The 22nd Rudolf Brdička Memorial Lecture

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Nanoimaging technique with high time and spatial resolution:
Mechanisms of translocation through the nuclear pore complex

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J. Heyrovsky Institute of Physical Chemistry,v.v.i.
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Nanoimaging technique with high time and spatial resolution: Mechanisms of translocation through the nuclear pore complex

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In eukaryotic cells, all traffic between the nucleus and the cytoplasm is regulated by the nuclear pore complex. Much is known about the structure of the nuclear pore complex. However, the mechanism that allows very large particles to pass through the pore is still debated. In this talk I will discuss current models proposed for the opening and closing of the pore. I will present recent experimental evidence from my lab which poses strong constraints about possible mechanisms. I will describe a nanoimaging technique that has a very high time and spatial resolution. Using this technique we can observe the translocation of particles in great detail and reveal possible mechanisms of action of the nuclear pore complex.

Enrico Gratton received his doctorate in physics in 1969 from the University of Rome. In 1986, while a Professor at the University of Illinois at Urbana-Champaign, Dr. Gratton was awarded a grant from the National Institutes of Health to establish the first national facility dedicated to fluorescence spectroscopy: the Laboratory for Fluorescence Dynamics (LFD). The LFD is a state-of-the-art fluorescence laboratory for use by local, national, and international scientists. It is committed to service in a user-oriented facility, as well as to research and development of fluorescence instrumentation and theory. The LFD has reached international recognition for the development of instrumentation for time-resolved fluorescence spectroscopy using frequency domain methods. In 2006 the entire LFD laboratory moved to its current location at the new Natural Sciences II building at the University of California, Irvine. Dr. Gratton remains Principal Investigator of the LFD and holds joint appointments as Professor in the UCI departments of Biomedical Engineering and Physics, and also in the College of Medicine. Dr. Gratton collaborates with other UCI researchers in the areas of engineering, medicine, physical science, information and computer science, biological science, and UCI's Beckman Laser Institute (BLI).

In the areas of biology and biophysics, Dr. Gratton utilizes his knowledge of the latest techniques in fluorescence spectroscopy and microscopy to image live cells. As head of the Laboratory for Fluorescence Dynamics, a National Center for Research Resources supported by the National Institutes of Health, he and the scientists in his lab use fluorescence to study cellular processes including protein aggregation, membrane interactions, and migration of cells, to track moving particles, and to analyze collagen formation and deformation. The research leads to a better understanding of cell function, with potential application to diagnosing and identifying treatment for many human diseases, including Huntington's disease, kidney disorders, and cancers. Their findings also lead to the development of new fluorescence instrumentation and to the continued advancement of his center's data analysis software, Globals for Spectroscopy and Globals for Imaging. Proceeds from the software are used to fund research-related conferences and workshops, reflecting the longstanding commitment of Dr. Gratton and his lab to disseminating the latest advances in biomedical research to the greater scientific community.

BRDIČKA LECTURES

1.	***(1991)***	*Edgar **HEILBRONNER** (Eidgenossische Technische Hochschule, Zürich)* "**The old Hűckel formalism**"
2.	***(1992)***	*Kamil **KLIER** (Lehigh University, Bethlehem, Pennsylvania)* "**Physical chemistry in two dimensions**"
3.	***(1993)***	*Joshua **JORTNER** (Tel Aviv University, Tel Aviv)* "**Clusters – a bridge between molecular and condensed matter chemical physics"**
4.	***(1994)***	*David J. **SCHIFFRIN** (The University of Liverpool)* "**Electrochemistry in two-dimensional systems**"
5.	***(1995)***	*Josef **MICHL** (University of Colorado, Boulder, Colorado)* "**Molecular kit for new materials**"
6.	***(1996)***	*Gerhard **ERTL** (Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin)* "**Self-organization in surface reactions**"
7.	***(1997)***	*Roger **PARSONS** (University of Southampton)* "**Electrochemistry in the last 50 years: from Tafel plotting to scanning tunnelling**"
8.	***(1998)***	*G. Barney **ELLISON** (JILA and University of Colorado, Boulder, Colorado)* "**The chemical physics of organic reactive intermediates in combustion and atmospheric processes**"
9.	***(1999)***	*Henry F. **SCHAEFER III** (University of Georgia, Athens, Georgia)* "**The third age of quantum chemistry**"
10.	***(2000)***	*Alexis T. **BELL** (University of California and Lawrence Berkeley Laboratory, Berkeley, California)* "**Progress towards the molecular design of catalysts –lessons learned from experiments and theory**"
11.	***(2001)***	*Mario J. **MOLINA** (Massachusetts Institute of Technology, Cambridge, Massachusetts)* "**The Antarctic ozone hole**"
12.	***(2002)***	*Jean-Marie **LEHN** (Université Louis Pasteur, Strasbourg a Collége de France, Paris)* "**Selforganization of supramolecular nanodevices**"
13.	***(2003)***	*Helmut **SCHWARZ** (Technische Universität Berlin)* "**Elementary processes in catalysis: looking at and learning from** "**naked**" **transition ion**"
14.	***(2004)***	*Rudolph A. **MARCUS** (California Institute of Technology, Pasadena)* **"Strange isotope effects in stratospheric ozone and in the earliest minerals in the solar system"**
15.	***(2005)***	*Avelino **CORMA** (Instituto de Tecnología Química, Valencia)* " **Supramolecular Entities Based on Molecular Sieves for Catalysis and Synthesis of New Materials**"
16.	***(2006)***	*Paul **CRUTZEN** (Max Planck Institute for Chemistry, Mainz):* **"Atmospheric Chemistry and Climate in the ´Anthropocene´"**
17.	***(2007)***	*Harry B. **GRAY** (California Institute of Technology, Pasadena**)*** **"The Currents of Life: Electron Flow through Metalloproteins"**
18.	***(2008)***	*Michael **GRÄTZEL** (Ecole Polytechnique Fédérale de Lausanne)* "**Mesoscopic Electrodes for Generation and Storage of Electric Power from Sunlight"**
19.	***(2009)***	*Gabor. A. **SAMORJAI** (Department of Chemistry and Lawrence Berkeley National Laboratory, University of California, Berkeley)* **"Molecular Foundations of Heterogeneous Catalysis"**
20.	***(2010)***	*Pavel **HOBZA** (Institute of Organic Chemistry and Biochemistry of the ASCR, v. v. i., Prague)* **"Noncovalent Interactions and their Role in Chemistry and Biochemistry"**
21.	***(2011)***	Klaus ***MÜLLEN** (Max-Planck Institute, Mainz)* **„Carbon Material and Graphenes"**

Rudolf BRDIČKA
(1906-1970)

Professor of physical chemistry at Charles University, founding member of the Czechoslovak Academy of Sciences, founder and first director of the Institute of Physical Chemistry of the Czechoslovak Academy of Sciences.

An outstanding electrochemist renowned in particular by his pioneering work on kinetic polarographic current and on applications of polarography in medicine. A brilliant university teacher, author of an internationally recognized textbook of physical chemistry. He has crucial merits for development of modern physical chemistry in this country.

To commemorate his work and personality, the Institute of Physical Chemistry of the Academy of Sciences of the Czech Republic has organized since 1991 annually a festive R. Brdička Lecture. Invited speakers have been eminent scientists active in some field relating to the research currently pursued in the Institute.