NEBRASKA CENTER FOR MATERIALS AND NANOSCIENCE
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Room-temperature electronic spin correlations: towards spin-coherent technologies

Most room-temperature technologies attempt to marginalize many-body physics, relying on classical, collective degrees of freedom such as magnetic moments to describe their behavior. For example, modern high-volume information storage technology relies on room-temperature electronic spin transport through so-called ``spin valves", which can have parallel or antiparallel magnetic domains. In such spintronic devices individual electrons experience different scattering rates depending on whether their spins are parallel or antiparallel to a magnetic domain's magnetization, but the interaction between current-carrying electrons is negligible. In recent years, however, new room-temperature spintronic devices are emerging that rely on the spin correlations of current carriers during transport. A result is nonmagnetic materials whose resistance and luminescence change substantially in magnetic fields as small as a few Gauss! For such magnetic fields single-particle thermodynamic energies are four orders of magnitude smaller than thermal energies, so the origin of this phenomenon must be spin-spin coherent quantum dynamics. Other devices are motivated by the discovery that room-temperature spin-orbit correlations can produce new kinds of spin-polarized currents and voltages as well as electrically tunable spin dynamics. Examples of these effects will be drawn from materials as disparate as organic semiconductors, oxide tunnel junctions and topological insulators.

Thursday, April 23, 4:00 pm
136 Jorgensen Hall

3:30 pm—Refreshments
Jorgensen Hall 1st Floor Vending Area

Host:
Prof. Peter Dowben
Department of
Physics & Astronomy

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