University of Notre Dame
College of Science
Department of Physics

COLLOQUIUM

Spin-Orbit Interaction Rediscovered in Transition Metal Oxides

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(Refreshments at 3:30 p.m. NSH 202)

Condensed matter physics addresses the fundamental properties of solids and liquids, and of all subfields of physics, physics, it has generated the largest number of practical applications that have dramatically changed our lives in recent decades. It is widely recognized that whoever controls the synthesis and discovery of novel materials generally controls the evolution of basic research into their properties and, ultimately, their successful application in advanced technologies. The 4*d*- and 5*d*-transition metal oxides are a class of new materials that exhibit nearly every collective state known for solids, e.g., ferroelectricity, ferromagnetism, antiferromagnetism, metamagnetism, metal-insulator transition and superconductivity. It is commonly expected that ruthenium oxides and iridium oxides are more metallic and less magnetic than their 3*d* and 4*f* counterparts because of the extended nature of the 4*d* and *5d* orbitals. In marked contrast, many ruthenates and iridates are magnetic insulators that exhibit a large array of phenomena seldom or never seen in other materials. We review the anomalous physical properties of these materials, which include novel colossal magnetoresistance, a spin-valve effect in bulk crystals, strong orbital magnetism, and the Jeff = ½ insulating state. The critical underlying mechanism for these phenomena is the spin-orbit interaction, which strongly competes with other interactions to create an unusual balance between relevant degrees of freedom in this class of materials.

Hosts: Jacek Furdyna and Morten Eskildsen

ALL INTERESTED PERSONS ARE CORDIALLY INVITED TO ATTEND