

**Vincenzo Balzani**

**CURRICULUM VITAE**

**Name: Vincenzo Balzani**

**Present address:** Dipartimento di Chimica "G. Ciamician" Università di Bologna, Via Selmi 2, 40126 Bologna, Italy.

[www.ciam.unibo.it/photochem](http://www.ciam.unibo.it/photochem)

**Birth:** November 15, 1936, at Forlimpopoli (Forlì), Italy

**University Education:** Laurea in Chimica, cum laude, University of Bologna (Italy), 1960.

**Present Position:** Professor of Chemistry, University of Bologna (Italy), since 1973.

**Past Positions:** Assistant Professor, University of Bologna, 1963-1968; Assistant Professor, University of Ferrara, 1968-1969; Associate Professor, University of Bologna, 1969-1973.

**Activities:**

- **Visiting Professor:** University of British Columbia, Vancouver, Canada 1972; Energy Research Center, Hebrew University of Jerusalem, Israel, 1979; University of Strasbourg, France, 1990, University of Leuven, Belgium, 1991; University of Bordeaux, France, 1994.
- **Director :** Photochemistry and Radiation Chemistry Institute (FRAE) of the Italian National Research Council (CNR), Bologna (1977-1988); III Summer School of the European Photochemistry Association (1979); Center for the Photochemical Conversion of Solar Energy, University of Bologna (1981-1998); NATO ARW on "Photoinduced Charge Separation and Energy Migration in Supramolecular Systems", Capri, Italy (1987); II NATO Science Forum "Supramolecular Chemistry", Taormina, Italy (1991); School on Photochemistry, ICS, Trieste, Italy (1993); PhD course in Chemical Sciences, University of Bologna (2002-2007). Laurea specialistica (pre-doc course) on Photochemistry and Material Chemistry (2004-2007)
- **Chairman:** Baxendale Memorial Symposium (1983); Workshop on "Stati Eccitati, Intermedi Reattivi, e Metodologie di Studio" (1988); XII IUPAC Symposium on Photochemistry (1988); Gruppo Italiano di Fotochimica (1982-1986); European

- Photochemistry Association (1988-92); International Symposium on "Photochemistry and Photophysics of Coordination Compounds (1989- )
- **Member of Scientific Committees:** Representative of the Italian Government at CEE for the research in Photochemistry and Photobiology (1974-76); International Symposium on "Photochemistry and Photophysics of Coordination Compounds" (1974-1989); International Conference on "Photochemical Conversion and Storage of Solar Energy" (1976-1984); IUPAC Symposium on Photochemistry (1976, 1982, 1986, 1988, 1990); Photochemical Center of the Italian National Research Council (CNR), Ferrara (1976-2000); Standing Committee of the European Photochemistry Association (1982-86); Executive Committee of the European Photochemistry Association (1986-1988); Meeting on "Trends in BioInorganic Chemistry" (1988); ICS Conference on "Lasers in Chemistry" (1990, 1993); NATO Advanced Study Institute on "Photoprocesses in Transition Metal Complexes, Biosystems, and Other Molecules" (1991); EUCHEM Conference on "Supramolecular Reactivity and Catalysis" (1991); Congresso Nazionale di Chimica Supramolecolare (1993- ); EPA Summer School on "Photoinduced Energy and Electron Transfer in Supramolecular Species" (1992); Panel of experts, NATO Special Programme on Supramolecular Chemistry (1992-94); Scientific Council, European Laboratory for Non-Linear Optics (1993-2000); Second European Conference on Molecular Electronics (1994); European Society for the Promotion of Basic Research in Quantum Solar Energy Conversion (1994-2000); Changchun International Symposium on Functional Supramolecular Systems (1995); Jury of the Boulart Prize, Bruxelles (1995); NATO ARW on Physical Supramolecular Chemistry (1996); XXI International Symposium on Macrocyclic Chemistry (1996); XXXIII International Conference on Coordination Chemistry (1998); The Italian Academy for Advanced Studies in America (1998- ); Centro CNR per lo Studio sulla Sintesi e Stereochimica di Speciali Sistemi Organici, Milano (1998-2000); Centro CNR per lo Studio dei Meccanismi di reazione, Roma (1998-2000); Institute for Advanced Study, University of Bologna (1997- ). Meeting on "Realtà e prospettive della Chimica nell'Università di Bologna (1999); Symposium on "Le Frontiere della Chimica", Accademia dei Lincei, 1999; Meeting on "Inorganic Crystal Engineering", RSC (2000); International Conference on "Science and knowledge: towards which rationality?" (2000); VI International Meeting on Solar Energy and Applied Photochemistry (2000); Scientific Council of the Bononia University Press

(2001- ); Santa Maria Workshop on Supramolecular Chemistry (2002); Giornate della Chimica, Accademia Nazionale dei Lincei (2002-2005); III Convegno Nazionale di Fotobiologia e Fotochimica (2002). Symposium on Supramolecular Approaches to Organic Electronics and Nanotechnology, Strasbourg (2004); NanoTech Insight, Luxor (2005); Nanoforum, Milan (2005); Scientia Rerum: la Scienza di fronte ai classici, Bologna (2005); Cronobie, Bologna (2005); XVIII IUPAC Conference on Physical Organic Chemistry (2006); Nanotech Insight, Cairo (2007); International Symposium on Radiation and Photochemistry, Kerala, India (2006); International Conference on Molecular Machines and Sensors, Shanghai, Cina (2007); Convegno su: “Le fonti di energia”, Accademia dei Lincei e Accademia delle Scienze di Torino, Torino, 2007; Committee on “La storia dell’energia solare” (2007); Convegno “Giacomo Ciamician, genio della chimica e profeta dell’energia solare”, Bologna, 2007); European Materials Research Society Meeting, Strasbourg, 2008; XV International Conference on the Origin of Life, Florence. 2008; Conference on Energy crisis, water shortage, and climate changes in the Mediterranean area: the involvement of chemistry, Castiglione della Pescaia, Italy, 2008; Convegno su Dmitry Mendeleev, Accademia dei Lincei, Roma, 2009; Convegno su “Storia naturale della creatività”, Accademia dei Lincei, Roma, 2009; Centro Agorà Scienza, Università di Torino, 2009.

- **Member of Editorial Boards:** Research on Chemical Intermediates (1983-1991); Gazzetta Chimica Italiana (1984-1989); Supramolecular Chemistry (1992- 2009 ); New Journal of Chemistry (1994-2000); Nanotechnology (1994-2001); Chemistry European Journal (1995- ); Inorganica Chimica Acta (1995-2002); Inorganic Chemistry (1997-1998); Chemical Society Review (1997-1998); International Journal of Photoenergy (2000-2008); ChemPhysChem (2000- ); RSC Dalton Transactions (2000-2007); Accounts of Chemical Research (2000-2003); Encyclopedia of Supramolecular Chemistry (2002-2003); Organic & Biomolecular Chemistry (2003-2007); Tetrahedron (2003-2007); Tetrahedron Letters, 2003-2007); Comptes Rendus Chimie (2004- ); Topics in Current Chemistry (2005-2009 ); Small (2005- ); ChemSusChem (2008- )
- **Editor:** *Supramolecular Photochemistry*, Nato ASI Series n. 214, Reidel, Dordrecht, 1987; *Supramolecular Chemistry*, Nato ASI Series n. 371, Reidel, Dordrecht, 1992 (with L. De Cola); Guest Editor, *Supramolecular Photochemistry*, New J. Chem.,

n.7-8, vol. 20, 1996; Editor in chief of the Handbook on *Electron Transfer in Chemistry*, in five volumes, Wiley-VCH, Weinheim, 2001; Topics in Current Chemistry, volumes 280 and 281 on *Photochemistry and Photophysics of Coordination Compounds*, 2007.

- **Fellowships and Memberships:** *Fellow:* American Association for the Advancement of Science; Royal Society of Chemistry; Accademia Nazionale delle Scienze detta dei XL; Accademia Nazionale dei Lincei; Institute of Advanced Study, University of Bologna (resident fellow); Accademia delle Scienze di Torino; Società Nazionale di Scienze, Lettere ed Arti in Napoli; Academia Europaea; Accademia delle Scienze di Bologna; European Academy of Sciences. *Member:* European Photochemical Association; Inter-American Photochemical Society; Società Chimica Italiana.

### **Awards**

Miriam Borsari Medal, University of Bologna, 1960; Pacific West Coast Inorganic Lectureship, USA and Canada, 1985; Gold Medal "S. Cannizzaro", Italian Chemical Society, 1988; Doctorate "Honoris Causa", Faculty of Science, University of Fribourg (CH), 1989; Franqui Chair, University of Leuven, Belgium, 1991; Accademia dei Lincei Award in Chemistry, Italy, 1992; Wenner Gren Distinguished Lectureship, Sweden, 1993; Ziegler-Natta Lecturer, Gesellschaft Deutscher Chemiker, Germany, 1994; Italgas European Prize for Research and Innovation, 1994; Centenary Lecturer, The Royal Chemical Society (U.K.), 1995-96; Lee Lecture, University of Chicago, USA, 1995-96; Blacet Lecture, University of California at Los Angeles, USA, 1998; Sacconi Lecture, University of Florence, Italy, 1999; Porter Medal for Photochemistry, 2000; Prix Franco-Italien de la Société Française de Chimie, 2002; Upper Rhine Lectureship, France and Germany, 2002; Premio al Merito, Camera di Commercio, Industria e Agricoltura della Provincia di Forlì-Cesena, 2003; Ungaretti Lecture, University of Pavia (Italy), 2005; Grande Ufficiale dell'Ordine al Merito della Repubblica Italiana, 2006; Werdelmann Lecture, University of Essen (Germany), 2006; Quilico Gold Metal, Organic Division, Italian Chemical Society, 2008; Premio Alta Qualità delle Città, Bologna, 2008; Premio Galileo per la letteratura scientifica, 2009; Honor Professor, East

China University of Science and Technology of Shanghai, 2009; Blaise Pascal Medal , European Academy of Sciences, 2009.

