Fundación BBVA

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2010 BBVA Foundation Frontiers of Knowledge Awards

PRESS RELEASE

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This is the third edition of the Frontiers awards, with 3.2 million prize money distributed across eight categories

Somorjai wins the BBVA Foundation Frontiers of Knowledge Award for insights facilitating the control of key chemical reactions in productive and environmental processes

- Somorjai has led the transition to the chemical catalysis of the 21st-century, with the ability to explore the world on the molecular level and understand what is happening underneath – the first step towards purposefully controlling chemical reactions

- The new laureate is convinced that the main future challenges for modern chemistry are the quest for alternatives to fossil fuels, and the spread of "green chemistry"

- The BBVA Foundation Frontiers of Knowledge Awards, established in 2008, recognize world-class research and artistic creation. Their eight categories reflect the main scientific, technological, social and economic challenges of the present day

January 27, 2011.- The BBVA Foundation Frontiers of Knowledge Award in the Basic Sciences category goes in this third edition to the U.S. scientist of Hungarian origin Gabor A. Somorjai, "for his pioneering experimental and conceptual contributions to the understanding of surface chemistry and catalysis at a microscopic and molecular level", in the words of the prize jury.

"The chemical processes that occur on surfaces are of crucial importance in such varied fields as catalytic converters for automobiles or the industrial production of fertilizers and pharmaceuticals", the citation continues. The new laureate "has

made pioneering contributions to the development of surface chemistry, with enormous repercussions in our everyday and economic life."

The work of Gabor A. Somorjai (Budapest, 1935) marks the transition from an empirical, macroscopic brand of chemistry, fundamentally reliant on trial and error, to a chemistry capable of exploring the world at the molecular scale and understanding the events unfolding at a more basic level. Knowing how molecules work is a first step to controlling chemical reactions at will.

In the telephone conversation following news of the award, Somorjai gave the following insights into his work: "We have progressed from a state of ignorance on what was happening with chemical reactions to seeing an unexpected landscape open up before our eyes. We were in a phase based on empirical, macroscopic description then suddenly we had the tools to investigate at the molecular level. All the beauty and potency of surface reactions were laid out before us".

"Before [our work] it was impossible to study what was happening with molecules. We had to develop techniques that would allow us to look at the structure, composition and dynamics of reactions as they proceed on the surface. And if you understand at the molecular level you can also control, so you know you are heading in the right direction."

Understanding why ice is slippery

Most chemical reactions occur on the surface of compounds. Back in the 1960s, however, little was known about what these reactions signified on the molecular scale. Somorjai has been "an inspirational force", the jury concludes, "for research in this field, and is regarded by his peers as the 'father of modern surface chemistry'".

Somorjai's approach has helped to control and optimize surface chemical reactions and led to a far better understanding of such universal interactions as adhesion, lubrication or friction.

He has also devised ingenious experimental techniques and introduced major improvements to existing methods, combining vacuum-based techniques with others operating in less stringent (vacuum-free) conditions.

A long list of industries have benefitted from Somorjai's work. Pharmaceuticals, for instance, agriculture – through fertilizers – or the automobile industry – through catalytic converters. Advances in surface chemistry have facilitated the synthesis of semiconductor materials that are the raw material for microelectronics, the development of hydrogen-powered electric vehicles, and the observation and study of natural processes.

Somorjai's research, for example, has helped explain why ozone is destroyed in the stratosphere – due to reactions on the surface of microscopic crystals, and why ice is slippery – in the run-up to the 2002 Winter Olympics his advice was sought on how to make ice-skating surfaces faster or slower.

In the last few decades, his work has also been instrumental in extending the boundaries of nanoscience.

The energy crisis and "green chemistry"

"Everything is chemistry", Somorjai remarked yesterday, content to be receiving the award at the start of International Year of Chemistry 2011. "The fact you are talking is a chemical process involving the neurons in your brain. Energy conversion is chemistry too, and who can deny that our standard of living depends on pharmaceuticals and other processing industries".

He is convinced that the search for efficient alternatives to fossil fuels is "one of the frontier issues in science", and that surface chemistry can provide at least some of the answers. Another pressing challenge is to obtain more selective reactions, which produce only the desired product without creating waste, following the principles of "green chemistry".

