

Paul G. Kwiat

“The Quantum Information Revolution: 101 Uses for Schrödinger's Cat”

Paul G. Kwiat received his Ph.D. from the University of California, Berkeley (1993). After two years as a Lise Meitner Fellow with the premier quantum optics group of Prof. Anton Zeilinger at the Univ. of Innsbruck, Austria, he went to Los Alamos National Laboratory as an Oppenheimer Fellow. In 1998 he became a Technical Staff Member in the Neutron Science and Technology group of the Physics Division. In January 2001 he assumed the role of Bardeen Chair in Physics, at the University of Illinois, in Urbana-Champaign. A Fellow of the American Physical Society and the Optical Society of America, he has given invited talks at numerous national and international conferences, and has authored over 120 articles on various topics in quantum optics and quantum information, including several review articles. He has done pioneering research on the phenomena of quantum interrogation, quantum erasure, and optical implementations of quantum information protocols. He is the primary inventor of the world's first sources of polarization-entangled photons from down-conversion, which have been used for quantum cryptography, dense-coding, quantum teleportation, and most recently, realizing optical quantum gates.

A century after Einstein's revolutionary suggestion that light is composed of particles, the quantum information revolution seeks to use the almost magical properties of non-classical physics to enable new feats in information processing. The critical quantum resource is entanglement, which can now be produced at high rates with exquisite precision, enabling such feats as quantum cryptography and teleportation. I will describe some of these “miracles,” and our investigations into how the usual benefits can be further extended, by using more complex quantum states (e.g., “hyper-entanglement”), and by incorporating other elements of modern physics (e.g., special relativity). Time and appetites permitting, a brief lesson in quantum cooking may be forthcoming.

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