

Presentation ceremony of the 11th BBVA Foundation of Knowledge Awards in the Euskalduna Conference Centre in Bilbao

The Frontiers of Knowledge Awards call urgently for a renewed commitment to the sustainability of our planet

- The BBVA Foundation's international awards have moved to their new home in Bilbao, the venue for last night's concert in honor of laureates. For weeks now the city has been emblazoned with banners announcing the arrival of the awards.
- The President of the BBVA Foundation, Carlos Torres Vila, and the President of the Spanish National Research Council (CSIC), Rosa Menéndez, presided over a ceremony that also welcomed to the stage the President of the Basque Country, Íñigo Urkullu, and Juan Mari Aburto, the Mayor of Bilbao
- "Humanity has never had so much responsibility laid on its shoulders; the steps we take today could transform our planet for all time, and determine the lives of future generations," declared Carlos Torres Vila, President of the BBVA Foundation
- Established in 2008, the BBVA Foundation Frontiers of Knowledge Awards recognize contributions that expand the boundaries of the known world in science, art and the humanities. Each of their eight categories is decided by an international committee of experts.

Bilbao, 18 June, 2019.- Knowledge is vital as a motor of prosperity, but above all as a guide to decision-making in the face of pressing global concerns like the climate and biodiversity crises. This was one of overriding messages to emerge from the presentation ceremony of the 11th edition of the BBVA Foundation Frontiers of Knowledge Awards, held this evening in the awards' new home in the city of Bilbao. "Climate change, the biodiversity crisis and inequality are issues whose future consequences may be much more serious if we fail to act now," insisted BBVA Foundation President Carlos Torres Vila in his speech at the event.

“Humanity has never had so much responsibility laid on its shoulders as it has at this moment; the steps we take today could transform our planet for all time and determine the lives of future generations.”

The ceremony in the Euskalduna Conference Centre of the Bizkaia capital was presided over by the President of the BBVA Foundation and the President of the Spanish National Research Council (CSIC), Rose Menéndez, and attended by the President of the Basque Country, Íñigo Urkullu, the Mayor of Bilbao, Juan Mari Aburto, the President of the Provincial Council of Bizkaia, Unai Rementeria Maiz, and numerous representatives of Spain's academic and cultural communities, including the presidents of distinguished scientific societies and directors of research centers.

“We at BBVA are convinced that the ultimate goal of our activity is to help create a more sustainable horizon, in the fullest sense of the description, and confront the major challenges that lie before us,” Torres Vila continued. “The awards have served to strengthen our conviction that organizations like BBVA have the duty to make the fight for sustainability a badge of our identity.” This goal is embedded in the architecture of the Frontiers Awards, the only worldwide family of prizes that places research on our planet on an equal footing with basic sciences, medicine or economics through the categories of Climate Change and Ecology and Conservation Biology.

The achievements of laureates, added the BBVA President, “equip us with powerful conceptual tools and theoretical perspectives, and, in essence, make us better people. Their example is an encouragement to act with boldness to address the challenges of this complex and fascinating period of the 21st century.”

The President of the Spanish National Research Council (CSIC), Rosa Menéndez, also spoke about the urgency of preserving nature: “The science of the 21st century is warning us that we are putting our planet at risk. But it is also telling us that it is in science precisely that most work is being done to design solutions for a sustainable future.” CSIC has been involved from the outset in the organization of the awards through its expert panels who assess candidates prior to their consideration by the committees.

From this edition onwards, the Frontiers Awards will have their permanent home in Bilbao – not only the BBVA Group's city of origin, but the capital of one of Spain's most innovating regions. Torres Vila thanked the Basque authorities for the warm reception extended by the city, which for weeks now has been emblazoned with messages of welcome. “This city and the Basque Country in general,” he declared, “represent the living roots of the BBVA Group, and share with us a spirit of openness to today's global society.”

The President of the Basque Country, Íñigo Urkullu, who delivered the ceremony's closing address, chose to focus on the “frontiers of knowledge” concept that lends its name to the BBVA Foundation awards: “The word ‘frontier’ is used today

as a synonym for division and distrust. These awards, however, use the word 'frontiers' to define a horizon; a space where knowledge and experience are enriched and shared, and an opportunity to advance together in wellbeing and social justice."

