

Physicists Ignacio Cirac and Peter Zoller win the BBVA Foundation Frontiers of Knowledge Award in Basic Sciences

- The new laureates authored the first theoretical description of a quantum computer and today remain world leaders in quantum computation
- Both figure among the most highly cited scientists in atomic physics of the last 10 years
- This international award comes with prize money of 400,000 euros

January 29, 2009.- The Basic Sciences award in this inaugural edition of the BBVA Foundation Frontiers of Knowledge Awards has been shared by physicists Ignacio Cirac (Manresa, 1965) and Peter Zoller (Austria, 1952), “for their fundamental work on quantum information science”, in the words of the jury chaired by Theodor W. Hänsch, Nobel Prize in Physics. Cirac and Zoller’s research is opening up vital new avenues for the development of quantum computers, immensely more powerful than those we know today.

The BBVA Foundation Frontiers of Knowledge Awards seek to recognize and encourage world-class research at international level, and can be considered second only to the Nobel Prize in their monetary amount, an annual 3.2 million euros, and the breadth of the scientific and artistic areas covered.

The awards, organized in partnership with Spain’s National Research Council (CSIC), take in eight categories carrying a cash prize of 400,000 euros each. The Basic Sciences award, the sixth to be decided, is to honor contributions which significantly advance the stock of knowledge in this area for reasons of their importance and originality.

“It is a thrill to see how our expectations are being confirmed”

Peter Zoller greeted the news as “a great honor and a huge recognition for our area of work. It has been amazing to observe how this field has grown in the past ten years and how our expectations are little by little being borne out”. For this investigator, sharing the prize with his one-time collaborator, Ignacio Cirac, “is an added pleasure, since a lot of this work has been done together”. The Spanish researcher declared himself “especially honored because the award distinguishes the advances being made in an especially dynamic field”. Cirac also chose to

emphasize “the importance of basic science, which is where tomorrow’s applications are born”.

Ignacio Cirac and Peter Zoller are regarded as the theoretical physicists of most influence in the areas of cold atoms, quantum optics and quantum information. For more than a decade, their work has broken new ground and opened up new experimental opportunities. At the core of their research is the use of the microscopic world to build quantum computers and communication systems.

Their first major theoretical contribution, dating from 1995, was the description of a theoretical model for a quantum computer. They based their conjectures on what are known as *ion traps*, in which electrically charged and cooled atoms are trapped by an electric field and manipulated with lasers. Today, this technique still holds out the best promise for quantum computation. In fact some small-scale prototypes of quantum computers have already been built based on the ion trap idea.

In the last few years, work done at numerous laboratories has confirmed Cirac and Zoller’s theoretical predictions.

Fundamental work in quantum information

According to the jury’s citation, Cirac and Zoller earned this award “for their fundamental work on quantum information science. Both men have formulated new theoretical insights and inspired experiments from quantum simulation to engineering in systems ranging from atoms and ions to condensed matter”.

The jury in this inaugural edition of the Frontiers of Knowledge Awards, Basic Sciences category, was chaired by **Theodor W. Hänsch**, the 1995 Nobel Prize in Physics; nanoscientists **Hongkun Park** of Harvard University and **Sandip Tiwari** of Cornell University; **Douglas Abraham** from the University of Oxford; **Martin Quack** of ETH Zurich; and **Gerardo Delgado** of the Spanish National Council for Scientific Research (CSIC).

The Basic Sciences award is the sixth to be decided in this first edition of the BBVA Foundation Frontiers of Knowledge Awards. It follows on from awards in Climate Change (granted to U.S. scientist **Wallace S. Broecker**, who predicted climate warming due to human activity more than three decades ago); Development Cooperation (**Abdul Latif Jameel Poverty Action Lab** at the Massachusetts Institute of Technology (MIT)); Biomedicine (cancer researcher **Joan Massagué**, Spain’s most internationally cited working scientist); Arts (U.S. architect **Steven Holl**); and Information and Communication Technologies (engineer **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 today’s personal computers).

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courses, grants and awards. Among the 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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