### **Research Interests**

Photochemistry. Photophysics. Supramolecular chemistry. Electron transfer reactions. Molecular-level devices and machines. Molecular nanotechnology. Photochemical solar energy conversion.

### **Scientific activity**

His scientific activity is documented by four monographs and more than 500 papers published on the most qualified journals. He has been invited to give lectures at a great number of national and international Conferences, and seminars at many Universities and Research Centers around the world.

## Vincenzo Balzani

### Description of the scientific activity

#### 1960-1982

*Vincenzo Balzani* since the early sixties investigated in a systematic way the photochemical and photophysical behavior of several families of classical coordination compounds (in particular, Co(III), Cr(III), and Pt(II) complexes). In **1970** he published (with V. Carassiti) the monograph *Photochemistry of Coordination Compounds* (Academic Press, London) which has been the most authoritative reference book in the field (see, e.g., *J.Am.Chem.Soc.*, **93**, 3560 **1971**), as well as a source of inspiration for many young photochemists in the last 30 years. In the early seventies he was one of the first scientists who discussed the problem of solar energy conversion by photosensitization of the water splitting reaction in a paper (*Science* **189** 852 **1975**) that stimulated the work of several research groups. In the same period, he demonstrated the reducing properties of the luminescent excited state of  $\text{Ru}(\text{bpy})_3^{2+}$  (*Inorg.Chem.* **13** 2976 **1974**), a complex that he has extensively used during the following years in photochemical, chemiluminescent and electro-chemiluminescent processes (review: *Topics Curr. Chem.* **158** 31 **1990**). A brilliant spin-off of these systematic investigations was the discovery of an "artificial firefly" based on the oscillating Belousov-Zhabotinski reaction (*J.Am.Chem.Soc.* **104** 4250 **1982**).

#### 1982-1992

In the period 1980-1988, in collaboration with the group of A. von Zelewsky (Univ. of Fribourg, CH), he investigated the photochemical and luminescent behavior of more than one hundred Ru(II)-polypyridine complexes, showing that it is possible to tune their ground and excited state properties by a suitable choice of the ligands (*Coord. Chem. Rev.* **84** 85-277 **1988**; this paper as so far received more than 2000 citations in the literature). This work has opened the way to an extensive use of polypyridine metal complexes in a variety of processes of fundamental and applicative interest. He also investigated a great number of Pt(II), Pt(IV), Rh(III), and Pd(II) cyclometalated complexes (review: *Advances in Photochemistry* **17** 1-68 **1992**); some of these complexes are currently used in several laboratories for obtaining light-emitting diodes. He has then carried out extensive work in the field of bimolecular energy and electron transfer reactions involving excited states of coordination compounds, in part, in

collaboration with the group of F. Scandola, Univ. of Ferrara, Italy (see, e.g., *Inorg. Chem.* 25 4457 **1986**). Since 1983 he has been engaged in studies concerning luminescent lanthanide ions and in a series papers in collaboration with J.-M. Lehn (Univ. of Strasbourg, France) he has carried out systematic investigations on luminescent  $\text{Eu}^{3+}$  and  $\text{Tb}^{3+}$  cryptates which may be considered the simplest examples of "antenna" devices ( see, e.g., *Angew. Chem. Int. Ed.* 30 190 **1991**).

In 1984 he began to work on the possibility to control the photochemical and photophysical properties of coordination compounds by formation of supramolecular structures (*J.Am.Chem.Soc.* 107 6888 **1985**). His interest in the photochemical and photophysical properties of supramolecular species has then grown rapidly along three directions: (i) in collaboration with S. Campagna and G. Denti, he has investigated luminescent and redox-active oligonuclear complexes (including tri-, tetra-, hexa-, hepta-, deca-, trideca- and docosonuclear species, both homo- and hetero-metallic) in which, by a suitable choice and positioning of the various components, the electronic energy created by light excitation can be channelled in any desired part of the supramolecular structure (see, e.g., *J.Am.Chem.Soc.* 114 2944 **1992**); (ii) studies on host-guest systems in which the photochemical and photophysical properties of both partners can be strongly affected by their mutual interaction (see, e.g., *J.Phys.Chem.* 95 2080 **1991**); (iii) interaction of the chromophoric units that are present in species like catenanes and rotaxanes synthesized by the groups of J.-P. Sauvage and J.F. Stoddart (see, e.g., *J.Am.Chem.Soc.* 113 4033 **1991**; *J.Am.Chem.Soc.* 114 193 **1992**). His interest towards the photochemistry of supramolecular systems, and in particular towards the design of species capable of performing useful light-induced functions (photochemical molecular devices), has led him to write the monograph *Supramolecular Photochemistry* (Horwood, Chichester, **1991**, in collaboration with F. Scandola) which has been extremely well accepted (see reviews in *J. Am. Chem. Soc.*, 115, 1617 **1993** and *Angew. Chem. Int. Ed. Engl.*, 31, 104 **1992**).

### **1993-2009**

In the last 15 years, most of his activity has been dedicated to the design, construction, and characterization of molecular-level devices and machines in the frame of the bottom-up approach to nanotechnology. This activity has been carried out, in part, in collaboration with the groups of S. Campagna, F. Pina, J.F. Stoddart, and F. Vögtle. An innovative aspect of this research is the idea that the concept of macroscopic device can

be extended to the molecular level, and that it is possible to design supramolecular systems capable of performing specific functions upon stimulation with external energy inputs (in particular, with light).

Such an idea has been developed in many papers (vide infra) and illustrated in several review articles (see, e.g., *Chem.Rev.* 96 759 **1996**; *Acc.Chem.Res.* 31 405 **1998**; *Angew.Chem.Int.Ed.* 39 3348 **2000**; *Acc.Chem.Res.*, 34 445 **2001**; *Curr. Opinion Chem. Biol.*, 7 657 **2003**; *Small* 1 278 **2005**; *Topics Curr. Chem.*, 262, 1, **2005**; *Nanotoday*, 2(2), 18 **2007**; *Adv. Funct. Mat.*, 17, 740, **2007**; *Chem. Soc. Rev.*, 38, 1542 **2009**).

The topic of molecular-level devices and machines has also been extensively and systematically discussed in a monograph, in the frame of the bottom-up approach to nanotechnology (V. Balzani, A. Credi, M. Venturi: *Molecular Devices and Machines- A Journey in the Nano World*, Wiley-VCH, **2003**). Such a monograph, recently translated in Chinese and Japanese, has been very well accepted by the scientific community (see reviews in: *Angew. Chem. Int. Ed.*, 42, 2331 **2003**; *ChemBioChem*, 4, 663 **2003**; *J. Am. Chem. Soc.*, 126, 10191 **2004**). A second edition of this monograph, updated and enlarged, will appear in January **2008**.

The main results obtained in the field of molecular-level devices and machines can be summarized as follows (the most relevant papers are indicated):

1. Synthesis and characterization of dendrimers for light harvesting antenna systems based on transition metal complexes (*J.Am.Chem.Soc.* 116 9086 **1994**; *Chem. Eur. J.* 1 211 **1995**; *Acc.Chem.Res.* 31 26 **1999** ).

2. Photoinduced energy and electron transfer processes between metal complexes connected by flexible or rigid ligands (*J.Am.Chem.Soc.* 116 7692 **1994**; *J.Am.Chem.Soc.* 121 4207 **1999**, *ChemPhysChem* 7, 229, **2006**; *Chem. Eur. J.*, 14, 10772 **2008**.

3. Photochemical, photophysical, and electrochemical behavior of cyclophanes, catenanes, cages, knots, and tweezers (*J.Am.Chem.Soc.* 118 11610 **1996**; *Chem. Eur. J.*, 5 984 **1999**; *J.Am.Chem.Soc.* 121 5481 **1999**; *J.Org.Chem.* 65, 4120 **2000**; *Chem. Eur. J.*, 9, 2982 **2003**, *J.Am.Chem.Soc.*, 128, 637, **2006**; *J. Org. Chem.*, 73, 5839 **2008**).

4. Photo- and redox-active dendrimers, including : (i) photoswitchable boxes (*J.Am.Chem.Soc.* 121 6290 **1999**; *J.Am.Chem.Soc.* 129 in press **2007**); (ii) fluorescent sensors with signal amplification (*J.Am.Chem.Soc.* 124 6461 **2002**; *J. Mater. Chem.* 15, 2959 **2005**); (iii) light harvesting antennas (*Angew. Chem. Int. Ed.* 41 3595 **2002**; *Prog. Polymer Sci.* 30, 453 **2005**); (iv) fluorescent hosts for dyes (*ChemPhysChem* 224 **2000**;



*J.Am.Chem.Soc.* 126 568 **2004**); (v) dendrimers as ligands for metal ions (*J.Am.Chem.Soc.*, 125 4424 **2003**; *Chem.Eur.J.*, 10, 899, **2004**); (vi) molecular batteries (*Chem.Eur.J.*, 10, 6361, **2004**); (vii) self-assembling systems (*J.Am.Chem.Soc.* 126, 16466 **2004**; *Angew.Chem.Int Ed.* 44, 4574 **2005**; *Angew. Chem. Int. Ed.* 47, 5265 **2008**); (v) fluorescence depolarization (*ChemPhysChem* 7, 1980, **2006**; *J.Phys.Chem. B*, 111, 6620 **2007**; *ChemPhysChem*, 10, 265 **2009**); (vi) charge storing systems (*Chem. Eur. J.*, 14, 8365 **2008**).

