VIII edición
Premios Fundación BBVA Fronteras del Conocimiento
BBVA Foundation Frontiers of Knowledge Awards
8th edition

Frontiers of Knowledge Award in Ecology and Conservation Biology

The BBVA Foundation honors Ilkka Hanski for opening up an area of ecology that explains how species survive in fragmented habitats and allows to quantify the extinction threshold

- Hanski established metapopulation biology through a combination of fieldwork and mathematical modeling, to determine the degree of habitat fragmentation beyond which a species will go extinct
- His work has applications in optimizing the design of protected areas and defining conservation strategies in the face of habitat loss due to forces like deforestation, urbanization or climate change

Madrid, February 2, 2016.- The BBVA Foundation Frontiers of Knowledge Award in Ecology and Conservation Biology goes in this eighth edition to Finnish ecologist Ilkka Hanski, whose work is pivotal to our understanding of how species are affected by the growing problem of man-made habitat fragmentation. His contributions inform many of the conservation initiatives around us today, from the design of protected areas to the creation of biological corridors or environmental impact studies prior to major infrastructure developments.

Professor of Zoology at the University of Helsinki, Hanski's research focuses on metapopulations, a concept introduced in the late 1960s which he developed into a new field in ecology known as metapopulation biology, analyzing the persistence of species dispersed across distinct habitat patches whose populations nonetheless remain connected by colonization. The key question Hanski set out to solve is which number, size and population connectivity must be preserved for a species to survive through habitat degradation and loss.

Over the course of three decades, Hanski's theoretical insights, drawing on what the jury terms his "exquisite long-term field studies," have allowed to predict the persistence of a metapopulation on the basis of its colonization and extinction rates, on the one hand, and, on the other, the distribution and size of its habitat fragments.

Hanski has developed mathematical models that predict the viability of populations across a wide range of species and habitats. Moreover, "the impact

of his work is increasing," the jury notes, "as habitats become more fragmented due to anthropogenic influences."

In 1999, he published *Metapopulation Ecology*, the foundational text of the discipline he led into being. In this respect, the jury singles out Hanski as one of the small body of ecologists wedding theoretical contributions with experimental fieldwork whose work can also claim a direct relevance for biodiversity conservation initiatives.

His research has applications in optimizing the design of protected areas and defining conservation strategies in the face of landscape fragmentation due to forces like deforestation, urbanization or climate change.

Among Hanski's reactions yesterday on hearing of the prize was to stress the intrinsic value of understanding metapopulation dynamics: "In nature, many habitats are not homogeneous, but discontinuous or fragmented, and in these situations species end up distributed in metapopulations. So if we want to understand species' natural dynamics, we have to first understand metapopulation networks."

He also emphasized the importance of using such knowledge for conservation purposes: "Human activity increases the degree of fragmentation, so it is vital to know what the consequences are. Metapopulation theory helps us devise strategies to improve population survival. A typical example would be the optimal design of a reserve, deciding how it should be organized so it can fulfill its function with the least possible impact on species."

Meantime, mathematical models of metapopulation biology allow us to quantify the degree of habitat fragmentation a given species can withstand. In other words, to "determine the critical threshold beyond which fragmentation is fatal and the species is lost."

The dung beetle

Hanski (Finland, 1953) first got interested in population distribution in the late 1970s, as a doctorate student at the University of Oxford (United Kingdom). His attention was drawn to dung beetles, and the way different species clumped together in cattle pats. He began using mathematical models to describe the behavior of each species and elucidate the variables influencing their success or failure.

At the end of the 1980s, back home in Finland, he commenced the long-term field studies cited by the jury. Not with dung beetles this time, but with another model organism, the Glanville fritillary butterfly (*Melitaea cinxia*). He was inspired in this endeavor by the visit to Finland of Stanford entomologist Paul Ehrlich (United States), a Frontiers of Knowledge laureate in the sixth edition of the awards, although Hanski himself had been a keen butterfly collector in his childhood years.

