

**Monday, March 20, 2023**  
**4:10 – 5:00 PM**  
**Roberts Hall Room 101**

**Towards Quantum Networking with Neutral Atoms and  
Photons**

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**Abstract:**

Forming a quantum network between distributed quantum processors involves three key ingredients: qubits, quantum logic for entanglement generation and correction, and interaction interfaces. Neutral atom qubits with long coherence times and controllable interactions are thus excellent candidates for quantum information storage and processing, whereas single-photon qubits are faithful carriers of quantum information as they travel fast and interact very weakly with the environment. In this talk, I will first discuss the collective atomic qubits in a Rydberg ensemble held in a state-insensitive optical lattice trap. Both excitation blockade and spin-wave dephasing can contribute to the suppression of multiple excitations, allowing for deterministic preparation of collective atomic qubits, on-demand single photons, and atom-photon entanglement for quantum information processing. On the other hand, with an electromagnetically-induced-transparency-assisted spontaneous four-wave mixing process, we can generate energy-time entangled nonclassical photon pairs, as well as ultra-narrowband and high-quality heralded single photons, which are particularly suitable for photon-atom interaction interfaces. As an outlook, we may combine these two systems to build up a reliable, scalable, and practical quantum network.

Host: Randy Babbitt

*\* Refreshments served in the Barnard second floor atrium at 3:30 \**