**MATERIALS DEPARTMENT & MRL**
**JOINT COLLOQUIUM**
*Friday, April 6th, 2012*
***4:00 PM, MRL 2053***

# LANGE LECTURER

**LIGHT REFRESHMENTS WILL BE SERVED BEFORE THE SEMINAR AT 3:45PM**
***HOSTED BY: PROFESSOR RAM SESHADRI***


## Professor Tyrel M. McQueen

Department of Chemistry and Department of Physics and Astronomy, Johns Hopkins University


**Research Interests**
- New solid state chemistry materials design and synthesis techniques
- Experimental condensed matter physics, quantum magnetism, heat- and light-induced charge separation through strong electron correlations
- Superconductivity

# Interplay of Magnetism and Bonding in Spin-Ladder Iron Selenides


**Abstract**

Correlated electronic systems, or materials in which electrons show cooperative behavior rather than acting independently, have been of interest for many years. One of the most striking examples of such behavior is the ability of certain compounds, when cooled sufficiently, to carry electricity with zero resistance. The origin of such superconductivity at high temperatures in all known material classes remains controversial. In the case of the iron-based superconductors, which are based on two dimensional layers of edge-sharing $[FeX_4]$ (X = Se,As,P) tetrahedra, even the origin of magnetic and metallic ground states of non-superconducting parent compounds is contested, with apparently conflicting results on different material families. In this talk, I will present an overview of the state of the field, and our recent discovery that the reduced dimensionality spin-ladder compounds $Ba_{\{1-x\}}K_{\{x\}}Fe_2Se_3$, which are built of double-chains of edge-sharing $[FeSe_4]$ tetrahedra, are in fact ideal model systems in which to understand the interplay of charge and spin degrees of freedom in these fascinating compounds.