From sea-level rise to the discovery of the microbiome

In their speech **Charles Kane** and **Eugene Mele**, recognized in **Basic Sciences** for the discovery of topological insulators, talked the public through the experience of discovering these materials and their extraordinary electronic properties: "When we were in the middle of this research, I remember telling my wife Suzanne that I felt like I was unwrapping a present. And that is something to be grateful for," remarked Charles Kane. Topological insulators are "on the one hand, real materials that you can hold in your hand and study in the laboratory. And they have unique electronic properties that may be useful. On the other hand, the way we understand these materials rests on deeply elegant mathematical logic that reveals a powerful organizing principle for characterizing the phases of matter. This combination of real world application with theoretical depth and beauty is what to me makes the best of theoretical physics."

Jeffrey Gordon, recognized in **Biology and Biomedicine** for elucidating the importance of the microbiome to human health, began his speech with a nod to the subject of his research: "I and my tens of trillions of microbes accept this wonderful award ..." He then described how as a child "I dreamed of going to Mars. When I was older, I didn't have to travel far to encounter new life forms. A trip a few meters inside was sufficient to see a captivating world of trillions of microbes." His very own *terra incognita*. "Current human microbiome research," Gordon continued, "is addressing questions originally posed by microbiologists more than a century ago, but is doing so with new sets of tools. Being able to see ourselves as a splendid collection of interacting human and microbial parts teaches us that we do not travel through life alone, unaccompanied (...). Establishing a causal relationship between our microbial communities and health status is the starting point for dissecting the mechanisms by which they operate and communicate with us, as we are already doing in the cases of childhood undernutrition and obesity."

Ivan Sutherland, recognized in **Information and Communication Technologies** for devising the first man-machine graphical interaction system and inventing the virtual reality headset, recalled how as a student he was allowed hundreds of hours' access to the TX2, then "the most powerful computer in the world," simply because the machine's builder, Wesley Clark, believed that personal use of computers would one day be the norm. "Clark's idea of personal computers was radical in 1960 when only governments and large companies could afford computers." Sutherland had requested use of the TX2 to make engineering drawings; initiating a research endeavor that he described in his speech as "a thrilling adventure." He also related how in 1965, after watching a pilot receive images via his helmet from a camera mounted on the underside of his helicopter, he had the idea that led to "the birth of virtual reality." And so it was.

“My Harvard research group built equipment (...) that allowed a user to wander in an artificial mathematical world seen through the very same helicopter headset.” Sutherland took from this experience that “those who extend the frontiers of knowledge do so, as I did, not for recognition, but for the thrill of going where none have gone before.”

Gretchen Daily and **Georgina Mace**, recognized in **Ecology and Conservation Biology** for employing rigorous scientific criteria to develop tools to combat species loss, pointed out that the work they do “uses basic ecological science in practical conservation.” According to Mace, “we both sense an upturn in public and corporate attention to the state of the environment – and specifically to the values of nature and the risks and devastating costs of its loss,” adding that “it is inspiring to see the engagement by young people, local communities, cities, and business and industry, at a time when many national governments are focused elsewhere. The challenges are enormous, but science has a huge role to play in supporting these leaders, driving the values of nature into policy and finance, and opening achievable pathways to sustainable development.”

Anny Cazenave, **John Church** and **Jonathan Gregory**, recognized in **Climate Change** for confirming that global warming is causing sea level to rise at an accelerating rate, issued a call for “urgent worldwide action to mitigate emissions, and to develop plans to adapt to the sea-level rise that we can no longer prevent.” The three awardees are clear that this phenomenon “will impact the lives of tens to hundreds of millions of people this century, displacing many around the world and costing billions of dollars. And it will continue for many centuries. To avoid rapid rates of sea-level rise and to avoid crossing thresholds leading to many meters of sea-level rise requires rapid and deep reductions of greenhouse gas emissions. Even the aspirations of the Paris climate accord result in large sea-level rise in the long term.”

