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Optically Controlled Quantum Dots for Quantum Computing

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An exciton, the elementary optical excitation of a semiconductor quantum dot, could act as a qubit of quantum information. It is relatively easy to address, measure, and control. In fact, great progress has been made in recent years in this area [1]. Yet there may be another even more exciting and powerful approach that, although involving similar quantum dot materials and optical techniques, relies on a spin. In this talk I will discuss the relationship between the exciton qubit and the spin qubit, and review some of our recent experiments that illuminate the physics underlying these two different physical embodiments of quantum information. [1] D. Gammon and D.G. Steel, *Physics Today* **55(10)**, 36 (2002).