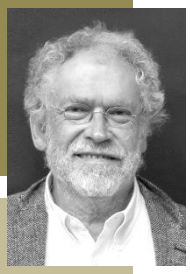
PHYSIKALISCHES KOLLOQUIUM

des Fachbereichs Physik
der Johann Wolfgang Goethe-Universität Frankfurt

Mittwoch, den 03.02.2016, 16 Uhr c.t.
Großer Hörsaal, Raum _0.111,
Max-von-Laue-Str. 1



Prof. Dr. Dr. h. c. mult. Anton Zeilinger

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Quantum Teleportation, Entanglement, and Einstein's Question "What is Light?"

It is well known that Einstein received the Nobel Prize for the groundbreaking idea of 1905, his annus mirabilis, that light consists of particles, today called photons. In 1935, he discovered together with Podolsky and Rosen that two quantum systems can be connected stronger than in classical physics. For that situation the Austrian Nobel Prize winner Erwin Schrödinger coined the name "entanglement" and called it "the essential feature of quantum mechanics" while Einstein, dismissed it as "spooky action at a distance". Technical progress in creating and handling entangled photon states not only led to experimental realization of such entangled states but also the discovery of novel phenomena, including, for example, multi-particle entanglement and quantum teleportation. These are not just intellectual curiosities, but they lay the foundations for a new information technology, with concepts such as quantum communication, quantum cryptography and quantum computation. In the talk, I will present some of the most recent experimental results, particularly on long-distance quantum communication and on the implementation of quantum states in higher-dimensional Hilbert spaces. I will also discuss future possible applications in quantum information systems. These will, for example, include experiments using satellite-based quantum communication on a worldwide scale. Towards the end of his life Einstein commented that despite years of conscious brooding, he did not come closer to answering the question "What is light?" It would be fascinating to know his position about these recent developments.

Die Dozenten der Physik

local host: Prof. Peter Kopietz, pk@itp.uni-frankfurt.de