**SPECIAL SEMINAR**

**Wednesday, 13 February**

**11.30**

**Audrey Wood seminar Room**

**Paolo Mataloni**

**Sapienza Università di Roma**

***Quantum simulation via 3-dimensional quantum photonics***

Quantum simulation allows to investigate a number of quantum phenomena that are hard to simulate by classical approaches, such as quantum transport, particle localization and energy transfer, quantum-to-classical transitions, and even quantum improved computation. Within this framework integrated quantum photonic circuits are bearing great promises for the future.

I will report on the recent results obtained in our laboratory by exploiting quantum circuits fabricated in a glass by femtosecond laser writing. In particular I will discuss quantum walks of pairs of entangled photons realized by integrated arrays of interferometers and where controlled phase shifts are introduced into each unit mesh of the networks. Polarization entanglement has been exploited to investigate the genuine effect of (bosonic and fermionic) statistics in the absence of particle interaction and to observe Anderson localization in two-particle discrete quantum walks affected by position dependent disorder. Different types of randomness and how localization of the entangled walkers is affected by the wave-function symmetry have been also investigated.

Future perspectives of the research related to the 3-dimensional capability of the femtosecond laser writing technique will be also discussed.