Professor Alain Aspect, from the Laboratoire Charles Fabry at the Institut d’Optique, Palaiseau, France will visit the Institute for Optical Sciences from 1 to 6 December 2009, as part of the Institute’s Distinguished Visiting Scientists program.

Born in 1947, Alain Aspect studied at the Ecole Normale Supérieure de Cachan and Université d’Orsay. After a three years teaching assignment in Cameroon, he started in 1974, at the Institut d’Optique in Orsay, an experimental program on the foundations of quantum mechanics. His 1982 tests of Bell’s inequalities with pairs of entangled photons have become a classic of quantum physics. With his student Philippe Grangier, he also made fundamental experiments on the quantum properties of single photon states of the light.

From 1985 to 1992 he worked with Claude Cohen-Tannoudji at the ENS (Paris) and Collège de France, on cooling atoms with lasers (in particular “cooling atoms below the one photon recoil”).

Since 1991, he is head of the group of Atom Optics that he has established at the Institut d’Optique, in Palaiseau. His recent scientific production concerns mainly Bose Einstein Condensates, Atom Lasers, Quantum Atom Optics, Quantum Simulators with Ultra-Cold Atoms.

Alain Aspect holds a position of CNRS senior scientist at the Laboratoire Charles Fabry de l’Institut d’Optique, and is Professor at Institut d’Optique Graduate School and Ecole Polytechnique.

He is member of the Académie des Sciences and of the Académie des Technologies (France), of the National Academy of Sciences (USA), of the Austrian Academy of Sciences. He has received many national and international awards, in particular the CNRS gold medal (2005), and the European Physical Society Quantum Electronics Prize (2009), and honorary doctorates from several prestigious universities.

Professor Aspect will give 3 lectures during his visit, as described below:

**Lecture 1: The Hanbury Brown and Twiss effect: from photon to atom quantum optics — part 1**

Tuesday, December 1 at 2 p.m.
Koffler Institute, Room KP108
569 Spadina Crescent

**Lecture 2: The Hanbury Brown and Twiss effect: from photon to atom quantum optics — part 2**

Thursday, December 3 at 11 a.m.
Galbraith Building, Room GB244
35 St. George Street

The Hanbury Brown and Twiss effect, discovered fifty years ago, was a milestone in the development of modern quantum optics. In particular, it is for giving a fully quantum interpretation of that effect that Roy Glauber developed the theoretical background which has allowed us to interpret many quantum optics experiments based on photon-
photon correlations measurements. Similar experiments are now possible with atoms, and the possibility to compare the behavior of bosons and fermions adds a new dimension to these studies.

In these two lectures, I will first review the photonic HBT effect and its various interpretations. I will then present its counterpart with atoms, as well as other atom correlation experiments, which pave the way for more atom quantum optics effects.

**Lecture 3: From Einstein's photon to Wheeler's delayed choice experiment: wave particle duality brought to light**

Sunday, December 6 at 3 p.m.
JJR Macleod Auditorium
Medical Sciences Building
1 King's College Road

This is the 2009 Boris P. Stoicheff public lecture, presented in collaboration with the Royal Canadian Institute.

Is light a wave or a particle? After many centuries of debate, involving giants as Newton, Huygens, Young, Fresnel, Maxwell, Einstein, the final answer of quantum mechanics is: “light is both a wave and a particle”. Wave-particle duality is at the root of the quantum revolution initiated at the beginning of the 20th century, but explaining the meaning of that weird concept is a difficult challenge. Most textbooks on quantum physics start with a description of an “experiment” to demonstrate it. In contrast to a common belief, this textbook experiment was not realized with photons before 1985, after the development of the first source of single photons. An even more fascinating version of that “thought experiment” –the “delayed-choice experiment” proposed by J.A. Wheeler, has been recently turned into a real experiment. We will present that experiment, which stresses one of the big “quantum mysteries” in the words of Richard Feynman.

For more information on this lecture series please contact Emanuel Istrate.