5. Photochromism of molecules capable of performing as "write-lock-read-unlock-erase" molecular switching devices and logic gates (*J.Am.Chem.Soc.* 119 5556 **1997**; *Chem.Eur.J.* 4 1184 **1998**; *J.Mater.Chem.*, 9 2265 **1999**; *Eur.J.Org.Chem.*, 2699 **2002**; *J.Am.Chem.Soc.* 125 987 **2003**; *Chem.Eur.J.*, 10 1519 **2004**); this research line includes a paper on artificial chemical systems capable of mimicking some elementary properties of neurons (*J.Am.Chem.Soc.* 122 4496 **2000**).

6. Molecular-level logic gates based on pseudorotaxanes, rotaxanes and catenanes (*J.Am.Chem.Soc.* 119 2679 **1997**; *J.Am.Chem.Soc.* 122 4496 **2000**; *ChemPhysChem* 3, 101 **2003**).

7. Design and realization of other types of molecular-level devices and machines (*J.Am.Chem.Soc.* 120 11190 **1998**; *Chem.Eur.J.* 4 2411 **1998**; *J. Am.Chem.Soc.* 121 4397 **1999**; *J.Am.Chem.Soc.* 122 3542 **2000**; *Chem.Eur.J.* 6 3558 **2000**; *J.Am.Chem.Soc.* 122 3542 **2000**; *Chem.Commun.*, 1860 **2001**; *Proc.Natl.Acad.Sci.* 99 4814 **2002**; *J.Am.Chem.Soc.* 124 12786 **2002**; *Photochem.Photobiol.Sci.*, 2, 459 **2003**; *Chem.Eur.J.*, 9 2982 **2003**; *Chem.Eur.J.*, 9 5348 **2003**; *Chem.Eur.J.*, 10 6375 **2004**, *J.Am.Chem.Soc.*, 128, 1489 **2006**; *J.Am.Chem.Soc.*, 129, 4633 **2007**. The papers on a molecular elevator (*Science*, 303 1845 **2004**), a nanomotor powered by sunlight (*Proc.Natl.Acad.Sci.* 103 1178 **2006**), and a molecular-level extension cable (*Proc. Natl. Acad. Sci, USA*, 103 18411 **2006**) have been highlighted on several scientific journals.

8) Processing Energy and Signals by Molecular and Supramolecular Species (*Chem. Eur. J.*, 14, 26 **2008**; *ChemSusChem*, 1, 26 **2008**; *Chem. Eur. J.*, 15, 7876 **2009**; *Angew. Chem. Int. Ed.*, 48, 8516 **2009**).

His scientific interest on energy, and particularly on sunlight, has been extended to the discussion of related political, social and moral issues in an essay (*Angew.Chem.Int.Ed.*, 46, 52-66 **2007**) which has received much attention in the scientific community.

Recently he has written a book entitled: *Energy for a sustainable world*, Wiley-VCH, 2010, in press.

### **Comment on the most recent activity**

Molecular devices and machine are expected to find applications in (i) information transfer, storage, and display processes that, in the long run, should lead to the construction of molecular-based (chemical) computers, and (ii) the development of nanorobotics and other technologies related to the manipulation of matter and exploitation of its properties at the molecular level

From a more fundamental viewpoint, the bottom-up construction of devices and machines will move science and technology not only from the micro- to the nano-scale, but also from electronics to photonics and chemionics, since light and chemical inputs are very convenient ways to power molecular-level systems and to exchange information at the molecular level. Furthermore, taking inspiration from natural nanoscale devices, the bottom-up approach is likely to displace the interest of scientists from solid state to solution and soft-matter. In perspective, the studies carried out on molecular devices and machines will contribute to the constructions of nanodevices in which photonics, chemionics, electronics, and mechanics will be integrated to a different extent depending on the function that the device has to perform. We shall then become accustomed with new acronyms like NED (nanoelectronic devices), NPD (nanophotonic devices), NCD (nanochemical devices), NPED (nanophotoelectronic devices), NEMS (nanoelectromechanical systems), and NPEMS (nanophotoelectromechanical systems).

### **Conclusion**

Vincenzo Balzani has given important contributions to the development of Photochemistry, Supramolecular Chemistry and, more recently, Molecular Nanotechnology. He has designed and investigated a number of molecular-level devices capable of performing a variety of specific functions, including (i) systems for information processing (wires, switches, antennas, plug/socket systems, extension cables, memories, logic gates, rudimentary neuron-like systems), and (ii) systems that, powered by chemical energy, electrochemical energy, or light exhibit machine-like behaviour (piston/cylinder systems, shuttles, lifts, rotary rings, dendritic

photoswitchable boxes). The high international reputation of his studies and the appreciation for his innovative work is testified by the great number of invitations (more than 300) to present lectures and seminars all over the world and by the highlights on his work appeared on top scientific journals like *Nature*, *Science*, *Chemistry and Engineering News*, *Chemistry in Britain*, and *Chemistry and Industry* (see separated lists).

Vincenzo Balzani is included in the list of the 100 most cited chemists since the beginning of the ISI classification. In the last 10 years his 154 papers have collected 7675 citations, with an average of 49.84 citations per paper. His overall *h*-index is 68, which places him again in the list of the top 100 chemists of the world

**Highlights appeared in the literature on the work  
of Vincenzo Balzani**

1. La luciole chimique: *La Recherche*, **1982**, November, 1310.
2. Luminescent cryptates: *Chemistry and Industry*, **1987**, August 17, 571.
3. An efficient photocatalyst: *Chemistry and Industry*, **1989**, January 16, 43.
4. Second sphere photochemistry: *Chemistry and Industry*, **1989**, January 16, 43.
5. A world in miniature: *Chemistry and Industry*, **1992**, June 15, 436.
6. Dendrimers; breakthrough into new materials: *Angew. Chem. Int. Ed.*, **1992**, 31, 1571.
7. Dendritic molecules: *Chemical and Engineering News*, **1993**, February 1, 28.
8. Light harvesting polymers: *Chemical and Engineering News*, **1993**, March 15, 38.
9. Dendrimers for commercial evaluation: *Chemical and Engineering News*, **1993**, August 16, 20.
10. Molecular machines: *Chemistry and Industry*, **1994**, January 3, 1994, 29.
11. Molecular wires and gilders: *Nature*, **1994**, 372, 133.
12. Dendrimeri, *La Chimica e L'Industria*, **1994**, 76, 55.
13. Switchable photonic molecules in information technology: *Chemistry and Industry*, **1994**, 19 December, 992.
14. Greener way to solar power: *New Scientist*, **1994**, November 12, No 1951, 30.
15. Building on biology: *Chemistry in Britain*, **1995**, 31(1), 33.
16. Electron-transfer branches out: *Nature*, **1995**, 374, 13.
17. Self-assembly: *Chemical and Engineering News*, **1996**, July 8, 26.
18. A colorful future for memory: *New Scientist*, **1997**, July 19, N. 2091, 12.
19. Take it to the limit: *New Scientist*, **1997**, August 2, N. 2093, p. 32-35.
20. Molecular-level switching: *Chemistry and Industry*, **1997**, August 18, N. 24, 655.
21. Rays of hope: *New Scientist*, **1997**, August 30, N. 2097, 36-39.
22. Mimicking natural photosynthesis: *Chemical and Engineering News*, **1998**, October 26, 37-46.
23. Light-powered molecular machines: *Chemical and Engineering News*, **1998**, October 26, 37-46.
24. Molecular logic arrives: *Scientific Computing World*, **1999**, February/March, 11.
25. Molecular machines: *Chemistry and Industry*, **1999**, March 1, 178.
26. Light harvesting by dendrimers: *Platinum Metals Review*, **1999**, 43, update 18, p. 2.