A 20th-century biography

Gabor A. Somorjai's life has been an eventful one. Born in Budapest to Jewish parents, he managed to escape the Nazi regime with his mother and sister in 1944, though his father was not so lucky and had to live out the war in a concentration camp. After the war, he began studying chemical engineering at the University of Budapest, only to find himself fleeing once more in 1956 when the Soviet Union moved in to crush the Hungarian uprising. In the United States, he enrolled in the University of California at Berkeley, where he obtained his Ph.D. in chemistry in 1960. He began his professional career as a researcher at IBM, but shortly returned to Berkeley, in 1964, as an assistant professor.

Today he continues at the same university as Director of the Surface Science & Catalysis Program in the Materials Sciences Division of the Lawrence Berkeley National Laboratory.

A tireless worker, his output in the last five decades includes over a thousand papers and three university textbooks. In this same period, he has mentored more than 330 doctorate students and postdoctoral fellows, and received just about every major honor in the chemistry field. The American Chemical Society even named an award after him, which in 2008 was presented to Dr. Avelino Corma Canós of the Instituto de Tecnología Química (Spanish National Research Council).

The jury chair, Nobel prizewinner Theodor W. Hänsch, unveiled the name of the new laureate at an announcement event in the Marqués de Salamanca Palace, the Madrid headquarters of the BBVA Foundation, where he was accompanied by the Foundation's Director, Rafael Pardo, and José Vicente García Ramos, Assistant Vice President of Scientific Programming at the Spanish National Research Council (CSIC),

Somorjai was nominated for the award by Michael Marletta, Chair of the Department of Chemistry at the University of California at Berkeley (United States); George W. Breslauer, Provost of the University of California at Berkeley (United States), and Paul Armand Alivisatos, Director of the Lawrence Berkeley National Laboratory (United States).

International jury

The jury in this category was chaired by **Theodor Hänsch**, holder of a Nobel Prize in Physics, Professor of Physics at Ludwig Maximilians University and Director of the Department of Laser Spectroscopy at the Max Planck Institute for Quantum Optics (Germany), with **Hongkun Park,** Professor of Chemistry and Chemical Biology and of Physics at the University of Harvard (United States) acting as secretary. Remaining members were **Douglas Abraham**, Professor of Statistical Mechanics in the Rudolf Peierls Centre for Theoretical Physics at Oxford University (United Kingdom); **Gerardo Delgado Barrio**, Research Professor and Director of the Instituto de Física Fundamental of the Spanish National Research Council (CSIC); **Martin Quack**, Professor of Physical Chemistry at ETH Zurich (Switzerland), and **Sandip Tiwari**, Charles N. Mellowes Professor in Engineering at Cornell University (United States) and Director of the National Nanotechnology Infrastructure Network, a U.S. partnership of nanotechnology research centers.

The 2009 in the Basic Sciences category was shared by physicist and chemist Richard N. Zare (United States) and physicist Michael E. Fisher (United Kingdom), for their contributions to understanding of molecular behavior. In the 2008 edition, the same award went to physicists Ignacio Cirac (Spain) and Peter Zoller (Austria) for their fundamental work in quantum information science.

The BBVA Foundation Frontiers of Knowledge Awards honor world-class research and artistic creation across eight prize categories. Their uniqueness lies in their close alignment with the scientific, technological, social and economic challenges of the present century. Each category carries a cash prize of 400,000 euros.

UPCOMING AWARD ANNOUNCEMENTS

CATEGORY	DATE
Biomedicine	Friday, February 4, 2011
Ecology and Conservation Biology	Wednesday, February 8, 2011
Contemporary Music	Tuesday, February 15, 2011
Economics, Finance and Management	Wednesday, February 16, 2011

The BBVA Foundation supports knowledge generation, scientific research and the promotion of culture, relaying the results of its work to society at large. This effort materializes in research projects; human capital investment; and specialization courses, grants and awards. Among the BBVA Foundation's preferred areas of activity are basic sciences, biomedicine, ecology and conservation biology, the social sciences and literary and musical creation.

A video recording of the new laureate's first impressions on receiving news of the award is available from the Atlas FTP with the following coordinates:

Server: **213.0.38.61**
Username: **agenciaatlas1**
Password: **amapola**

The name of the video is:
Premio Fronteras Ciencias Básicas

For more information, contact the BBVA Foundation Communication Department (+34 91 374 5210/comunicacion@fbbva.es) or visit the Foundation website www.fbbva.es