

The BBVA Foundation presents its Frontiers of Knowledge Awards in a ceremony celebrating science's power to meet the tests of the future

- Francisco González, President of the BBVA Foundation, stressed that these awards are about "improving society's scientific awareness and celebrating the passion for discovery and innovation." They are also "a true reflection of the knowledge map of the early 21st century"
- The BBVA Foundation Frontiers of Knowledge Awards, established in 2008, recognize world-class research and artistic creation. Their eight categories, with a combined cash prize of 3.2 million euros, address the main scientific, technological, social and economic challenges of the present day.

Madrid, June 15 2011.- The winners in the eight prize categories of the BBVA Foundation Frontiers of Knowledge Awards are the authors of contributions of huge present and future impact in multiple facets of our everyday lives, which have decisively enlarged the stock of knowledge in their respective disciplines. The eight laureates received their awards this evening at a formal ceremony in the Marqués de Salamanca Palace, Madrid headquarters of the BBVA Foundation. The breadth of scientific and cultural areas represented at the event reflects the values upheld by this award family: the universality of knowledge and the desire to recognize advances that address the major challenges facing humanity in the 21st century.

The awards in this edition have gone to **Shinya Yamanaka** for achieving cell reprogramming and opening the door to regenerative medicine; **Nicholas Stern**, for quantifying the economic cost of climate change; **Gabor Somorjai**, for discovering key chemical reactions in productive and environmental processes; **Edward O. Wilson**, for coining and popularizing the term

"biodiversity" and alerting society to its importance; **Donald E. Knuth**, for enriching and structuring the language of computers; **Lars Peter Hansen**, for designing the method used today by analysts and monetary decision-makers to draw conclusions from statistical data; the **International Rice Research Institute (IRRI)**, for turning rice research into an effective weapon in the fight against hunger; and **Helmut Lachenmann**, for enlarging the world of musical sounds.

The ceremony, under the presidency of Spain's Minister of Science and Innovation, Cristina Garmendia, BBVA Foundation President Francisco González, and the President of the Spanish National Research Council (CSIC), Rafael Rodrigo, welcomed eminent representatives of the international scientific community and high-level government institutions as well as leading figures from the worlds of business and the arts.

"Through these awards we wish to recognize the talent and the efforts of the entire scientific and artistic community," affirmed **Francisco González**, President of the BBVA Foundation.

"The Frontiers of Knowledge Awards unequivocally bear the stamp of our times. They are a true reflection of the knowledge map of the late 20th and early 21st centuries," he added. "We hope that, year by year, they will help to improve society's scientific awareness, while celebrating the passion to discover and innovate. They will also, we hope, encourage the rising generations to try and emulate these exceptional individuals with their passion to explore, create and innovate. Activities that are inwardly enriching as well as opening new horizons and opportunities for those who succeed in making them their profession."

The BBVA Foundation President also stressed that these awards, "devised in Spain and directed at scientists and cultural practitioners regardless of nationality, are the best example of our country's global vocation and forward-looking spirit."

For the Science and Innovation Minister, **Cristina Garmendia**, the goal is to "integrate the quest for research excellence with the creation of a supportive environment for business innovation and entrepreneurship." "The idea," she continued, "is that our legislation, the design of our scientific institutions, and a large part of our funding pursue a systematic cooperation between those who produce new knowledge and those who apply it."

The President of the Spanish National Research Council (CSIC), **Rafael Rodrigo**, praised the Frontiers of Knowledge Awards for turning a spotlight on "the magnificent fruit that can grow from collaborative working between the public and the private sector."

The CSIC advises the BBVA Foundation in the appointment of the juries and the pre-selection of nominees, guaranteeing that award decisions are governed by the strictest standards of scientific excellence. This is a "privilege" – continued Rodrigo – that involves "many people, many scientists, putting in long hours of work to ensure the objectivity, independence and end-to-end rigor of the candidate selection process".

SCIENTIFIC CREATIVITY APPLIED TO THE CHALLENGES OF OUR CENTURY

The breadth of disciplines addressed and the stature of the juries, formed by leading international experts in each prize area, have earned the Frontiers of Knowledge a firm place among the world's foremost award schemes. They carry a total cash prize of 3.2 million euros spread over eight categories.

The BBVA Foundation Frontiers of Knowledge Awards recognize innovation building on the cumulative stock of knowledge, and curiosity as a spur to exploration, creativity and the achievement of excellence. Their uniqueness lies in their close alignment with the scientific, technological, social and economic challenges of the present century.

In this respect, they are the first to reserve dedicated categories for Climate Change, Development Cooperation, Information and Communication Technologies, and Ecology and Conservation Biology, alongside the awards going to outstanding contributions in Economics, Finance and Management, Basic Sciences, Biomedicine and Contemporary Music.

THE PLEASURES OF RESEARCH

In their acceptance speeches during the ceremony – extracts of which we present below – the laureates talked about the fascination they feel for research and the social value of knowledge.