27. A three-pole switch: *Chemistry and Industry*, **1999**, July 19, 559.
28. Blossoming of dendrimers: *Chemical and Engineering News*, **1999**, November 1, 27-35.
29. Cyclophanes and catenanes as ligands: *Chemtracts- Inorg. Chem.*, **1999**, 12, 322.
30. Synthetic molecular motors, *Nature*, **1999**, 401, 120-121.
31. Working the links, threading the needle: *Science*, **2000**, 288, 402.
32. Molecular computation, *Chemical and Engineering News*, **2000**, May 1, p. 12.
33. Chemistry meets computing, *Nature*, **2000**, 406, 118-120.
34. Dendrimers make more sense, *The Alchemist* (Web), **2000**, issue 8, 3.
35. A little cobalt goes a long way, *Nature science update*, **2000**, June 2.
36. Molecular Steam Engine, *Nachrichten aus der Chemie*, **2000**, 84(06); 746.
37. Get your brain around it, *The Alchemist* (Web), **2000**, May 5.
38. Molecular motors: *Chemistry and Industry*, **2000**, August 7, 507.
39. Molecules that mimic the action of neurons, *Chemistry and Industry*, **2000**, September 18, 613.
40. Molecules in managed motions, *The Alchemist* (Web), **2000**, November 10.
41. Is the future NANO? *Chemistry in Britain*, December **2000**, p. 46-47.
42. *The New Chemistry*, Nina Hall ed., Cambridge, 2000.
43. Light machinery powered by light, *Science*, **2001**, 293, 2171.
44. *Stories of the invisible*, P. Ball, Oxford, 2001
45. Extended chemistry, *The Alchemist* (Web), **2002**, October 4.
46. Supramolecular extension cord, *Chemical and Engineering News*, **2002**, October 21, p. 17.
47. Molecules get plugged in, *Nature Materials*, **2002**, 1 (November), 142.
48. Indicators reveal inherent logic, *Chemical and Engineering News*, **2003**, Jan 6, 31.
49. *Bella e Potente*, L. Cerruti, Einaudi, 2003.
50. Chemist Step to It, *the Alchemist* (Web), **2004**, March 19.
51. Nanomachinery Gets a Lift, *Chemical and Engineering News*, **2004**, March 22, xx
52. Nanospider contro tutti, *Le Scienze*, aprile **2004**, 21
53. Chemistry on a high, *Chemistry World*, 1, May **2004**, 20.
54. Ascenseur moléculaire, *Science et Avenir*, Mai **2004**, 15.
55. Tiny elevator most complex nanomachine yet, *NewScientist.com*, March 18, 2004.
56. Chemistry Highlights 2004, *Chemical and Engineering News*, **2004**, December 23.
57. Light drives molecular motor, *Chemical and Engineering News*, **2006**, January 30.

58. Making light work of it, *Nature materials*, 5, March **2006**, p. 165.
59. Lighting up nanomachines, *Nature*, 440, 16 March **2006**, p. 286.
60. Nanomotor powered by solar energy, *Small*, **2006**, 2, 446.
61. *The Nanotech Pioneers*, S.A. Edwards, Wiley-VCH, **2006**, p. 52 and 61.
62. Supramolecular extension cord, *Chemical and Engineering News*, **2006**, Dec 4, p. 13.
63. Molecular extension cord for chemical computing, *New Scientist*, Nov. 20, **2006**.

**Cover pages of scientific journals illustrating articles  
of Vincenzo Balzani**

- Metal-based dendrimers, *Chem. Eur. J.*, volume 1, number 4, July **1995**.
- Light harvesting dendrimers, *Acc. Chem. Res.*, volume 31, number 1, January **1998**
- Photochromic memories, *Chem. Commun.*, number 2, January **1999**.
- A plug/socket molecular level device, *Chem. Eur. J.*, volume 5, n. 3, March **1999**
- Switching by redox and chemical inputs, *J. Org. Chem.*, volume 65, n. 7, April **2000**.
- A light driven molecular-level abacus, *Chem. Eur. J.*, volume 6, n. 19, October **2000**.
- Artificial molecular-level machines with [Ru(bpy)<sub>3</sub>]<sup>2+</sup> as a light-fueled motor, *International Journal of Photoenergy*, volume 3, number 2, June **2001**.
- Photochromic properties of 3-Methyl Substituted Flavylum Salts, *Eur. J. Org. Chem.*, n. 16, August **2002**.
- The Bottom-up Approach to Molecular-Level Devices and Machines, *Chem. Eur. J.*, volume 8, number 21, December **2002**.
- La Chimica del Futuro, Accademia Nazionale dei Lincei, II Giornata della Chimica, Fondazione Donegani, 2002.
- Light Harvesting Dendrimers, *Current Opinion in Chemical Biology*, 7, no.8, page, 657, December **2003**.
- Photochemical Molecular Devices, *Photochemical Photobiological Sciences*, vol. 2, no. 5, May **2003**
- Towards Molecular Photochemionics”, *International Journal of Photoenergy*, vol. 6, no. 1, **2004**.
- Nanomotor powered by solar energy. *Nanotech Briefs*, , vol. 3, No.3, March **2006**.
- Light fuelled shuttling in rotaxane nanomotors, *Australian Journal of Chemistry*, vol. 59, no. 3, **2006**.
- Amide-based Molecular Knots as Platforms for Fluorescent Switches, *Chem. Eur. J.*, vol 12, no. 22, **2006**.
- A Cyclam Core Dendrimer Containing Dansyl and Oligoethylene Glycol Chains in the Branches: Protonation and Metal Coordination”, *Chem. Eur. J.*, vol 12, no. 35, **2006**.
- F. Puntoriero, G. Bergamini, P. Ceroni, V. Balzani, F. Vögtle: “A fluorescent guest encapsulated by a photoreactive azobenzene dendrimer”, *New. J. Chem.*, **32**, 401-406 (2008).

## **Vincenzo Balzani**

### **Plenary or Invited Lectures at International Meetings**

- X Informal Conference on Photochemistry, Stillwater (USA), 1972.
- VII Intern. Conference on Photochemistry, Jerusalem (Israel), 1973.
- Symposium on Mechanistic and Preparative Aspects of Inorganic and Organometallic Photochemistry, Mulheim (Germany), 1974.
- XI Informal Conference on Photochemistry, Nashville (USA), 1974.
- Workshop on The Current State of Knowledge Concerning Photochemical Formation of Fuels, Boston (USA), 1974.
- Symposium on "Unusual Properties of Inorganic Compounds", Athens, Georgia (USA), 1975.
- Gordon Research Conference on Organic Photochemistry, Tilton, N.H. (USA), 1975.
- Gordon Research Conference on Inorg. Chem., New Hampton, N.H. (USA), 1975.
- XII Informal Conference on Photochemistry, Washington, D.C. (USA), 1976.
- Summer School on Photochemistry, Leuven (Belgium), 1976.
- Meeting on Solar Photochemistry, Orsay (France), 1977.
- XIII Informal Conference on Photochemistry, Clearwater Beach, Florida (USA), 1978.
- VII IUPAC Symposium on Photochemistry, Leuven (Belgium), 1978.
- X Intern. School on Solar Energy Processes, Sogesta, Urbino (Italy), 1978.
- Intern. Conference on Alternative Energy, Milano (Italy), 1980.
- International Symposium on Solute-Solute-Solvent Interactions, Firenze (Italy), 1980.
- Gordon Research Conference on Radicals Ions, Wolfeboro, N.H. (USA), 1980.
- IV Symposium on Photochemistry and Photophysics of Coordination Compounds, Montreal (Canada), 1980.
- III International Conference on Photochemical Conversion and Storage of Solar Energy, Boulder, Colorado (USA), 1980.
- 3eme Cycle en Chemie, University of Fribourg (Switzerland), 1981.
- Atelier de Photochemie, University of Strasbourg (France), 1981.
- X Intern. Conference on Photochemistry, Crete (Greece), 1981.
- V Meeting of the Portuguese Chemical Society, Oporto (Portugal), 1982.
- Groupe Francais de Photochimie, Paris (France), 1982.



- V Intern. Symposium on the Photochemistry and Photophysics of Coordination Compounds, Gif-sur-Yvette (France), 1982.
- 3rd Intern. Symposium on Homogeneous Catalysis, Milano (Italy), 1982.
- XVII Heyrovsky Discussion, Prague (Czechoslovakia), 1983.
- 3eme Cycle en Chimie, Les Diablerets (Switzerland), 1983.
- IV Italian-Czechoslovak Symposium on Catalysis, Torino (Italy), 1983.
- XXXV Southeast Regional ACS Meeting, Charlotte, North Carolina (USA), 1983.
- IV Intern. Symposium on the Photochemistry and Photophysics of Coordination Compounds, London (England), 1984.
- Symposium on Recent Advances in Chemical Routes of Trapping Solar Energy, Bombay (India), 1984.
- Symposium on the Photochemistry of Metal Complexes, Tokyo (Japan), 1984.
- Atelier de Photochimie and Photophysique des Composes Organometalliques et de Coordination, Paris (France), 1985.
- Annual Meeting of the Societè Suisse de Chimie, Berne (Switzerland), 1985.
- VI Conference on Photochemical Conversion of Solar Energy, Paris (France), 1986.
- Gordon Research Conference on Inorg. Chem., Wolfeboro, N.H. (USA), 1986.
- XXIV Intern. Conference on Coordination Chemistry, Athens (Greece), 1986.
- Discussion Group Meeting on Fast Reactions in Solution, Gargnano (Italy), 1986.
- NATO ARW on Photoinduced Charge Separation and Energy Migration in Supramolecular Species, Capri (Italy), 1987.
- VII Intern. Symposium on the Photochemistry and Photophysics of Coordination Compounds, Elmau (FRG), 1987.
- Gordon Research Conf. on Organic Photochemistry, Andover, N.H. (USA), 1987.
- XIII Intern. Conference on Photochemistry, Budapest (Hungary), 1987.
- Italian-Swiss Conference on Photochemistry, Como (Italy), 1987.
- Meeting on Molecular Photochemistry, Hengelhoef (Belgium), 1987.
- Euchem Conference in Inorg. Chem., Dourdan (France), 1988.
- Sixth Symposium on Photochemistry, Eisenach (DDR), 1988.
- Winter College on Atomic and Molecular Physics, ICTP, Trieste (Italy), 1989.
- 25th Euchem Conference on Stereochemistry, Burgenstock (CH), 1989.
- Interdisciplinary Meeting on Luminescence, Bologna (Italy), 1989.
- XXVII Intern. Conference on Coordination Chemistry, Broadbeach (Australia), 1989.

