**Atomic and Laser Physics Seminar**

**Monday, 4 February**

**11.30**

**Audrey Wood Seminar Room**

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***Towards cavity QED on a chip***

A single quantum emitter coupled to an optical cavity can be a versatile tool for quantum processing. It can be a source of single photons, a nonlinearity causing single photons to interact with each other, and an interconnect between flying qubits (the photons) and qubit memory (the emitter). The physics of these processes has been quite fully developed using individual macroscopic cavities coupled to atoms or ions. An important next step is to scale the systems to include many cavities and many individual quantum emitters. This motivates the development in my laboratory of microfabricated chips that offer a degree of scalability.

I will describe [1] experiments on single atoms coupled to single microfabricated cavities, [2] new chips in which many cavities are interconnected to make a chain capable of computation, and [3] first steps towards the use of single dye molecules as the quantum emitters.

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[1] J. Goldwin, M. Trupke, J. Kenner, A. Ratnapala and E. A. Hinds, “Cavity-enhanced atom detection with cooperative noise reduction”, Nature communications **2**, 418 (2011).

[2] G. Lepert, M. Trupke, M. J. Harmann, M. B. Plenio, E. A. Hinds “Arrays of waveguide-coupled optical cavities that interact strongly with atoms” New Journal of Physics **13**, 113002 (2011).

[3] J. Hwang and E. A. Hinds, “Dye molecules as single-photon sources and large optical nonlinearities on a chip” New J. Phys. **13** 085009 **(**2011).