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BBVA Foundation Frontiers of Knowledge Awards
8th edition

BBVA Foundation Frontiers of Knowledge Award in Climate Change

Ramanathan takes the BBVA Foundation award for demonstrating the global warming impact of other gases and particles and showing that means are available besides limiting CO_2 to achieve short-term progress against the clock

- The Indian climatologist, a professor at the University of California, San Diego, estimates that by acting on short-lived gases from here to 2030, we can cut in half projected global warming over the next 35 years
- As a member of the Pontifical Academy of Sciences, he urged Pope Francis to make climate change a part of his message, considering it a moral issue for all humanity

Madrid, January 8, 2016.- The BBVA Foundation Frontiers of Knowledge Award in the Climate Change category goes in this eighth edition to Indian climatologist Veerabhadran Ramanathan for discovering that human-produced gases and pollutants other than CO_2 have a huge power to alter the Earth's climate, and that by acting on them it is possible to make a short-term dent on the rate of global warming.

Ramanathan's work "has inspired him to propose and test practical actions to mitigate climate change in a way that also improves air quality and human health, especially in more impoverished regions of the world," in the words of the jury, which also highlighted the centrality of the scientist's contributions in "assessing the strategies being proposed to meet the goals of the Paris Agreement."

The citation also commends Ramanathan's "vision and dedication" in "communicating the risks posed by climate change and air pollution," which has commanded the attention of world leaders and helped "shape public awareness." Ramanathan is a member of the Pontifical Academy of Sciences,

and in recent years has played a key role in advising Pope Francis and other religious leaders on climate-change-related matters.

Ramanathan (Madurai, India, 1944), a professor at Scripps Institution of Oceanography (University of California, San Diego) since 1990, declared himself optimistic in conversation yesterday: "We have the huge task before us to slow down climate change, and this recognition just one month after the summit agreement energizes me to work even harder and to do my best to raise public awareness of the problem. I consider the award a great honor and also an opportunity."

The all-important "trace gases"

In 1975, five years after moving to the United States, Ramanathan discovered that chlorofluorocarbons (CFCs), gases then solely associated with the destruction of the ozone layer, were also powerful drivers of the greenhouse effect, and, as such, contributed to climate change.

Ramanathan found that one tonne of CFCs traps as much heat in the atmosphere as ten thousand tonnes of CO_2. Scientists at the time believed carbon dioxide to be the only human-produced greenhouse gas. But after Ramanathan's groundbreaking work, it was revealed that other gases such as methane and HFCs – precisely the coolants used in fridges in place of CFCs because they were harmless for the ozone layer – were also potent greenhouse gases.

In the years that followed, Ramanathan and other researchers discovered that these "trace" gases – so called because they are less abundant than CO_2 – are responsible for 45% of the greenhouse effect ascribable to human action.

The finding offers a peculiar parallel with Ramanathan's own career. On completing his engineering degree in India, he worked for two years in a factory making refrigeration units, where his job was to stop the escape of refrigerant gases, none other than CFCs. But there would be no short leap from this experience to investigating the atmospheric impacts of CFCs. Ramanathan could not solve the factory's gas escape problem, and instead left the firm to return to university where his studies brought him into contact with U.S. research groups.

In the early 1970s, he enrolled at the State University of New York, where he began studying the greenhouse effect in the atmospheres of Venus and Mars. His work there earned him a postdoctoral position with NASA, investigating atmospheric ozone and its influence on terrestrial surface climate. And that is how he came to discover and quantify the greenhouse impact of CFCs.

Drones to analyze pollution

Ramanathan also pioneered studies on the climate change impact of aerosols or suspended particles. As part of this endeavor, in the 1990s he set up pathbreaking large-scale experiments using what were then largely untried technologies. Thanks to an experiment whereby a flotilla of what we would now call drones flew

through a pollution cloud over the Pacific wider than the United States and three kilometers thick, Ramanathan and his colleagues found that a specific kind of aerosol, soot or black carbon, was also a potent greenhouse driver and therefore a prime culprit in global warming.

These aerosols make up much of the pollution affecting European cities, but they are also produced by the burning of inefficient fuels like dung in cooking stoves in India and other poor countries in southeast Asia. This kind of pollution kills tens of thousands of people among the world's poor. Indeed Ramanathan remembers his own grandmother "coughing endlessly" over her smoky indoor cooking fire. It was this experience that inspired the launch of Project Surya – the Sanskrit word for "sun" – aimed at getting non-soot emitting and solar stoves into the homes of rural Indians, and monitoring the climate and health effects of the initiative by means of data gathered using mobile phones.

Talking yesterday, Ramanathan stressed that anti-climate change energies should also be directed against pollutants such as these, so directly detrimental to human health.

Rapid warming mitigation

He is adamant that after the "memorable" agreement reached in Paris, the global community must redouble its efforts to tackle trace gases and black carbon, in view of the "great opportunity" they offer to make a rapid dent in the rate of warming. This is because trace gases and soot are short-lived pollutants. Once released, they remain in the atmosphere for just a short time, compared to the centuries of CO_2, so cutting their emissions would bring much faster benefits than from CO_2 mitigation alone.

Trace gases and soot "are about 25 to 4,000 times more potent warmers than carbon dioxide, but they remain in the atmosphere from mere days in the case of carbon soot to 15 years in the case of HFCs," Ramanathan explained yesterday. "Curbing the emissions of these short-lived climate pollutants, unlike curbing carbon emissions, will have an immediate effect and can dramatically slow global warming within a few decades. These steps will delay environmental disaster and give us time we desperately need to radically change our energy diet."