He selected a large study area in the Åland Islands, in the Baltic Sea, where thousands of dry meadow patches provided the ideal fragmented habitat. From the early 1990s, Hanski and his students conducted an annual census of the butterflies present in each meadow, refining their models as they progressed and testing their predictions, with a mix of theory and empiricism that was particularly valued by the judges.

Metapopulation biology is now applied to numerous species, and its conceptual tools have been eagerly seized on by other disciplines. We could cite, for instance, cancer research, where they are used to study the behavior of tumor cell populations, or epidemiology, where knowing the critical size of a metapopulation network can help fight the spread of a disease. "The metapopulation concept," agreed Hanski yesterday, "has been incorporated into many different areas of research."

Human beings as fragmented microbe habitats

Since 2012, Hanski has led the Metapopulation Research Group at the University of Helsinki, looking at how habitat fragmentation affects plant and animal development.

His own research path illustrates just how far the theory's ramifications have extended. Recently, Hanski has been applying genomics to the study of metapopulations, seeking to ascertain, among other things, which genes are essential to preserve the population network of a given species. In the case of the Glanville fritillary, for instance, one such gene plays a key role in flight and dispersal performance.

Another offshoot has to do with human health. Intrigued by the relationship between the human immune system and the various microorganism communities that populate the human body, Hanski has developed a theory that links the biodiversity individuals are exposed to with the behavior of their microbiome, and its implications for the state of their immune system. "After all, for our microbiome we ourselves are fragmented habitats, and it is intellectually fascinating to work with colleagues from other fields, such as immunology," he remarked yesterday.

About the BBVA Foundation Frontiers of Knowledge Awards

The BBVA Foundation promotes, funds and disseminates world-class scientific research and artistic creation, in the conviction that science, culture and knowledge hold the key to better opportunities for all world citizens. The Foundation designs and implements its programs in partnership with some of the leading scientific and cultural organizations in Spain and abroad, striving to identify and prioritize those projects with the power to significantly advance the frontiers of the known world.

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.

Their **eight categories** include classical areas like *Basic Sciences*, and other, more recent areas characteristic of our time, ranging from *Biomedicine, 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, who arrive at their decisions in a wholly independent manner, applying internationally recognized metrics of excellence. 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 Ecology and Conservation Biology category were Xavier Bellés Ros, Research Professor in the Institute of Evolutionary Biology (IBE-CSIC); Daniel Oro de Rivas, Research Professor at the Mediterranean Institute for Advanced Studies (IMEDEA-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).

Ecology and Conservation Biology jury

The jury in this category was chaired by **Georgina Mace**, Professor of Biodiversity and Ecosystems at University College London where she also heads the Centre for Biodiversity and Environment Research (United Kingdom). The secretary was **Jordi Bascompte**, Professor of Ecology in the Department of Evolutionary Biology and Environmental Studies at the University of Zurich (Switzerland). Remaining members were **Nina Buchmann**, a professor in the Department of Environmental Systems Science at the Institute of Agricultural Sciences, ETH Zurich (Switzerland); **Gerardo Ceballos**, a professor in the Instituto de Ecología of the Universidad Nacional Autónoma de México; **Pedro Jordano,** Research Professor in the Department of Integrative Ecology at Estación Biológica de Doñana, CSIC (Spain); and **Rik Leemans**, Professor of Environmental Systems Analysis at Wageningen University (Netherlands).

Previous laureates

A list of laureates in previous editions is available on the following link:

http://www.fbbva.es/TLFU/tlfu/ing/microsites/premios/fronteras/index.jsp

UPCOMING AWARD ANNOUNCEMENTS

CATEGORY	DATE
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: **AgenciaAtlas5**

Password: **premios**

The name of the video is:

"PREMIO FRONTERAS DEL CONOCIMIENTO CATEGORÍA ECOLOGÍA Y BIOLOGÍA DE LA CONSERVACIÓN PROF. ILKKA HANSKI"

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

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