PHYSICS DEPARTMENT COLLOQUIUM

"Manipulating Spin Coherence in Solid State Systems"

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The ability to control and manipulate spins in solid state systems forms the basis for spintronics and quantum information technologies. I will provide an overview of the study of spin dynamics in different systems, where we use electric, magnetic and optical fields to manipulate spin coherence. These include the study of (a) dynamic properties of the spin liquid phase observed in a dilute magnetic compound [1,2], where we show that the low temperature excitation spectrum consists of collections of discrete, fluctuating spin clusters with well-defined normal mode frequencies that can be addressed via the technique of spectral "hole burning", (b) spin dynamics in semiconductor microcavities, a new and promising research field with unique means of controlling light-matter interactions, where I will discuss the photonic manipulation of electron spins in optically-pumped GaAs microcavities [3] as well as its implications for the underlying physics of quantum information processing in the solid state, and (c) electrical control of spin coherence in novel oxide-based semiconductors with room temperature spintronic application capabilities.

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