- VIII Intern. Symposium on the Photochemistry and Photophysics of Coordination Compounds, S. Barbara, California (USA), 1989.
- Workshop on Supramolecular Organic Chemistry and Photochemistry, Saarbrücken (FRG), 1989.
- Workshop on Photoredox Reactions and Their Importance in Solar Energy Research, Adelboden (CH), 1989.
- Conference on Recent Trends in Photochemistry, Irbid (Jordan), 1989.
- Workshop on Progress Towards Molecular Scale Electronics, Durham (U.K.), 1990.
- Symposium on Photoinduced Charge Transfer, Rochester, N.Y. (USA), 1990.
- VIII International Conference on Photochemical Conversion and Storage of Solar Energy, Palermo (Italy), 1990.
- XIII IUPAC Symposium on Photochemistry, Warwick, England, 1990.
- Symposium on Molecular Modeling: Theory and Experiment, Elmau (Germany), 1990.
- Symposium on Sensors and Actuators, Enschede (Holland), 1990.
- Conference on Frontiers of the Chemistry of Metal Ions, Firenze (Italy), 1990.
- Meeting on Coordination and Organometallic Chemistry, Lunteren (NL), 1991.
- IX International Symposium on the Photochemistry and Photophysics of Coordination Compounds, Fribourg (CH), 1991.
- XVI International Symposium on Macrocyclic Chemistry, Sheffield (England), 1991.
- NATO ASI School on "Photoprocesses in Transition Metal Complexes, Biosystems, and Other Molecules", Assois (France), 1991 (a series of four lectures)
- EUCHEM Conference on "Supramolecular Reactivity and Catalysis", Padova (Italy), 1991.
- Mediterranean Meeting on Photochemistry, Acireale (Italy), 1991.
- II NATO Science Forum: Supramolecular Chemistry, Taormina (Italy), 1991.
- IV Winter Conference of the Inter-American Photochemical Society, Clearwater Beach, Florida, (USA), 1992.
- 29<sup>th</sup> Inter. Conference on Coordination Chemistry, Lausanne (Switzerland), 1992.
- European Conference on Molecular Electronics, Padova (Italy), 1992.
- 3eme Cycle en Chemie, Champéry (Switzerland), 1992.
- EPA Summer School on "Photoinduced Energy and Electron Transfer in Supramolecular Species", Rimini (Italy), 1992
- International Symposium on Perspectives in Photochemistry, Ferrara (Italy), 1992.

- Second Birmingham Supramolecular Science Symposium, Birmingham, U.K., 1992
- Meeting on Transient Species and Excited States, Belfast, U.K., 1992.
- Second International Conference on Solar Energy Storage, Cairo (Egypt), 1993.
- Symposium on Conceptual Tools for Understanding Chemistry, Trieste (Italy), 1993.
- X International Symposium on the Photochemistry and Photophysics of Coordination Compounds, Sendai (Japan), 1993.
- XIV International Conference on Photochemistry, Vancouver (Canada), 1993.
- NATO ARW on Photoinduced Electron Transfer Reactions, Albufeira (Portugal), 1993.
- Latin American Inorg. Chem. Meeting, Santiago de Compostela (Spain), 1993
- School on Photochemistry, ICPAC, Trieste (Italy), 1993
- Second Conference on Laser in Chemistry, ICSHT Trieste (Italy), 1993.
- Nato ARW on Transition Metals in Supramolecular Chemistry, S. Margherita Ligure (Italy), 1994.
- Workshop on Molecular Recognition Chemistry, Stockholm (Sweden), 1994.
- X Inter. Conf. on Photochemical Conversion and Storage of Solar Energy, Interlaken (Switzerland), 1994.
- Symposium on Supramolecular Chemistry, Bordeaux (France), 1994.
- 18<sup>o</sup> Meeting of the Sociedade Brasileira de Quimica, Caxambu (Brasil), 1995.
- VII Encontro Brasileiro de Fotoquimica e Fotobiologia, Caxambu (Brasil) 1995.
- XIX DOE Solar Photochemistry Conference, Tamiment (USA), 1995.
- VIII Symposium on Novel Aromatic Compounds, Braunschweig (Germany), 1995.
- NATO ARW on Modular Chemistry, Estes Park, Colorado (USA), 1995.
- NATO ARW on Physical Supramolecular Chemistry, Miami (USA), 1996.
- Symposium on Contemporary Aspects of Photochemistry, Birmingham (U.K.), 1996.
- EUCHEM Conference on Nitrogen Ligands in Organometallic Chemistry and Homogeneous Catalysis, Como (Italy), 1996.
- Electron and Ion Transfer in Condensed Media, ICTP, Trieste, Italy, 1996.
- Workshop on Ru-Mn Artificial Photosynthesis, Paris (France), 1997.
- Spring School on Synthetic Electroactive Organic Architectures, Siena (Italy), 1977.
- Workshop on Heterosupramolecular Chemistry, Ferrara (Italy) 1997.
- XII International Symposium on the Photochemistry and Photophysics of Coordination Compounds, Saint Michael's College, Vermont (USA), 1997.
- VI European Symposium on Organic Reactivity, Louvaine-la Neuve (Belgium), 1997

- Symposium on Supramolecular Chemistry, Accademia dei Lincei, Rome (Italy), 1997.
- III National Meeting of the Portuguese Physical-Chemistry Society, Lisbon, 1997.
- Workshop on Applications of Supramolecular Systems, Tel Aviv (Israel), 1998
- Euchem Conference on Artificial Photosynthesis, Sigtuna (Sweden), 1998.
- Conference on Reactive Intermediates and Reaction Mechanisms, Ascona (CH), 1998.
- XXXIII International Conference on Coordination Chemistry, Florence (Italy), 1998.
- NATO AWR on Supramolecular Science, Lerici (Italy), 1998.
- Luigi Galvani International Workshop, Bologna (Italy), 1998.
- International Francqui Symposium on Conjugated Polymers, Oligomers, and Dendrimers, Bruxelles (Belgium), 1998.
- Material Research Society Fall Meeting, Boston (USA), 1998.
- 4 Center (Amsterdam, Bologna, Bonn, Fribourg) Meeting, Bologna (Italy), 1999.
- International Symposium on Intra- and Intermolecular Electron Transfer, Konstanz (Germany), 1999
- Workshop on Ru-Mn Artificial Photosynthesis, Cetraro (Italy), 1999.
- Symposium on Phthalocyanines and Related Compounds, Madrid (Spain), 1999.
- XXIII International Symposium on the Photochemistry and Photophysics of Coordination Compounds, Lipari (Italy), 1999.
- IV International Conference on Materials Chemistry, Dublin (Ireland), 1999.
- XXIV International Symposium on Macrocyclic Chemistry, Barcelona (Spain), 1999.
- XIX International Conference on Photochemistry, Durham, NC (USA), 1999.
- Symposium on Frontiers in Photophysics and Photochemistry, Leuven (B), 1999.
- 1st International Dendrimer Symposium, DECHEMA, Frankfurt (Germany), 1999.
- German-Italian Meeting of the Coimbra Group: "Chemistry at the Beginning of the Third Millennium", Pavia (Italy), 1999.
  
- Trends in Transition Metal Chemistry: Towards the Third Millennium, Pisa (Italy), 2000.
- 4 Center (Amsterdam, Bologna, Bonn, Fribourg) Meeting, Amsterdam (NL), 2000.
- XVIII IUPAC Symposium on Photochemistry, Dresden (Germany), 2000.
- Science and Knowledge: towards which Rationality? Bologna (Italy), 2000.
- Inorganic Crystal Engineering, Dalton Discussion 3, Bologna (Italy), 2000.

- Photophysics and Photochemistry 2000, Costa de Estoril (Portugal), 2000.
- Functional Supramolecular Systems, Bochum (Germany) 2000.
- Meeting on Molecular Science, Valencia (Spain), 2000.
  
- Meeting on Nanotechnology for Materials, University of Milano Bicocca, Milano (Italy), 2001.
- VI International Conference on Solar Energy and Applied Photochemistry, Cairo (Egypt), 2001.
- 4 Center (Amsterdam, Bologna, Bonn, Fribourg) Meeting, Taormina (Italy), 2001.
- XII European Symposium on Organic Chemistry, Groningen (NL), 2001.
- VI European Mediterranean Conference in Inorganic Chemistry, Barcellona (Spain) 2001.
- Conference on Molecular Nanotechnology, Augustusburg (Germany), 2001.
- TMR Meeting on Nanometer Size Metal Complexes, FRAE-CNR, Bologna (Italy).
- Karl-Ziegler Symposium on Molecular Machine, GDCh, Wurzburg (Germany), 2001.
- Workshop on Molecular Photomagnetism, Seeheim (Germany), 2001.
- International Workshop on Molecular Motors, Dechema, Frankfurt (Germany), 2001
- X Meeting on New Compounds and Materials, Bressanone (Italy), 2001.
  
- Meeting on Nanotechnology, Department of Biochemistry, University of Bologna, Bologna (Italy), 2002.
- First Workshop on Current Trends in Nanotechnologies, Catania (Italy) 2002
- International Symposium on Nanochemistry, Valencia (Spain) 2002.
- Workshop on Material Science in Italy in the European Frame, Firenze (Italy), 2002.
- Symposium on Diversity in Organic Chemistry, Wageningen (The Netherlands) 2002.
- Symposium on Revisiting the "Chemistry War", 1914-1923, Institute of Advanced Study, Bologna (Italy), 2002.
- XXVII International Symposium on Macrocyclic Chemistry, Park City (USA), 2002.
- NATO ASI School on Molecular Electronics, Pisa (Italy) 2002.
- XVI IUPAC Conference on Physical-Organic Chemistry, San Diego (USA), 2002.
- Euresco Conference on Molecular Rods, Wires, and Switches, San Feliù (Spain), 2002.
- V Japan-Italy Seminar, Venice (Italy), 2002.