In a 2015 paper, Ramanathan estimated that if we reduce our emissions of methane 50%, black carbon 90% and fully replace HFCs by 2030, we can cut in half projected global warming over the next 35 years.

This is not to say that we should concentrate on short-lived gases to the exclusion of any effort on CO_2. Rather we need to "press the two levers. Limiting CO_2 emissions alone will not deliver the Paris target." In his view, trace gases and soot represent "a powerful card in our hand, and now is the time to play it."

For Ramanathan, it should not be forgotten that climate change is a problem with its origin in the world's richest countries, but whose burden will fall

disproportionately on the poor: "Three billion people who have nothing to protect them, whom we cannot leave to their fate."

Paradoxically, it was awareness of this injustice that saved him from "depression" and the feeling of "total failure" that afflicted him some ten years ago, after working on climate change for thirty years producing "one bad-news paper after another." The scientific evidence was there, he reflects, "but nothing was being done." Just then, Ramanathan received a call from the Vatican inviting him to join the Pontifical Academy of Sciences. His acceptance would bring him into contact with the world's most important spiritual leaders, and open a new dimension in his career which has instilled in him a fresh optimism.

As a member of the Pontifical Academy of Sciences, he co-organized the 2014 symposium *Sustainable Humanity, Sustainable Nature*, many of whose conclusions found their way into the *Laudato Si* encyclical on global environmental deterioration.

Climate change, for him, "is an essentially moral problem which demands that we change our behavior as a society and start to think beyond ourselves and even our children; which means thinking about our planet and those living far away." It is therefore a problem that calls for the involvement of moral leaders: "We scientists have no moral authority to tell others how to behave, but religious leaders have that authority. There are two points on which all religions agree: the protection of the poor, and the protection of nature, of creation. The struggle against climate change is a point of union between all religions, and also between religion and science."

His research remains a constant source of new data on climate change. In 2014, he calculated that the rate of decrease in the Arctic albedo (the amount of light reflected off the planet's surface) due to sea ice depletion was equivalent to 25% of the CO_2-induced warming of the last 30 years.

About the BBVA Foundation Frontiers of Knowledge Awards

The BBVA Foundation established its Frontiers of Knowledge Awards in 2008 to recognize the authors of outstanding contributions and radical advances in a broad range of scientific, technological and artistic areas congruent with the knowledge map of the late 20th and the 21st centuries, and others that address central challenges, such as climate change and development cooperation, deserving of greater social visibility and recognition.

Their **eight categories** include classical areas like *Basic Sciences* and *Biomedicine*, and other, more recent areas characteristic of our time, ranging from *Information and Communication Technologies, Ecology and Conservation Biology, Climate Change* and *Economics, Finance and Management* to *Development Cooperation* and the innovative realm of artistic creation that is *Contemporary Music*.

The **juries** in each category are made up of leading international experts in their respective fields. The BBVA Foundation is aided in the organization of the awards by the **Spanish National Research Council (CSIC)**. As well as designating each jury chair, the CSIC is responsible for appointing the technical evaluation committees that undertake an initial assessment of candidates and draw up a reasoned shortlist for the consideration of the juries.

CSIC technical committee members in the Climate Change category were **Gerardo Félix Benito Ferrández**, Research Professor in the Spanish Museum of Natural Sciences (MNCN-CSIC); **Daniel Oro de Rivas**, Research Professor in the Mediterranean Institute for Advanced Studies (IMEDEA-CSIC); **José Luis Pelegrí Llopart**, Research Professor in the Institute of Marine Sciences (ICM-CSIC); and **Xavier Querol Carceller**, Coordinator of the CSIC Natural Resources Area and Research Professor at the Institute of Environmental Assessment and Water Research (IDAEA-CSIC).

Climate Change jury

The jury in this category was chaired by **Bjorn Stevens**, Director of the Max Planck Institute for Meteorology (Germany). The secretary was **Carlos Duarte**, Tarek Ahmed Juffali Chair in Marine Biology and Associate Director of the Red Sea Research Center at the King Abdullah University of Science and Technology (Saudi Arabia). Remaining members were **Sandrine Bony**, senior scientist at the Laboratoire de Météorologie Dynamique (LMD), run jointly by the Centre National de la Recherche Scientifique and University Pierre et Marie Curie (France); **Miquel Canals**, Professor of Marine Geology and Chairman of the Department of Stratigraphy, Paleontology and Geosciences at the University of Barcelona (Spain); **Martin Heimann**, Director of the Department of Biogeochemical Systems at the Max Planck Institute for Biogeochemistry (Germany), and Edward S. Rubin, Alumni Chair Professor of Environmental Engineering and Science at Carnegie Mellon University (United States).

UPCOMING AWARD ANNOUNCEMENTS

CATEGORY	DATE
Information and Communication Technologies (ICT)	Tuesday, January 12, 2016
Basic Sciences	Tuesday, January 19, 2016
Biomedicine	Tuesday, January 26, 2016
Ecology and Conservation Biology	Tuesday, February 2, 2016
Contemporary Music	Tuesday, February 9, 2016

Economics, Finance and Management	Tuesday, February 16, 2016
Development Cooperation	Tuesday, February 23, 2016

LAUREATE'S FIRST DECLARATIONS AND IMAGES

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

Server: **213.0.38.61**

Username: **AgenciaAtlas4**

Password: **premios**

The name of the video is:

"PREMIO CAMBIO CLIMÁTICO PROFESOR RAMANATHAN"

In the event of connection difficulties, please contact Alejandro Martín at ATLAS:

Mobile: +34 639 16 58 61

E-Mail: amartin@atlas-news.com