

Massachusetts Institute of Technology  
Department of Physics

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## Condensed Matter Theory Seminar

"Spin-orbit coupling induced novel states in Mott insulators"

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**Abstract:** Over the last few years, there has been an upsurge of interest in materials in which exotic states may emerge as the result of relativistic spin-orbit interactions. We will discuss insulating iridium oxides from this perspective. We show that the strong spin-orbit coupling, through the entanglement of spin and orbital spaces, leads to a variety of interesting Hamiltonians ranging from the Heisenberg model to the Kitaev or quantum compass models, for different lattice geometries. Based on these effective Hamiltonians, we present a comprehensive theoretical study of the rich phase behavior and dynamics observed in layered iridium oxides such as tetragonal  $\text{Sr}_2\text{IrO}_4$  and  $\text{Sr}_3\text{Ir}_2\text{O}_7$  and hexagonal  $\text{A}_2\text{IrO}_3$  ( $\text{A}=\text{Na}, \text{Li}$ ). We also discuss the layered tetragonal vanadate  $\text{Sr}_2\text{VO}_4$  and argue that magnetically-hidden octupolar order, driven by spin-orbit coupling, is realized in this compound.

12:00noon  
Tuesday, May 12, 2015  
Duboc Room (4-331)