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Spins in Antiferromagnets: Stories of the Supposedly "Useless"

Magnets are one of the most technologically useful objects known to human society. The ferromagnetic state, perhaps the most familiar of a quite wide range of states of matter that encompass magnetism, has been known since antiquity. In contrast, an antiferromagnet, formed when neighboring magnetic moments or spins align in opposite directions was not identified until the birth of quantum mechanics, and has been famously described as "useless." In recent years materials ruled by the quantum mechanics that drives antiferromagnetism have moved to the forefront of research in spintronics and other fields of magnetism. In this talk, after a brief introduction to these important states of matter and the inherent challenge of measuring them, I will discuss my research group's recent related work, which seeks to understand how angular momentum can be transported or converted in materials with antiferromagnetic exchange interactions. We use unique experimental tools for these studies, ranging from micromachined thermal isolation platforms optimized to study heat transport to nanolithographically patterned non local spin valves.

Short Bio

Prof. Barry L. Zink leads a research group at the University of Denver focusing on measurements of heat, charge, and spin transport in thin films and nanostructures. These measurements are often enabled by micro- and nanomachined thermal isolation platforms that use free-standing silicon-nitride membranes. Barry completed his PhD at UC San Diego in 2002, and has earned honors including the Piercy Distinguished Visiting Professorship (U. Minnesota), the NSF CAREER award and the NRC Post-doc. Magnetism and magnetic materials are the basis of much of his work, encompassing a wide range of topics from metal-insulator transitions in amorphous magnetic semiconductors and complex oxides, to thermal transport and magnetothermoelectric effects in thin film ferromagnets, to spin-charge conversion probed via the spin Seebeck effect.