**In the Biology and Biomedicine category**

# The BBVA Foundation recognizes Jeffrey Gordon for discovering the key role of gut microbes in human health

- The American researcher and his team were "the first to demonstrate the importance of the gut microbiome in regulating animal physiology," in the words of the award committee; a paradigm-setting insight that has opened up a new realm in biomedical research
- Following on from Gordon's discovery, it was recently shown that gut microbes play a central role in conditions like obesity, diabetes and inflammatory bowel disease, as well as in malnutrition and its impact in children
- His work, says the committee, has opened the door to the use of fecal microbiota transplantation for the treatment of colitis, while his whole research field holds out great promise for the development of targeted therapies for a range of diseases

**Madrid, 29 January 2019.-** The BBVA Foundation Frontiers of Knowledge Award in the Biology and Biomedicine category has gone in this eleventh edition to American researcher Jeffrey Gordon, for his fundamental discovery of the importance of the gut microbial community to human health, in the words of the committee.

"Gordon and his team were the first to demonstrate the importance of the gut microbiome in regulating animal physiology," the citation continues. "Following this fundamental discovery, it has been shown by many groups around the world that the gut microbiome plays a central role in health and in disease, including obesity, diabetes and inflammatory bowel disease, and perhaps will have great implications on the pathogenesis of neurological disorders and response to drug therapy."

Gordon's work has ushered in a brand new area of basic research in biomedicine exploring the role of microbes in the body's healthy functioning, and has enabled new research directions in the study of multiple conditions, as well as the search for novel treatments.

Gordon discovered, for instance, that gut flora may contribute to the onset of obesity. And he was also able to show that the long-term effects of childhood malnutrition, like impaired brain and immune system development, are determined not only by diet but also by the assembly or otherwise of a healthy microbiome.

Further ahead, his work may herald a new era of microbiome-based therapies. As the committee remarks, "fecal microbiota transplantation can be beneficial for the treatment of some disease conditions, including types of colitis. As the precise molecular mechanisms of the role of bacteria in our physiology are being discovered, this will have great promise for the development of targeted therapeutics for diverse human diseases."

## A human-microbe "symbiosis" essential to health

Science has long known that the human body teems with microbial species that colonize every available surface. But what it failed to suspect was how important these communities are. In fact, Gordon and his group only got interested in gut flora as part of their research on intestinal development. While exploring the chemical signals cells exchange as they go about building the gut, Gordon found that the microbes that live there *converse* constantly with our cells, and perform services that they rely on. One such service would be digesting nutrients that the human body cannot metabolize.

This discovery that microbes and their human hosts exist in a symbiotic state essential to their mutual survival was a major paradigm shift. The new laureate explained it thus after hearing of the award: "We cannot live or function alone; there is this ongoing collaboration between ourselves and the tens and tens of trillions of microbes that inhabit our bodies."

"People should step back and take a more expanded view of what we truly are; this splendid collection of microbial and human cellular and genetic parts," Gordon enthuses. "There are over a hundred-fold more microbial genes than human genes in our bodies, and in this respect we are more bacterial than human, but we benefit from one and other's company. The question is the degree to which our biological features are an expression of our microbial contributions."

Gordon declares himself "captivated" by the idea that hundreds of millions of years ago a much simpler organism had to decide whether it had enough genes to metabolize the nutrients it needed, or whether it should coopt those of other life forms, forging a symbiotic relationship that has lasted to this day. "Most people's view of microbes is in the context of war and conflict, rather than cooperation and collaboration, but what our research has revealed is that microbes can be our friends."

## The role of the microbiome in obesity and malnutrition

To elucidate the role of gut microbes, Gordon and his team used mice reared under sterile conditions, so they harbored no microbes of their own. They then colonized them with known members of the gut microbial community to observe how they reacted to particular nutrients. This kind of research has produced firm evidence that microorganisms are causally related to diseases like obesity, as well as having a role to play in the treatment of malnutrition.

As Gordon explains it, "our research journey has focused on what is normal in human microbial communities, and whether deviations from normal are associated with disease."

The new field of microbiome research is right now a hive of activity, but Gordon cautions that "we need to keep sight all we still have to learn." It may be tempting to think that there are "fattening" and "slimming" microbes, but it will never be that simple: the effect of each microbiome is personal and specific, because "the important thing is the interaction" between the microbes and the host's cells.

## Reduced microbial diversity in the West

One fact that emerges is that the enormous diversity of the human microbiome is being eroded in Western societies: "We looked at the microbiomes of people living in different parts of the world, and saw that in Westernized societies there has been a loss of the diversity of these microbial communities, and that is not good. It is a reflection of our lifestyles and our diets, a reflection perhaps of the things that we consume, including our promiscuous use of antibiotics."

Looking to the future, Gordon is hopeful that "we will learn how to feed ourselves in more healthful ways, improving the content of staple foods to the benefit of the consumer's microbiome, and making better decisions on how food should be processed to maintain the active ingredients and by this means improve the nutritional status of different populations."