Claudia Goldin, recognized in **Economics** for her analysis of the causes behind the gender wage gap, made reference to the fact that “the issue of gender is still with us, and may always be,” even though, “we are poised to close some of the most glaring residual gaps in much of the world, including in Spain. Women are 50% of the population,” Goldin continued, “yet they have not been 50% of the labor force. They contribute to the economy, yet often in ways that are not fully valued. They have, across history, left the confines of their homes and stepped onto a larger stage. Yet their time is still not fully valued. The reasons why they entered the broader labor force, from some earlier period to our current era, and why their labor is still not valued equally to that of men has occupied my thinking for some time. A host of technological changes (including those in the home, factory, and office and those that concern the most intimate of our needs, such as reproductive technologies) have served to narrow various gaps between men and women in earnings, education, occupations, and labor force participation.”

Noam Chomsky, recognized in **Humanities and Social Sciences** for his “unparalleled” contributions – in the words of the committee – to the study of

language as an innate faculty wired into the human brain, was unable to attend the ceremony for reasons of health, but took part nonetheless via a video recording of his acceptance speech, read from Arizona (United States). "It is particularly gratifying [to receive this award] as recognition of the achievements of the so-called 'generative enterprise.' At the outset, in the 1950s, it seemed to be an exotic initiative (...)" "Galileo expressed his amazement at the remarkable fact that with a few dozen symbols, humans are somehow able to express infinitely many thoughts, and to convey to others the inner workings of their minds. Similar observations motivated Cartesian dualism. Wilhelm von Humboldt regarded language as 'the formative organ of thought,' based on the unique human ability to 'make infinite use of finite means.' By now languages of vast typological range have been investigated in this manner, at a level of depth, and scope of inquiry, that could not have even been imagined not long ago. The work also revitalized the study of language acquisition and processing, and became a core part of the emerging cognitive sciences."

John Adams, distinguished in the **Music and Opera** category for composing "a music genuinely of our time," looked back in his speech at his own musical past in parallel with the history of contemporary music: "When I was starting out in the 1960s our concerns as young composers were in retrospect somewhat selfish ones: cultivating a personal style and establishing our individualism at all costs. It was a period when the writing of 'serious' music became an intellectual activity, a willful act of pushing the boundaries, of radical experimentation not only with music's materials but also with the listener's powers of comprehension. For those of us would-be avant-garde revolutionaries, the ideal was to adopt cool rational methods of composing (...). It was also a time when contemporary music became mostly so complex and inaccessible that it all but lost its audience. People who loved the classics – Bach or Schubert or Mahler and even Stravinsky – could find neither pleasure nor meaning in the new music, which for most listeners was an impenetrable black box. I have tried over the course of my creative life to restore the primacy of feeling and emotional connectedness in my music. Especially in my operas I have sought ways to use music to address the collective myths of our time, whether they be those national identity and aspiration, or of the deep psychological complexities of our human experience."

About the BBVA Foundation Frontiers of Knowledge Awards

The BBVA Foundation Frontiers of Knowledge Awards, established in 2008, recognize and reward contributions of singular impact in science, art and the humanities, privileging achievements that significantly expand the frontiers of the known world, open up new fields, or emerge from the interaction of various disciplinary areas. Their eight categories are congruent with the knowledge map of the 21st century: Basic Sciences; Biology and Biomedicine; Information and Communication Technologies; Ecology and Conservation Biology; Climate Change; Economics, Finance and Management; Humanities and Social Sciences; and Music and Opera.

The awards come with a cash prize of 400,000 euros in each category, along with a diploma and a commemorative artwork.

Of the 107 individuals and institutions distinguished in the first ten years of the awards, seven have since gone on to win the Nobel Prize: Shinya Yamanaka; James P. Allison, Robert J. Lefkowitz, Lars Peter Hansen, Jean Tirole, Angus Deaton, and William Nordhaus. Some 50 to 60 nominations are received each year in most award categories, put forward by prestigious academic, research and artistic institutions the world over. The winner in each category is decided by an international committee made up of world authorities in the subject area, who deliberate independently behind closed doors. Before that, nominees are assessed by a panel formed by research staff of the Spanish National Research Council (CSIC), a partnership that will be reinforced as of the coming edition through the involvement of the University of the Basque Country and other Basque research and cultural centers.



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