

At 400,000 euros, the largest monetary award in the ICT field

Kailath wins the BBVA Foundation Frontiers of Knowledge Award in Information and Communication Technologies for breaking through the barrier of chip miniaturization

- “Cellphones will eventually take over from computers”, affirms Kailath, Hitachi America Professor of Engineering at Stanford University
- Kailath, who regards this award as a “tribute” to the brilliance of his students, has mentored a generation that have gone on to become leaders in research and industry
- The Frontiers of Knowledge Awards address the great global challenges of the 21st century. No comparable award scheme reserves a category for Information Technologies

January 19, 2010.- The BBVA Foundation Frontiers of Knowledge Award in the Information and Communication Technologies category goes in this second edition to engineer and mathematician Thomas Kailath (Pune, India, 1935), as author of a mathematical development enabling the production of increasingly small size chips. Kailath has invented methods to pattern integrated circuits with components finer even than the lightwaves used in their production, a bit like drawing a line that is finer than the point of the pencil. This happened at a time when the limits of chip miniaturization seemed both close and insurmountable.

Kailath was able to conquer that barrier to achieve the results forecast by ‘Moore’s law’, whereby the number of transistors that can be placed in an integrated circuit doubles every year and a bit. “At that time it was thought that 100 nanometers was the smallest thing you could make in a chip with optics [a nanometer is one millionth of a millimeter]. Right now, the limit stands at 32 nanometers, and we were the first to break through that barrier”, explained Kailath, Hitachi America Professor of Engineering at Stanford University, in a phone conversation just after hearing of the award.

The new laureate has generated knowledge and applications “with transformative impact

on the information and communication technologies that permeate everyday life”, in the words of the jury’s citation.

Thomas Kailath has revolutionized a multitude of supposedly disparate areas, from wireless communications and mobile telephony to the aforementioned miniaturization of integrated circuits. And his achievements extend beyond the applied side to purely mathematical formulations. For Kailath is that rare combination: a scientist with the ability to solve profound mathematical problems and translate them into practical applications, generating new technologies.

He has been nominated by the president of the IEE Signal Processing Society, José M. F. Moura, at the Carnegie Mellon University, with the support of the Spanish Royal Academy of Engineering, the Institute of Advanced Studies of the Technical University of Munich; the School of Engineering of the Stanford University, the Massachusetts Institute of Technology, the Princeton School of Engineering and Applied Science; the Israel Institute of Technology; and the Imperial College London.

The BBVA Foundation Frontiers of Knowledge Awards honor world-class research and artistic creation across eight prize categories. Their uniqueness lies in their close alignment with the scientific, technological, social and economic challenges of the present century. Thus categories are reserved for Development Cooperation; Information and Communication Technologies; Ecology and Conservation Biology; and Climate Change, alongside the awards going to outstanding contributions in Economics, Finance and Management; Basic Sciences; Biomedicine and Contemporary Music.

The Information and Communication Technologies category is the second to be decided in the 2009 edition. On January 15, the winner of the Climate Change category was announced as German physicist and mathematician Klaus Hasselmann.

In the inaugural 2008 edition, the award in the ICT category went to Israeli engineering professor Jacob Ziv, one of the ‘fathers’ of discoveries enabling such vital applications as the compression of the data, text, image and video files used in all personal computers.

A tribute to the brilliance of his students

In the course of his teaching career, the awardee has directed around eighty PhD theses, a good deal more than the average U.S. university professor, and has worked alongside postdoctoral researchers all over the world. Many of these students now occupy leading positions in industry or have set up their own businesses.

“I was able to see the opportunities and enter new fields because I learned to use my students as intelligence amplifiers”, says Kailath. “So I regard this prize as a tribute also to them, to their brilliance and dedication”.

Kailath has authored some 400 publications in specialist journals, as well as various books that set new standards in their subject area.

In the 1980s, his work on wireless signalling led to the development of a new antenna system used in the now ubiquitous Wi-Fi technology, and was also instrumental in bringing to market the GSM cellphone standard.

In this terrain, Kailath predicts that “Cell phones will get better and better, with more computing power. They will eventually replace computers”. He declares himself “astounded” by the predominance of the mobile phone. “Nowadays people think that if you don’t pick up the phone there’s something wrong. I don’t always carry mine with me because like any technology it has its drawbacks, but the ability to be globally connected at any time is a good thing. Less good is that today we are drowning in information, but that doesn’t mean we are absorbing more”.

Kailath was born in Pune (India) in 1935. He was far from being a child prodigy in mathematics and in fact passed his exams at school by memorizing the solutions to all the problems taught in class. It was not until geometry entered the curriculum that the young Kailath was won over. Years later, studying at Pune University, Kailath happened on his future when reading an article by Claude Shannon titled “Information Theory” in the magazine *Popular Science*. That was back in 1950, when TV signal transmission was still an emerging technology. In 1956, Kailath was awarded a grant to continue his doctorate studies at Massachusetts Institute of Technology (MIT), in Cambridge (United States), where he became the center’s first ever Indian-born student. In 1976, he obtained U.S. nationality.

International jury

Chairing the jury was **Andrea Goldsmith**, Professor of Electrical Engineering at Stanford University and Junior Past President of the Information Theory Society of the IEEE (Institute of Electrical and Electronics Engineers, the most influential professional association in the world of advanced technology). Other members were **Ronald Ho**, Distinguished Engineer on the VLSI Research Group of Sun Microsystems; **Oussama Khatib**, professor and leading specialist in robotics working at the Artificial intelligence Laboratory of Stanford University; **Nico De Rooij**, Director of the Institute of Microengineering at the École Polytechnique Fédérale de Lausanne (Switzerland); and Spaniard **Ramón López de Mántaras**, Director of the Artificial Intelligence Research Unit (IIIA-CSIC).

Upcoming award announcements

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| Basic Sciences (Physics, Chemistry, Mathematics) | January 26, 2010 |
| Biomedicine | January 27, 2010 |
| Ecology and Conservation Biology | January 28, 2010 |
| Development Cooperation | January 29, 2010 |

The Contemporary Music and Economics categories will be decided during the month of February.

The BBVA Foundation supports knowledge generation, scientific research and the promotion of culture, relaying the results of its work to society at large. This effort materializes in research projects; human capital investment; and specialization courses,

grants and awards. Among the BBVA Foundation's preferred areas of activity are basic sciences, biomedicine, ecology and conservation biology, the social sciences and literary and musical creation.

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