

Bell Prize goes to scientists who proved 'spooky' quantum entanglement is real

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The John Stewart Bell Prize for Research on Fundamental Issues in Quantum Mechanics and their Applications, awarded by the University of Toronto. Credit: University of Toronto

A trio of scientists who defied Einstein by proving the nonlocal nature of quantum entanglement will be honoured with the John Stewart Bell Prize from the University of Toronto (U of T). The prize recognizes the most significant recent achievements in the world in quantum mechanics and is considered by many to be the top international award in the field.

The recipients each led separate experiments in 2015 that showed two particles so distant from one another that no signal could connect them even at the speed of light nevertheless possessed an invisible and instantaneous connection. They are:

- Ronald Hanson, Delft University of Technology, Netherlands
- Sae-Woo Nam of the National Institute of Standards & Technology, United States
- Anton Zeilinger, University of Vienna, Austria

According to quantum entanglement, the world is a very weird place where [quantum particles](#) become correlated in pairs. These pairs predictably interact with each other regardless of how far apart they are: if you measure the properties of one member of the entangled pair you know the properties of the other. Einstein was not a believer: in the 1930s, he called it "spooky action at a distance."

"While many experiments have come close to proving [quantum entanglement](#), the scientists we are honouring have closed previous loopholes," says Professor Aephraim Steinberg, a [quantum physicist](#) at the U of T's Centre for Quantum Information & Quantum Control (CQIQC) and one of the founders of the Bell Prize. Earlier tests, for example, were plagued by the difficulties of ensuring that no signal could make it from one detector to the other as well as the fact that so many photons were being lost in the test process.

"Collectively, they have removed all reasonable doubt about the nonlocal nature of [quantum entanglement](#). In so doing they are also opening the door to exciting new technologies including super-secure communications and the ability to perform certain computations exponentially faster than any classical computer," says Steinberg.

Created by the CQIQC at U of T in 2005, the John Stewart Bell Prize for Research on Fundamental Issues in Quantum Mechanics and their Applications is judged by an international panel of experts and awarded every two years for achievements in the previous six years.

"Advancing understanding of [quantum mechanics](#), along with its

technological applications, is something that deserves to be celebrated and recognized around the world. We expect that, in some cases, the Bell Prize will prove to be a precursor to the Nobel Prize in Physics," says Daniel James, director of the CQIQC.

The [prize](#) will be awarded on Thursday, August 31 at 1:25 pm at the Fields Institute on the U of T campus. Recipients will give short talks after the ceremony.

Provided by University of Toronto

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