

**Title:** Probing uncharted regions in the structure-property landscape via size confinement

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**Time:** 4:00 PM

**Venue:** S N Bose Hall

**Abstract:** We often overlook the delicate balance that prevails between crystal structure and properties in condensed matter physics: a tiny variation in the local symmetry and interatomic spacing may cause massive changes in the way a solid behaves. We know this from the response of a solid to changes in the state variables such as temperature and pressure. However, since a decrease in particle size causes small but regular changes in the unit cell dimensions, it can also be a very effective parameter in exploring the property landscape of a solid. Size-driven lattice distortions may affect physical properties more drastically than temperature and pressure, and are less likely to cause 'co-lateral damages'. I will show that size-induced changes in the crystal structure play a crucial role in a variety of interesting situations, such as: (a) persistence of superconductivity down to unexpectedly small sizes, (b) appearance of a magnetic moment in isolated Fe atoms embedded in a nanocrystalline metal, (c) destruction of ferroelectricity in nanocrystalline oxides, and (d) stabilization of novel crystal structures.