- Meeting of the European Network on Molecular Level Devices and Machines, Pavia (Italy), 2002.
- 2° Sigma Aldrich Young Chemists Symposium, Riccione (Italy), 2002.
- XVIII Croatian Meeting of Chemists and Chemical Engineers, Zagreb (Croatia), 2003.
- Meeting on Dendrimers and Nanoscience, University of Bordeaux, Bordeaux (France), 2003.
- II Mediterranean Meeting on Photochemistry, Giardini Naxos, Italy, 2003.
- XXVIII International Conference on Solution Chemistry, Debrecen (Hungary), 2003.
- III International Dendrimer Symposium, Berlin (Germany), 2003.
- International Symposium on Templates, Bonn (Germany), 2003.
- The Supramolecular View of Life: A Discussion, Institute of Advanced Study, Bologna, 2003.
- Second National Conference on Nanoscience and Nanotechnology, Bologna (Italy), 2004.
- 5<sup>th</sup> Symposium on Supramolecular Chemistry in Ireland, Dublin (Ireland), 2004.
- 2<sup>nd</sup> Italian-German Workshop on Electrochemistry, Bologna (Italy), 2004.
- III Chianti Electrochemistry Meeting on Metal Containing Molecules, Siena (Italy), 2004.
- Euresco Conference on Chemistry and Physics of Multifunctional Materials, Tomar (Portugal), 2004.
- XX Congress of the International Union of Crystallography, Firenze (Italy), 2005.
- Scientia Rerum, Bologna (Italy), 2005.
- First European Conference on Chemistry for Life Sciences, Rimini (Italy), 2005.
- Euresco Conference on Supramolecular Chemistry, Obernai (France), 2005.
- New Technologies for Energy, Italgas, University of Torino, 2006.
- 3<sup>rd</sup> World Congress on Biomimetics and Nano-Bio, Lausanne, CH, 2006.
- Nanoscience & Nanotechnology n&n6, Frascati, Italy, 2006.
- 
- Trends in Modern Chemistry, 3<sup>rd</sup> Aarhus winter Meeting, Aarhus (DK), 2007.
- Europe's Energy Policy: The Role of Chemistry, Brussels (B), 2007.
- International Conference on "Molecular Machines and Sensors", Shanghai, China, 2007.

- XVII International Symposium on the “Photochemistry and Photophysics of Coordination Compounds”, Dublin (Ireland), 2007.
  - International Conference on “Functional Materials and Molecular Devices for Nanoelectronics and Nanosensing”, Rome (Italy) 2007.
  - Meeting on “Solar Energy and Artificial Photosynthesis”, The Royal Society, London (UK), 2007
  - 41<sup>st</sup> IUPAC World Chemistry Congress, Torino (Italy), 2007.
  - Forum on Ethics and Science for the Environment, Ferrara (Italy), 2007.
  - 21<sup>st</sup> Solvay Conference, Bruxelles, 2007.
- 
- New Frontiers in Micro and Nano Photonics, Florence (Italy), 2008.
  - International Conference on “Energy crisis, water shortage, and climate changes in the Mediterranean area: the involvement of chemistry”, Castiglion della Pescaia, 2008.
  - XXII IUPAC Symposium on Photochemistry, Gothenburg, Sweden, 2008.
  - XIII Symposium on Luminescence Spectrometry, Bologna, Italy, 2008.
  - Public Lecture, Second EuCheMS Chemistry Congress, Torino, Italy, 2008.
  - XIII Summer Course on Pharmaceutical Analysis, Rimini, Italy, 2008.
- 
- New Trends in Science and Education Technology, University of Modena and Reggio Emilia: Energy for Spaceship Earth; April 23, 2009.
  - XX Italian-Spanish Congress on Thermodynamics of Metal Complexes, Pisa, Italy, June 7-11, 2009.
  - VII European Biophysics Congress, Genova, July 11-15, 2009.
  - International Congress “The Centenary”, Padova, Italy, September 2, 2009.
  - Peter Belser’s Birthday Symposium, Fribourg (CH), September 28, 2009.
  - IDROBIO: Biological processes as a possible source for renewable energy, Accademia dei Lincei, Rome, 2-3 November 2009.
  - European Academy of Sciences, Award Ceremony, Bologna, November 6, 2009.
  - Jean-Pierre Sauvage’ Symposium, Strasbourg, 26-27 November 2009.

## Vincenzo Balzani

### Plenary or Invited Lectures at Italian Meetings

- V Convegno Nazionale di Chimica Inorganica, Taormina, 1972.
- VIII Congresso dell'Associazione Italiana di Chimica Fisica, Salice Terme (Pavia), 1973.
- Convegno CNR su Fotochimica e Chimica delle Radiazioni, Roma, 1975.
- I Scuola di Fotochimica GIF, Ferrara, 1976.
- XIII Congresso della Società Chimica Italiana, Merano (Bolzano), 1978.
- XIII Congresso Nazionale di Chimica Fisica, Catania, 1978.
- II Scuola di Fotochimica, Perugia, 1978.
- XII Convegno Nazionale della Divisione di Chimica Organica, Ancona, 1980.
- XIII Congresso Nazionale di Chimica Inorganica, Camerino, 1980.
- XVI Congresso Nazionale di Chimica Fisica, Abano Terme (Padova), 1981.
- Congresso sulla Catalisi Omogenea ed Eterogenea, Torino, 1983.
- Scuola di Fotochimica GIF., Bologna, 1986.
- II Seminario di Chimica Inorganica e Metallorganica, Gargnano, 1986.
- Convegno sul Consiglio Nazionale delle Ricerche in Emilia-Romagna, Bologna, 1986.
- Simposio su "Fotochimica e Applicazioni", Milano, 1988.
- Riunione scientifica del Centro Interuniversitario di Chimica Fisica, Assisi, 1988.
- Convegno della Società Chimica Italiana, Milano, 1988.
- Minisimposio "Fotosintesi", Congresso della Società Chimica Italiana, Perugia, 1989.
- V Convegno della Società Italiana per le Ricerche sulle Radiazioni, Roma, 1989.
- Congresso della Società Chimica Italiana, San Benedetto del Tronto, 1990.
- Incontro su "Sintesi e metodologia speciali in Chimica inorganica, CNR, Padova, 1990.
- Microsimposio sulla Chimica Supramolecolare, SCI, Chianciano Terme, 1991.
- Simposio su " Chimica Supramolecolare", Accademia dei Lincei, Roma, 1992.
- I° Congresso Nazionale di Chimica Supramolecolare, Pavia, 1992
- Workshop su "Modelli per lo studio teorico di processi reattivi", Pisa, 1993.
- Convegno Nazionale di Fotobiologia e Fotochimica, Volterra, 1994.
- XXVII Congresso Nazionale di Chimica Fisica, Montepaone, 1994.
- Seminario su "Chimica Fisica del Riconoscimento Molecolare", Torino, 1994.



- Riunione su "Sistemi supramolecolari e collettivamente organizzati, CNR Milano, 1994.
- Convegno "Verso la complessità molecolare ", Villa Duodo, Monselice, 1995.
- XVIII Congresso della Società Chimica Italiana, Milano, 1995.
- Incontro su "Supramolecole, autoreplicazione e nuove strutture in chimica", Istituto Lombardo Accademia di Scienze e Lettere, Milano, 1996.
- I Scuola di Chimica Inorganica per Dottorandi, Pavia, 1996.
- Simposio su "Chimica dei Plasmi e Laser-Chimica", Università di Bari, 1996.
- Simposio su "L'eredità di G. Ciamician a Bologna", Università di Bologna, 1996.
- Seminario Nazionale di Chimica Fisica: "Fotochimica", Torino, 1997.
- Discorso Inaugurale, Anno Accademico 1997-98, Università di Bologna, 1997.
- La Chimica come risorsa culturale al servizio della Società, Centro Studi Donati, Bologna, 1998.
- Settimana della Scienza e della Tecnologia, Università di Bologna, 1998.
- Convegno su Determinismo e Complessità, Nova Spes, Roma, 1998.
- Scuola di Fotochimica GIF, Bologna, 1998.
- IV Seminario Nazionale di Spettroscopia Analitica, Gargnano, 1999.
- Scuola di Specializzazione in Sintesi Chimica dell'Università di Milano, 1999.
- XXIV Corso Estivo di Chimica Organica "A. Corbella", Gargnano, 1999.
- Materiali Molecolari Avanzati per Fotonica ed Elettronica, Villasimius, Cagliari, 1999.
- Edichem 99: "La Chimica nella Prospettiva del Nuovo Secolo", Bari, 1999.
- Scuola di specializzazione in sintesi chimica, Milano, 2000.
- XX Congresso Nazionale della Società Chimica Italiana, Rimini, 2000.
- XX Corso Avanzato in Chimica Farmaceutica, Urbino, 2000.
- Nuovi orientamenti nella sintesi organica, SCI, Milano, 2000.
- Scuola Nazionale di Fotochimica, GIF, Bologna, 2001.
- Convegno su Creatività Umana ed Innovazione Scientifica, Bologna, 2002
- Convegno su Recenti Sviluppi in Chimica Inorganica e Fotochimica, Ferrara, 2002
- Scienza a Porte Aperte, Facoltà di Scienze, Università di Salerno, 2002.
- Towards Computational System Architectures Based on Molecular Level Devices, Dipartimento di Chimica "G. Ciamician", Università di Bologna, 2002.
- Riflessioni sulla chimica e dintorni, La Civiltà delle Macchine, Forlì, 2003.

