Physics & Astronomy SEMINAR

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Quantum Magnets:

A Tale of Emergent Properties and Frustration

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In solid-state quantum magnets, a combination of single-ion properties and exchange interactions cause the magnetic ions to have quantized moments which are often highly anisotropic and lead to rich and interesting physics. For example, we can observe exotic magnetic phases such as the "quantum spin glass" due to the presence of disorder as well as frustration in these systems, these lead to complex energy landscapes and bizarre dynamic properties such as extremely long relaxation times. Additionally, subjecting some of these systems to a quench across a second-order quantum phase transition causes them to behave in ways we are still trying to understand. This is because much of these unfamiliar magnetically (dis)ordered states and strange effects that we observe fall squarely inside of the non-equilibrium regime, which is a scientific wilderness that is still vastly unexplored both experimentally and in theory and whose understanding may open the door to extreme technological advances in the near future. I will introduce the field of quantum and frustrated magnets focusing on the conceptual understandings of how these highly anisotropic moments arise in these systems, the resultant magnetic phases and phase transitions between them, and I will give some examples of the non-equilibrium effects these systems display.