CERN Colloquium

SPEAKER: Prof. Alain Aspect (Institut d'Optique Graduate School, Palaiseau)

TITLE: **From Bell's inequalities to quantum information: a new quantum revolution**

DATE: Wed 16/12/2015 16:30

PLACE: TH Conference Room

ABSTRACT

In 1935, with co-authors Podolsky and Rosen, Einstein discovered an intriguing quantum situation, in which particles in a pair are so strongly correlated that Schrödinger called them “entangled”. By analyzing that situation, Einstein concluded that the quantum formalism is incomplete. Niels Bohr immediately opposed that conclusion, and the debate lasted until the death of these two giants of physics.
In 1964, John Stuart Bell discovered that it is possible to settle the debate experimentally, by testing the famous "Bell's inequalities", and to show directly that the revolutionary concept of entanglement is indeed a reality. A long series of experiments closer and closer to the ideal scheme presented by Bell has confirmed that entanglement is indeed "a great quantum mystery", to use the words of Feynman.

Based on that concept, a new field of research has emerged, quantum information, where one uses quantum bits, the so-called “qubits”, to encode the information and process it. Entanglement between qubits enables conceptually new methods for processing and transmitting information. Large-scale practical implementation of such concepts might revolutionize our society, as did the laser, the transistor and integrated circuits, some of the most striking fruits of the first quantum revolution, which began with the 20th century. To cite only the simplest example of these new concepts, quantum cryptography allows one to guarantee an absolute privacy of communications, based on the most fundamental laws of quantum mechanics.

Organised by: Wolfgang LERCHE PH/TH .....**Tea and coffee will be served at 16h00**