- Luminescenza: dalla scoperta della Pietra di Bologna alle più recenti applicazioni, Università di Bologna, Bologna, 2003.
- Scuola di Specializzazione in Sintesi Chimica dell'Università di Milano, Milano, 2003.
- Colloquio Galileiano, Dottorato in Scienze, Università di Pisa, Pisa, 2003.
- Inaugurazione sito divulgativo Università di Bologna, Bologna, 2003.
- Trasmissione sulle Armi Chimiche, Radio 3 Scienza, 2003.
- Workshop “Scienza e Pace: Paradigmi e Pratiche a Confronto”, Modena, 2003.
- XXXIII Congresso Nazionale di Chimica Fisica, Napoli, 2004.
- III Scuola Nazionale di Fotochimica, GIF, Bologna, 2004.
- X Scuola Nazionale di Scienza dei Materiali, Sestri Levante, 2004.
- Festival della Scienza, Genova, 2004,
- XII Convegno Nazionale della Società Italiana per le Ricerche sulle Radiazioni, Genova, 2004.
- La rivoluzione Einstein, Università di Bologna, 2004.
- Diritto alla Scienza: la cultura scientifica in Italia, Firenze, 2005.
- Ricerca scientifica ed energia del futuro, Senigallia , 2005.
- ScienzaSocietà Scienza, Cagliari, 2005
- XI Scuola Nazionale di Scienza dei Materiali, Cortona, 2005.
- Giornata in ricordo di Vittorio Ricevuto, Messina, 2005.
- Sigma Aldric Young Chemists Symposium, Riccione, 2005.
- Costruttori di Molecole, Festival della Scienza, Genova, 2005.
- Perché la Scienza, Radio 3 Scienza, 2005.
- VI Convention Nazionale Ambiente-Ricerca-Giovani, Bologna (2005).
  
- Il secolo fragile, Settimana della Scienza, CNR, Bologna, 2006.
- I Giovani e la Chimica in Friuli-Venezia Giulia, Università di Trieste, Trieste, 2006.
- High-tech Engines and Cars, Modena, Italy, 2006.
- Comportamenti etici per uno sviluppo sostenibile, Università di Ferrara, 2006.
- Il Consiglio Europeo delle Ricerche: le ricerche di frontiera, Università di Bologna, 2006.
- V Convegno Nazionale AICIng, Torino, 2006.
- XXII Congresso Nazionale della Società Chimica Italiana, Firenze, 2006.
- I Chimici e le piante, Storia e Ambiente, Bologna, 2006.

- La ricerca del futuro: quale scienza per quale sviluppo, Genova, 2006.
- Convegno Nazionale di Fotochimica, Salice Terme, 2006.
  
- Convegno su “Le fonti di energia”, Accademia dei Lincei e Accademia delle Scienze, Torino, 2007.
- Convegno “Made in tomorrow”, La triennale di Milano, Milano, 2007.
- Scuola di Fotochimica GIF, Bologna, 2007.
- Convegno “Giacomo Ciamician, genio della chimica e profeta dell’energia solare”, Bologna, 2007.
- VIII Congresso Nazionale di Chimica Supramolecolare, Trieste, 2007.
- Giornata di studio su”L’accumulo dell’energia elettrica nell’era delle fonti rinnovabili”, Facoltà di Ingegneria, Università di Bologna, 2007.
- Sigma Aldric Young Chemists Symposium, Riccione, 2007.
  
- Giornata di studio sul fotovoltaico, Università di Padova, 10 giugno 2008.
- Congresso della Facoltà di Scienze per il decennale dell’università dell’Insubria, Como, 12 giugno 2008.
- XXXII Convegno Nazionale della Divisione Chimica Organica, Taormina, 26 giugno 2008.
- IX Convention nazionale ARG (Ambiente, ricerca, Giovani), Cinisi (Sicilia), 2008.
- Convegno su “Le energie rinnovabili”, CerviaAmbiente, Cervia, 2008.
- Cronobie 08: Il futuro (è) la scienza, Bologna, 2008.
- Lezioni di Valore, Premio Alta Qualità, Bologna, 2008.
- Convegno “Più energia per la sicurezza alimentare”, Regione Emilia Romagna, Bologna (2008).
  
- Convegno su “L’ambiente e la ricerca di energie alternative”, Fondazione Università di Mantova, 21 febbraio 2009.
- Università di Camerino, giornata di studio “Energia e sostenibilità”, 18 marzo 2009.
- Convegno su Dmitry Mendeleev “140 anni dalla presentazione del Sistema Periodico, 28-29 maggio, Accademia dei Lincei, Roma, 2009.
- Convegno su “Storia naturale della creatività”, Accademia dei Lincei, Roma, 3-4 giugno 2009.
- Congresso BioEcoGeo, Gruppo 24ore, Milano, 9 giugno 2009.



## **Vincenzo Balzani**

### **Lectures at Universities and Research Centers**

- University of Bologna, Bologna (Italy), 1969.
- Wayne State University, Detroit, Michigan (USA), 1972.
- Bell Telephone Laboratories, Murray Hill, New Jersey (USA), 1972.
- Euratom Research Center, Ispra (Italy), 1973.
- Boston University, Boston, Massachusetts (USA), 1974.
- University of Ferrara, Ferrara (Italy), 1974.
- University of North Carolina, Chapel Hill, North Carolina (USA), 1975.
- North Carolina State University, Raleigh, North Carolina (USA), 1975.
- Istituto di Ricerche "G. Donegani", Novara (Italy), 1975.
- University of Bologna, Bologna (Italy), 1975.
- Hahn-Meitner Institut, Berlin (Germany), 1976.
- Centro di Ricerche Montedison, Milano (Italy), 1976.
- University of Pisa, Pisa (Italy), 1976.
- University of Bologna, Bologna (Italy), 1977.
- University of Padova, Padova (Italy), 1977.
- Snamprogetti, San Donato Milanese, Milano (Italy), 1978.
- Ecole Polytechnique Federale, Lausanne (Switzerland), 1979.
- Universite Louis Pasteur, Strasbourg (France), 1979.
- Energy Research Center, Hebrew University, Jerusalem (Israel), 1979.
- Technion, Haifa (Israel), 1979.
- Weizmann Institute, Rehovot (Israel), 1979.
- Ben Gurion University of Beer-Sheba (Israel), 1979.
- Boston University, Boston, Massachusetts (USA), 1980.
- Columbia University, New York (USA), 1980.
- Brookhaven National Laboratorie, Upton, New York (USA), 1980.
- University of Modena, Modema (Italy), 1981.
- University of Berne, Berne (Switzerland), 1981.
- Montepolimeri Research Center, Ferrara (Italy), 1982.
- Center for Fast Kinetics Research, University of Texas, Austin, Texas (USA), 1983.
- University of Pisa, Pisa (Italy), 1984.
- Tohuko University, Sendai (Japan), 1984.

- University of Strasbourg, Strasbourg (France), 1985.
- University of Alberta, Edmonton (Canada), 1985.
- University of Calgary, Calgary (Canada), 1985.
- University of British Columbia, Vancouver (Canada), 1985.
- Simon Fraser University, Vancouver (Canada), 1985.
- University of Victoria, Victoria (Canada), 1985.
- University of Washington, Seattle (USA), 1985.
- Oregon State University, Corvallis (USA), 1985.
- University of Oregon, Eugene (USA), 1985.
- University of California, Davis (USA), 1985.
- University of California, S. Barbara (USA), 1985.
- University of California, Irvine (USA), 1985.
- University of Southern California, Los Angeles (USA), 1985.
- University of Catania, Catania (Italy), 1985.
- Scuola normale Superiore, Pisa (Italy), 1986
- Politecnico di Milano, Milano (Italy), 1986.
- University of Milano, Milano (Italy), 1987.
- Igen Inc., Rockville, Ma. (USA), 1987.
- Polaroid Corp., Cambridge, Mass. (USA), 1987.
- University of Barcellona, Barcellona (Spain), 1988.
- University of Parma, Parma (Italy), 1988.
- Rockefeller University, New York (USA), 1988.
- The Austrian Chemical Society, Vienna (Austria), 1988.
- University of Fribourg, Fribourg (Switzerland), 1988.
- Gesellschaft Deutscher Chemiker, University of Erlangen, Erlangen (FRG), 1988.
- University of Regensburg, Regensburg (FRG), 1988.
- University of Messina, Messina (Italy), 1988.
- University of Cosenza Cosenza (Italy), 1989.
- University of Pavia, Pavia (Italy), 1989.
- Department of Theoretical Chemistry, University of Sydney (Australia), 1989.
- Department of Chemistry, University of Adelaide (Australia), 1989.
- Department of Polymer Science CSIRO, Melbourn (Australia), 1989.
- Laboratory of Biodynamics, University of California at Berkeley (USA), 1989.
- Chemical Society of Fribourg, Fribourg (Switzerland), 1989.

