



# Condensed Matter Theory Center Seminar

**Rajibul Islam**  
(University of Maryland)  
Tuesday, December 14  
11:00am-12:30pm  
2205 Physics Building

## **“Phase transition in long range quantum Ising model simulated with trapped ions”**

Trapped ion systems provide an ideal standard for quantum simulation experiments, by virtue of their ability to support arbitrary interactions, their excellent quantum coherence properties and their ability to be measured with near perfect quantum efficiency. We simulate an infinite range ferromagnetic Ising model in a transverse magnetic field using a chain of laser-cooled trapped  $^{171}\text{Yb}^+$  ions and observe transition from paramagnetic to ferromagnetic spin ordering as the ratio of transverse field to Ising couplings is varied. The crossover curves get 'sharper' as the system size is increased, from  $N=2$  to about a dozen, prefacing the expected quantum phase transition in an infinite system. The Ising couplings can be experimentally tuned to access various spin orderings and transitions between them, and some of them can be very sharp (first order) even for relatively small systems.