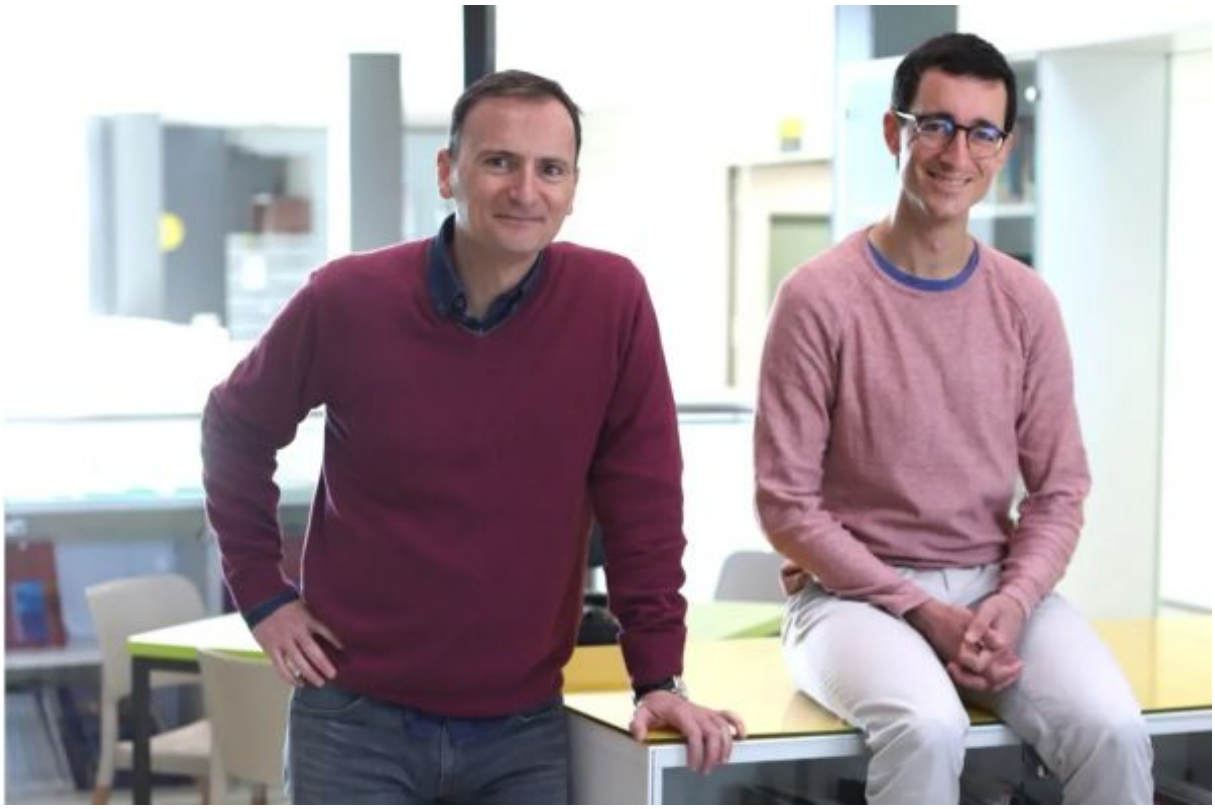


Paul Ehrenfest Best Paper Award for Quantum Foundations 2022

ICFOnians receive best paper award for Quantum theory based on real numbers can be experimentally falsified

January 05, 2023

The Paul Ehrenfest Best Paper Award for Quantum Foundations, given by the Institute for Quantum Optics and Quantum Information in Austria, recognizes outstanding and influential research contributions to the foundations of quantum physics, aiming to raise awareness on the relevance of the field of quantum foundations in modern research, and to draw attention to new and interesting achievements in the field. The prize is awarded to the most significant paper in foundations of quantum physics, theoretical or experimental, published in a peer-review journal in the five calendar years prior to the prize call (i.e., this year between January 1st, 2017 and December 31st 2021). Papers from all areas in the foundations of quantum physics, and by authors of any background, are eligible for the award.

ICFO researchers Marc-Olivier Renou and ICREA Prof. at ICFO Antonio Acin, in collaboration with Prof. Nicolas Gisin from the University of Geneva and the Schaffhausen Institute of

Technology, Armin Tavakoli from the Vienna University of Technology, and David Trillo, Mirjam Weilenmann, and Thinh P. Le, led by ICFO alumnus Prof Miguel Navascues, from the Institute of Quantum Optics and Quantum Information (IQOQI) of the Austrian Academy of Sciences in Vienna have been named recipients of the 2022 award for their paper titled **Quantum theory based on real numbers can be experimentally falsified**, published in **Nature**. In this paper, the researchers have proven that if the quantum postulates were phrased in terms of real numbers, instead of complex, then some predictions about quantum networks would necessarily differ. Indeed, the team of researchers came up with a concrete experimental proposal involving three parties connected by two sources of particles where the prediction by standard complex quantum theory cannot be expressed by its real counterpart.

The 2022 selection committee has awarded the prize for i¿½proving that quantum theo y based on real numbers and quantum theory based on complex numbers give rise to differe t predictions and identifying explicitly a Bell-type experimental scenario where this happen , hence opening the possibility for an experimental falsification of quantum theory based n real numbers.i

?½ The researcher group led by Prof Acin was also the recipient of the 2016 and 2018 aul Ehrenfest Best Paper Award, making this the third time that the group has been recogn zed for the significance of its contributions in the area of the foundations of quantum physics.

Congratulations!