Edward O. Wilson: a new unifying biology

“Ecology has to draw inspiration and knowledge from all across the rest of biology, from molecular genetics to systematics, behavioral biology, and evolutionary theory. [This] is consistent with the overall trend of biology in the 21st century towards a balance of reduction and synthesis – from discovering the points, so to speak, to connecting the points.

Conservation science is also acquiring a new breadth and balance. We are coming to understand that in order to save the living world it will be necessary to discover and analyze individually the species composing it, most of which remain unknown to science.”

Donald E. Knuth: the dance of electrons

“The best theories are inspired by natural problems that arise in practice. The best practice is informed by theoretical results (...).So there's a wonderful positive feedback loop, with theory grounded in practice and practice optimized by theory. However (...) my life's work has in fact been characterized also by an important third dimension, namely 'fun'. My story is really best understood as a blend of theory, practice, and fun.

My theoretical work has been driven by a compulsion to answer intriguing questions (...). And I've also experienced a thrill whenever I've been able to train a computer to produce beautiful patterns of numbers or images. It's enormously exciting to imagine how electrons dance inside a machine when it is performing computations. So it seems to me that the joy of such so-called 'aha moments' is what really lies behind all scientific discoveries and advances in technology."

Shinya Yamanaka: dizzying advances in a revolutionary technology

"Since our initial report on iPS cells, many scientists have been tirelessly working to find new breakthroughs and are now advancing this technology at a surprising speed.

Its potential use and applications in medicine are enormous. However, the technology is still in its infancy (...). There are also many challenges which need to be overcome before the technology is successfully applied in the discovery of new drugs and regenerative medicine (...). I hope to pursue my research with my many fellow researchers so that we can truly put iPS cell technology to use for patients."

Nicholas Stern: on the verge of a new industrial revolution

"We must recognize and rise to the two great challenges of our century, overcoming world poverty and managing climate change. If we fail on one we fail on the other. (...) And the likely consequences will be severe, prolonged and global conflict.

The good news is that we can not only see how to begin and pursue that process, but also we can see that it will be creative, innovative and a driver of (...) a very different type of growth. Science has guided us on the risks and necessary scale of action. We can see technologies emerging. We understand the essence of the key economic policies. The challenge now is creating the political will. (...) We must emphasize not only the immense risks from inaction but also the great opportunities in the transition to the low-carbon economy."

Gabor A. Somorjai: the control of molecules transforms daily life

"It always fascinated me that surfaces play key roles in all aspects of our daily lives, including the functioning of the human body. Surfaces are also the agents called catalysts, which accelerate chemical reactions such as those that produce fuels and chemicals. Clean air, water and energy conversion by chemical reactions are all the products of catalysts. Understanding catalysis and other chemical processes at surfaces on the molecular level has been the aim in my laboratory over the past 45 years.

Microelectronics for computers, new polymers, bio-implants, such as heart valves and replacements of joints, hips and knees, and many other applications of surface technologies were also made possible through molecular understanding of the structure and chemical bonding of surfaces."

Lars Peter Hansen: factoring beliefs into economic models

“A central ingredient in dynamic economic models is the way in which forward-looking investors respond to new information. Investors' beliefs about aspects of the future for which we have little basic information can have a potent impact on current asset values and assessments. (...) For a few decades, the builders of dynamic, stochastic models, including myself, addressed the question of how to model investor beliefs by imposing model-determined 'rational expectations'. But as the role of beliefs and the associated ambiguities became better appreciated, I found it both promising and challenging to re-examine and extend how investors behave in uncertain and complex environments.”

Robert Zeigler, International Rice Research Institute (IRRI): mobilizing science for the war against hunger

“Rice is the most important crop for the world's poor – feeding more than 3 billion people every day. It is the staple food for people across Asia where more than 60% of the world's undernourished live. Rice is also becoming increasingly important in Africa and Latin America. It is clear that rice will be part of any equation to address issues of food security, hunger and poverty.

IRRI's purpose is clear – apply the best science to increase the productivity of rice, improve the livelihoods of rice farmers while maintaining affordable supplies for consumers, especially the poor.

The prize will be used to support new research areas. We will initiate studies to better understand the biology of flowering that should lead to increased seed production.”

Helmut Lachenmann: the creative energy of music

“It is still poorly understood that music, as an art that is emphatically felt, has to do with reflection, innovation, and the discovery of new ways of organizing and perceiving reality; with aesthetic adventure and also, time and time again, with irritation. It is to this creative and motivating energy that we owe the unique expressive and stylistic riches of European music, from its origins in the Middle Ages to the soundscapes of the 19th century, and the achievements of the twentieth century and this one, which are about so much more than their complex tonality.

Music – as a transgressor of boundaries each time in a different guise, as a flight from representations of beauty and order that cling to the canons imposed by society – arises from a compositional practice in constant renewal; which continually looks afresh at the musical medium and spells the word 'music' differently in each new work.”

All awardees were presented with an artwork by sculptor Blanca Muñoz (Madrid, 1963), based on a series of spirals that represent the progress and interrelation of scientific disciplines. The spiral, in the words of the author, "is the optimal solution for growth in a limited space as well as the best way to represent continuity."

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