Berliner Physikalisches Kolloquium

Humboldt-Universität zu Berlin, Audimax, Hauptgebäude, 1. Stock,
Unter den Linden 6, 10117 Berlin

Eine gemeinsame Veranstaltung der Physikalischen Gesellschaft zu Berlin e.V. (PGzB), der Freien Universität Berlin (FUB), der Humboldt-Universität zu Berlin (HUB), der Technischen Universität Berlin (TUB) und der Universität Potsdam (UP), gefördert durch die Wilhelm und Else Heraeus-Stiftung.

Am Donnerstag, dem **06. Februar 2014, um 18:30 Uhr**

spricht

Prof. Dr. Serge Haroche
Nobelpreis für Physik 2012
Collège de France & Ecole Normale Supérieure, Paris, France

über das Thema

„Manipulating photons non-destructively and taming Schrödinger cats of light“

Moderation: Ludger Wöste (FU Berlin)

We know since Einstein seminal paper of 1905 on the photoelectric effect that light, known since Maxwell to be an electromagnetic wave, is also made of discrete quanta, the photons. This strange wave-particle dualism has opened the way to the quantum theory and revolutionized physics. When they discussed the counter-intuitive quantum concepts, the fathers of the theory – Einstein, Bohr and Schrödinger among them – used to describe *thought experiments* in which they imagined that they freely manipulated photons, electrons or atoms and observed their strange behaviour. At the same time, they believed that these ideal experiments would be forever impossible to turn into actual ones in the laboratory. A major difficulty to realize these experiments with photons is that they are very fragile particles, usually destroyed upon detection. Technological advances have recently changed this state of affairs and made it possible to manipulate photons in ways which were previously thought impossible. I will describe this adventure and show how we have built a “photon box” in which we can count light quanta without destroying them, as we can do with marbles in a bag. We have also “tailored” the light trapped in the box and generated laboratory versions of the famous Schrödinger cat which the Austrian physicist imagined to be suspended between life and death. In our case, the “cat” is made of photons instead of atoms and it is maintained “half-way” between two states which classical physicists would consider to be incompatible. By studying this strange behaviour, we get a deeper knowledge about the quantum laws and learn tricks that we hope to use one day for developing new technologies which could improve the precision of measurements, the secrecy of communications or the power of computer simulations.