Lectures on quantum optics and quantum information at Collège de France

Serge Haroche

11 Place Marcellin Berthelot

Amphithéâtre Marguerite de Navarre

Mondays at 9:30 am, followed by seminar at 11am

Starts on January 30th, ends on March 13th

Lectures in French, some seminars in English

You might be interested in other Collège de France courses

in Physics, Maths or other fields : inquire at ***www.college-de-france.fr***

Series of lectures given over the last 4 years

2001-2002 : Entanglement, complementarity and decoherence : from thought experiments to quantum information

2002-2003 : Decoherence and the quantum-classical boundary

2003-2004 : Mesoscopic state superpositions: open systems and decoherence in quantum optics and quantum information

2004-2005 : Controling decoherence: theory and experiments

Lecture notes of these previous courses available in PDF at
www.cqed.org

2005-2006 : Entanglement and quantum information: an experimental survey (I)

This year's course at Collège de France

Beginning of a series of lectures on recent quantum information experiments. This year will be devoted mainly to ***ion trap physics***.

We will describe the main tools (trapping, cooling and detecting the ions), the ion laser interaction leading to effective hamiltonians of the Jaynes-Cummings type (with analogies with CQED physics), the different decoherence mechanisms (damping due to coupling to radiation and phonon relaxation).

We will then analyse experiments (mainly of the innsbruck and NIST groups) implementing single and two qubit gates, Bell's inequality tests with ions, teleportation and simple quantum algorithms. Entanglement of several ions will also be described.

If time permits, we will introduce in the last lecture the course of next year, devoted to quantum information with cold neutral atoms in optical lattices.

Seminars (those given in *english* are in *red*)

30 Janvier: *Les condensats au plat pays: gaz de Bose en dimension réduite*
Jean Dalibard, ENS, Paris

6 Février: *Optical cavity quantum electrodynamics*
Gerhard Rempe, Max Planck Institüt für Quantenoptik, Munich, Allemagne

13 Février: *De l'observation d'atomes neutres individuels au traitement de l'information quantique*
Arno Rauschenbeutel, Université de Bonn, Allemagne

20 Février: *Decoherence and quantum information processing*
Juan Pablo Paz, Université de Buenos Aires, Argentine

27 Février: *Correlations and Counting Statistics of an Atom Laser*
Tilman Esslinger, Ecole Polyrechnique de Zurich (ETH), Suisse

6 Mars: *A passion for precision*
Theodor Hänsch, Université de Munich et Max Planck Institüt für Quantenoptik, Allemagne

13 Mars: *Les boîtes quantiques semiconductrices : des atomes artificiels pour une optoélectronique quantique*
Jean-Michel Gérard, CEA, Grenoble