Department of Physics
Condensed Matter Physics
Clarendon Laboratory, Parks Road, Oxford OX1 3PU

UNIVERSITY OF OXFORD

CONDENSED MATTER SEMINAR

Thursday 9th of March at 2.15pm

"On-chip quantum photonics with integrated quantum dot emitters"

Prof Mark Fox
Department of Physics & Astronomy, University of Sheffield

In this presentation I will review progress at the University of Sheffield on integrating InGaAs quantum dots (QDs) into GaAs quantum-photonic circuits. The goal of the work is to develop a chip-compatible platform that exploits the favourable properties of the dots for applications in quantum technologies. The seminar will focus first on single-photon sources for use in on-chip quantum optics. A key performance parameter is the photon indistinguishability, which is limited by dephasing associated with the local environment of the QD. I will describe recent results in which the Purcell effect in a photonic crystal nanocavity has been used to enhance the radiative emission rate to the point that near-perfect single-photon emission is achieved in an on-chip geometry. I will then discuss chiral coupling between QDs and nano-photonic waveguides, which is a manifestation of chiral quantum optics. Experiments demonstrating both chiral emission and exciton spin initialization will be described. These results rely on the precise positioning of dot within the nano-photonic structure, and lay the foundations for developing on-chip spin networks with spin qubits localized in different QDs.

Host: Prof Robert Taylor

Audrey Wood Seminar Room, Clarendon Laboratory