aspects of photoinduced processes
S. E. Braslavsky, The history of the IUPAC Symposia on Photochemistry – a
success story
H. Burrows, Uranyl ion photochemistry revisited
N. Hoffmann, Photochemically induced radical reactions with furanones
G. La Ganga, Artificial photosynthesis: a molecular approach to
photoinduced water oxidation
M. Litter, Mechanisms of removal of heavy metals and arsenic from water by
TiO₂-heterogeneous photocatalysis

Figure 69. Nathan McClenaghan

The Porter Medal was awarded to Masahiro Irie (see Figure 51) for his work on photochromic materials. In his talk he offered a
historical view about the development of these materials, including
the strong scientific contacts with colleagues from Bordeaux, and
even performed an experiment on photochromism. David Leigh elaborated on “Making the tiniest machines” and, by the way, performed several very entertaining magic tricks during his lecture! The opening Plenary Lecture was given by Jiro Abe on “Fundamentals and applications of fast photochromic materials”. Miguel Garcia Garibay delivered a talk on “Reaction yield amplification by quantum-chain photochemical reactions in crystalline solids”.

Figure 69. Nathan McClenaghan
There were three parallel sessions. Several talks were presented on the use of scaffolds for the production of man-made photosynthetic systems, such as those developed in Bo Albinson’s lab using self-assembled DNA nanosystems for energy and electron transfer applications. Lucia Flamigni spoke also on “Functional arrays for light energy capture and charge separation”. “Chemical sensing and biosensing using advanced fluorescent (nano) materials” was the title of the talk given by Otto Wolfbeis. Many talks were devoted to progress in luminescent sensors for biological applications, such as those by Laren Tolbert and by Willi Skene. Jean-Marie Lehn (Chemistry Nobel Laureate in 1987) developed his ideas “Towards adaptive chemistry. Aspects of photo-induced processes”. Hugh Burrows in his talk revisited the photochemistry of the uranyl ion. The International Foundation of Photochemistry sponsored the lecture by Marta Litter in which she explained why photocatalysis is the method of choice to remediate waters contaminated with metal ions.

The EPA-PPS Prize Lecture was delivered by Norbert Hoffmann and the EPA PhD Prize lecture was given by Giuseppina La Ganga (Univ. Messina). There were also Poster Award presentations.

This account is a mere progress report of the successful story of the IUPAC Symposia on Photochemistry. The series will hopefully continue with prominent actors, very engaged young students and researchers, interesting results, and a large number of successful international projects. The Symposia have given strong impulses to the field. The theoretical and practical knowledge gained over these 50 years of IUPAC Photochemistry has been enormous. Many of the applications developed have undoubtedly contributed to a better life for our societies. In the UNESCO Year of light (2015) [63], the photochemical community is proud to be a highly interdisciplinary group of colleagues actively collaborating with each other, working with light and developing tools using light, with a large number of students following the steps of many brilliant scientists that have enlightened the path over many years.

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References

1. With the exception of those for Symposium IV in Baden-Baden, the proceedings of all other Symposia are found in http://www.iupac.org/publications/pac/conferences/family/PHOTO/. Not all lectures and oral presented in the Symposia are published, but the collections are representative of the evolution of Photochemistry over the years. The reports on the Symposia published in the European Photochemistry Association (EPA) Newsletters are a vivid account of the events during each Symposium.


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