

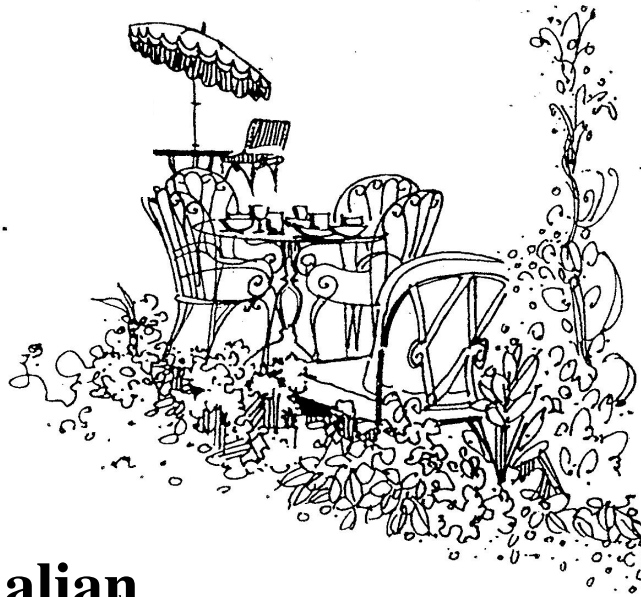
Chez Pierre

Presents ...

Monday, April 6, 2015

12:00pm

MIT Room 4-331



Jak Chakhalian

University of Arkansas

“Emergent phenomena hidden in plain view: Strong electronic correlations at oxide interfaces”

Complex oxides are a class of materials characterized by a variety of competing interactions that create a subtle balance to define the lowest energy state and lead to a wide diversity of intriguing properties ranging from high T_c superconductivity to exotic magnetism and orbital phenomena. By utilizing bulk properties of these materials as a starting point, interfaces between different classes of complex oxides offer a unique opportunity to break the fundamental symmetries present in the bulk and alter the local environment. Harnessing our recent advances in complex oxide growth, we can combine materials with distinct or even antagonistic order parameters to create novel materials in the form of heterostructures with atomic layer precision. The broken lattice symmetry, strain, and altered chemical and electronic environments at the interfaces then provide a unique laboratory to manipulate this subtle balance and enable novel quantum many-body states not attainable in bulk. Understanding of these phases however requires detailed microscopic studies of the heterostructure properties. In this talk I will review our recent results on unit-cell thin nickelates, titanates and cuprate-manganite heterostructures to illustrate recently uncovered principles of rational materials design and control of collective quantum phenomena by the interface.

1. J. Chakhalian et al, Nature Materials 11, 92–94 (2012).
2. TeYu Chien et al, Nature Communications 4, 2336 (2013).
3. Jian Liu et al, Nature Communications 4, 2714, (2013).
4. J. Chakhalian et al, Review of Modern Physics, 86, 1189, (2014)