- University of Bayreuth, Bayreuth (FRG), 1990.
- Emory University, Atlanta (Georgia, USA), 1990.
- Georgia State University, Atlanta (Georgia, USA), 1990.
- University of Strasbourg, Strasbourg (France), 1990 (a series of four seminars).
- University of Amsterdam, Amsterdam (NL), 1990.
- Scuola Normale Superiore, Pisa (Italy), 1990.
- State Pedagogical University, Leningrad (USSR), 1991.
- University of Novosibirsk, Novosibirsk (USSR), 1991.
- Institute of Chemical Kinetics, Academy of Sciences, Novosibirsk (USSR), 1991.
- Institute of Chemical Physics, Academy of Science, Moscow (USSR), 1991.
- Department of Chemistry, University of Moscow, Moscow (USSR), 1991.
- "Frontiers of Science" Lecture, University of Konstanz, Konstanz (Germany), 1991.
- Department of Chemistry, University of Pavia, Pavia (Italy), 1992
- Molecular Electronic Seminar, University of Stuttgart, Stuttgart (Germany), 1992.
- Innogenetics, Gent (Belgium), 1992.
- Francqui Lecture, University of Leuven, Leuven (Belgium), 1992
- Department of Organic Chemistry, University of Leuven (Belgium), 1992 (a series of twelve lectures).
- Faculty of Science, University of Bologna, Bologna (Italy), 1992.
- School of Chemistry, University of Birmingham, Birmingham (England), 1992
- Department of Chemistry, Dublin City University, Dublin (Ireland), 1992
- Department of Organic Chemistry, The Royal Institute of Technology, Stockholm (Sweden), 1993
- Department of Physical Chemistry, Uppsala University, Uppsala (Sweden), 1993
- Department of Physical Chemistry, University of Umeå Umeå (Sweden), 1993
- Department of Chemistry, University of Goteborg, Goteborg (Sweden), 1993
- The Royal Swedish Academy of Sciences, Stockholm (Sweden), 1993
- Chemische Gesellschaft Zürich, Zürich (Switzerland), 1993.
- Laboratorium für Organische Chemie ETH, Zürich (Switzerland), 1994
- Technische Universität Berlin, Berlin (Germany), 1994
- Institut für Physikalische Chemie, University of Frankfurt, Frankfurt (Germany), 1994
- Fachbereich Chemie, Universität Leipzig, Leipzig (Germany), 1994
- Accademia delle Scienze, Torino (Italy), 1994
- Department of Organic Chemistry, University of Bordeaux, Bordeaux (France), 1994

- Christmas Lecture, ICoCEA-CNR, Bologna (Italy), 1994
- Facoltà di Chimica Industriale, Univ. di Bologna, Bologna (Italy), 1995
- Louisiana State University, New Orleans, USA, 1995
- School of Chemistry, University of Bristol, Bristol (UK), 1996
- Department of Chemistry, University College Dublin, Dublin (Ireland), 1996
- Department of Chemistry, University of Dundee, Dundee (UK), 1996
- Department of Chemistry, University of Durham, Durham (UK), 1996
- Department of Chemistry, University of Chicago, Chicago (USA), 1996
- Department of Chemistry, University of Notre Dame, Notre Dame (USA) 1996
- Department of Chemistry, Northwestern University, Evanston (USA), 1996.
- Department of Chemistry, University of Bonn, Bonn (Germany), 1996
- Institute of Inorg. Chem., University of Fribourg, Fribourg (CH), 1996
- Dipartimento di Chimica, Università di Napoli, Napoli (Italy), 1997
- Scuola di specializzazione, Università di Napoli, Napoli (Italy), 1997
- Chemical Physics Seminar, UCLA, Los Angeles (USA), 1998
- Blacet Lecture, Department of Chemistry and Biochemistry, UCLA, Los Angeles (USA), 1998
- Facoltà di Scienze, Università di Salerno, Salerno (Italy), 1998
- Department of Chemistry, Boston University, Boston (USA), 1998.
- The Luigi Sacconi Memorial Lecture, Firenze (Italy), 1999.
- Dipartimento di Chimica, Università di Camerino, Camerino (Italy), 1999.
- Dipartimento di Chimica, Università di Parma, Parma (Italy), 1999.
- Organic Chemistry Department, University of Madrid, Madrid (Spain), 1999.
- Università di Ferrara: Scienza 2000, Ferrara (Italy), 1999
- Scuola Normale Superiore di Pisa, Colle val d'Elsa (Italy), 1999.
- Corso di Laurea in Scienze dell'Informazione, Cesena (Italy, 1999.
- Facoltà di Scienze, Università di Bologna, Bologna (Italy), 2000.
- Faculty of Science, University of Amsterdam, Amsterdam (NL), 2000
- Scientiae Munus, Parma (Italy), 2000.
- Campus Colloquia, Area di Ricerca CNR, Bologna (Italy), 2000.
- Frontiers of Chemistry lecture, Wayne State University, Detroit (USA), 2001.
- Department of Chemistry, Rutgers University, Newark (USA), 2001.
- Dipartimento di Scienza dei Materiali, Università di Milano-Bicocca (Italy), 2001.
- School of Chemistry, University of Birmingham, Birmingham (UK) 2001.



- Scuola di Specializzazione in Sintesi Chimica, Università di Milano, Milano (Italy), 2001.
- Supramolecular Chemistry Course, University of Amsterdam, Amsterdam (NL), 2001
- Institut of Organic Chemistry and Biochemistry, University of Freiburg (Germany), 2002.
- Ecole Nationale Supérieure de Chimie de Mulhouse (France), 2002.
- Institut of Organic Chemistry, University of Karlsruhe (Germany), 2002.
- Institut de Chimie, University of Strasbourg (France), 2002
- Scuola di Specializzazione in Sintesi Chimica, Università di Milano, Milano (Italy), 2002.
- Società Chimica Italiana, Sezione Veneto, Padova (Italy), 2002.
- Dipartimento di Chimica, Università di Perugia (Italy), 2002.
- Politecnico di Milano, Milano (Italy), 2003.
- Institute of Inorganic Chemistry, University of Zürich (CH), 2003.
- Computational Science, Department of Chemistry and Applied Biosciences ETH Zurich USI-Campus, 2004.
- Università di Modena e Reggio Emilia, 2004.
- International Master in Nanotechnologies, CIVEN, Universities of Padua and Venice, Italy, 2004.
- Università di Parma, Dipartimento di Chimica Generale ed Inorganica, Parma, 2004.
- Scuola Normale Superiore di Pisa: XXXVIII Corso di Orientamento, 2004.
- Fotochimica dalle Alpi all'Etna (in onore Prof. Mazzucato), Perugia, 2004.
- Scuola Avanzata di Formazione Integrata, Università di Pavia, 2005.
- Scuola Normale Superiore, Pisa 2005.
- Nanotecnologia, Cronobie, Bologna, 2005.
- Dall'atomo all'uomo, Master Scienza e Fede, Ateneo Pontificio Regina Apostolorum, Roma, 2006.
- Inaugurazione dell'Anno Accademico della Facoltà di Scienze, Bologna, 2006.
- La Scienza e le scommesse del futuro, Unione Industriale, Torino, 2006.
- Bruno-Werdelmann Lecture, University of Essen, Germany, 2006.
- SPAIS: (Scuola permanente di aggiornamento per gli insegnanti di scienze): Le nanotecnologie e i nanomateriali, Caccamo (PA), 2006.
- Collegio Santa Caterina, Università di Pavia, 2007.
- Facoltà di Scienze, Università della Basilicata, Potenza, 2007.

- Università di Milano, Dipartimento di Chimica, giornata dell'orientamento, 2007.
- Basel Chemical Society, Basel, (CH), 2007.
- Centro Ricerche Donegani, Novara, 2007.
- Istituto Universitario di Studi Superiori, Università di Ferrara, Ferrara, 2007.
- Université Paul Sabatier - CNRS, Toulouse (France), 2007.
- Sezione Umbria della Società Chimica Italiana, Perugia, 2007.
- Il problema della complessità: dall'atomo all'uomo, Master Scienza e Fede, Ateneo Pontificio Regina Apostolorum, Roma, 2008.
- Energia: sfida ed opportunità, Festival delle Scienze, Roma, 2008.
- Galilean School of Higher Education, University of Padova, 2008
- Scuola di Dottorato in Scienza ed Alta Tecnologia, Università di Torino, Torino, 2008.
- Battaglia and Mulazzani Day, Area della ricerca CNR, Bologna, 2008.
- Accademia delle Scienze di Bologna Energia per l'astronave Terra, Bologna, 12 febbraio 2009.
- Seminari della Facoltà di filosofia: Il problema energetico. Università di Bologna, 17 febbraio 2009.
- GiovedìScienza: Il dedalo energetico. Torino, 19 febbraio 2009.
- III Workshop Fortlan Scienza nelle Scuole: Energia per l'astronave Terra, Università di Modena-Reggio Emilia, 2 aprile 2009.
- Spinner 2013, Lectio magistralis: Energia Oggi e domani: sfide e opportunità; Ravenna, 22 aprile 2009.
- Comunicare la Scienza, Polo di Rimini, Università di Bologna: Energia per l'astronave Terra; 27 aprile 2009.
- Scuola estiva La scienza al tempo della crisi, Agorà: "Energia: guardando da lontano, guardando lontano", Torino 8, luglio 2009.
- Convegno su "Fonti energetiche rinnovabili: il futuro e il passato tra scienza e storia della scienza, Ravenna, 25 settembre 2009.
- Workshop SIRR "Energia e radiazioni: quali prospettive per la ricerca", Napoli, 9 novembre 2009.
- Accademia dei Lincei: L'energia: il problema dei problemi, 11 dicembre 2009.