

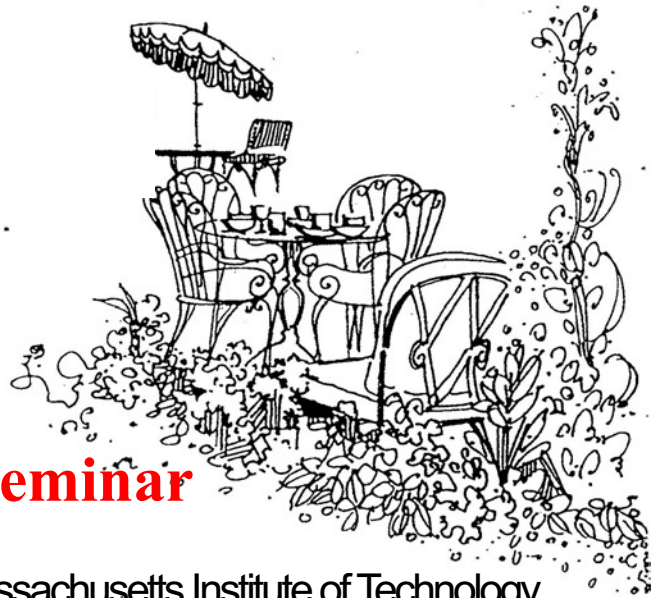
Chez Pierre

Presents ...

Monday, September 27, 2021

12:00pm Noon

Chez Pierre Seminar



Joshua Javier “Shua” Sanchez – Massachusetts Institute of Technology

“Probing the Symmetry-Breaking Phases in Iron-based Superconductors with Combined Strain, Transport and X-ray Techniques.”

The normal state of iron-based superconductors is strongly influenced by the fluctuations associated with a novel phase of matter, the electronic nematic phase. While the exact origin of nematicity is still under debate, it is often characterized through its coupling with either the lattice or the conducting electrons, i.e. through structural and transport observables. In this talk I introduce a new technique, the elasto-XRD, which combines in-situ tunable strain with simultaneous transport and x-ray diffraction measurements performed at the Advanced Photon Source at Argonne National Laboratory. This technique allows precision detwinning of structural domains and exploration of structural and electronic behavior in both the large and infinitesimal strain limits. I present measurements of the shear modulus and elastoresistivity above the nematic transition and the spontaneous orthorhombicity and resistivity anisotropy below the nematic transition, all within a single sample of $\text{Ba}(\text{Fe}_{0.96}\text{Co}_{0.04})_2\text{As}_2$. These quantities show agreement across temperature and phase, indicating a constant proportionality to nematicity which is then reexamined across the doping phase diagram. Finally, the resistivity anisotropy is found to decouple from the lattice in the high-strain limit, which we take as evidence for an anisotropic spin fluctuation origin of the nematicity.