

“The Emergence of Superconductivity in Inhomogeneous Systems”

Inhomogeneous superconductivity, where puddle regions or phase separation dominates behavior, is evident in materials ranging from high-temperature superconductors to complex oxides. Yet, although inhomogeneous superconductors have been intensely studied, the nature of the onset of superconductivity in these systems is still largely unknown. In this talk I will present electrical transport measurements of model inhomogeneous superconductors, and discuss the onset and ground states of superconductivity in these systems. First, I will show how superconductivity is established in granular normal-superconducting systems via a “rare-region” or extremal-grain process. I will then show how the ordering and separation of superconducting islands in a normal metal matrix can induce metallic states and other unusual phases. These results are generally relevant to how superconductivity is established in low-dimensional or disordered systems.