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Rydberg-mediated quantum manipulation of atoms[1]

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Rydberg-Rydberg interactions are strong enough to allow a single atom to control the evolution of a second atom several microns away [1]. Laser trapping techniques allow the atoms to be stably positioned at such distances, and optical pumping can be used to selectively prepare and/or read out the internal quantum states of the atoms. When subject to resonant Rydberg excitation, the evolution of each atom becomes conditioned on the quantum state of the other. I will describe experiments at the University of Wisconsin and elsewhere that demonstrate these and other capabilities of Rydberg-mediated quantum manipulation of atoms.

[1] M. Saffman, T. G. Walker, and K. Molmer, "Quantum information with Rydberg atoms," arXiv:0909.4777v2

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