## Bio notes

Jeffrey I. Gordon earned a degree in medicine from the University of Chicago in 1973. He went on to do his clinical training in internal medicine and gastroenterology, completing a post-doctoral fellowship at the National Institutes of Health (NIH). In 1981, he joined the faculty at Washington University in St. Louis (Missouri, United States), where he remains to this day.

A varied teaching and research career in medicine, biological chemistry and molecular biophysics took him through the ranks of academia to the two positions that he holds today, as Dr. Robert J. Glaser Distinguished University Professor and Director of the Edison Family Center for Genome Sciences and Systems Biology. In this time, he also served as Chair of the Executive Council of the Division of Biology and Biomedical Sciences, overseeing all graduate education in the biological sciences.

The author of more than 500 papers in international journals and with 24 patents to his name, he has been thesis mentor to 63 PhD and MD/PhD students and research mentor to 68 post-doctoral fellows. He is a member of the editorial boards of *Cell Metabolism*, *Cell Host and Microbe*, and *Science Translational Medicine*. The gut bacterium *Parabacteroides gordonii*, isolated in 2009, was named in his honor.

### Biology and Biomedicine committee and evaluation support panel

The rigor, quality and independence of the judging process have earned these awards the attention of the international scientific community and a firm place among the world's foremost prize families.

The jury in this category was chaired by **Angelika Schnieke,** Chair of Livestock Biotechnology in the Department of Animal Sciences at the Technical University of Munich (TUM) (Germany). The secretary was **Óscar Marín,** Director of the MRC Centre for Neurodevelopmental Disorders at King's College London (United Kingdom). Remaining members were **Dario Alessi,** Director of the Protein Phosphorylation and Ubiquitylation Unit in the School of Life Sciences at Dundee University (United Kingdom); **Lélia Delamarre**, Group Leader in the Department of Cancer Immunology at biotech company Genentech (United States); **Robin Lovell-Badge**, Senior Group Leader and Head of the Laboratory of Stem Cell Biology and Developmental Genetics at the Francis Crick Institute (United Kingdom); **Ursula Ravens,** Senior Professor in the Institute of Experimental Cardiovascular Medicine at the University Heart Center of the University of Freiburg (Germany); **Ali Shilatifard**, Chairman of the Department of Biochemistry and Molecular Genetics at Northwestern University Feinberg School of Medicine (United States); and **Bruce Whitelaw,** Deputy Director (Partnerships) at the Roslin Institute, University of Edinburgh (United Kingdom).

The BBVA Foundation is aided in the evaluation process by the Spanish National Research Council (CSIC), the country's premier public research organization. The Foundation and CSIC jointly appoint the evaluation support panels charged with undertaking an initial assessment of the candidates proposed by institutions across the world and drawing up a reasoned shortlist for the consideration of the award committees. CSIC is also responsible for designating each committee chair.

The **CSIC Technical Committee** in this category was coordinated by **María Victoria Moreno**, the Council's Deputy Vice President for Scientific and Technical Areas, and formed by: **Susana Alemany**, Coordinator of the Biology and Biomedicine Area and Scientific Researcher in the Alberto Sols Biomedical Research Institute; **Ana Aranda**, Research Professor in the Alberto Sols Biomedical Research Institute; **Jesús Ávila**, Research Professor in the Severo Ochoa Molecular Biology Center; **Dolores González**, Research Professor at the López Neyra Institute of Parasitology and Biomedicine; and **María Isabel Medina**, Coordinator of the Food Science and Technology Area, and Research Professor at the Institute of Marine Research.

## About the BBVA Foundation Frontiers of Knowledge Awards

The BBVA Foundation centers its activity on the promotion of world-class scientific research and cultural creation, and the encouragement of talent.

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, ranging from basic sciences to key challenges for the natural environment by way of domains at the crossroads of disciplines – Biology and Medicine; Economics, Finance and Management – or the supremely creative realms of music and the opera.

**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 coordinates:

Server: **5.40.40.61**

Username: **agenciaatlas2**

Password: **fronteras**

The video is in the folder labelled:

**"PREMIO BIOLOGÍA Y BIOMEDICINA"**

In the event of connection difficulties, please contact **Miguel Gil** at production company Atlas:

**Mobile**: 619 30 8774

**E-mail**: mgil@mediaset.es

## CALENDAR OF ANNOUNCEMENT EVENTS

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| **Ecology and Conservation Biology** | Tuesday, 5 February, 2019 |
| **Information and Communication Technologies (ICT)** | Tuesday, 19 February, 2019 |
| **Basic Sciences** | Tuesday, 5 March, 2019 |
| **Economics, Finance and Management** | Tuesday, 26 March, 2019 |
| **Music and Opera** | Tuesday, 9 April, 2019 |
| **Humanities and Social Sciences** | Tuesday, 30 April, 2019 |