



ICTS Colloquium

Title : Ferroelectricity and Superconductivity in two dimensions

Speaker : Gaurav Chaudhary (University of Cambridge, UK)

Date : Tuesday, 07 January 2025

Time : 4:00 PM (IST)

Abstract : Ferroelectricity and superconductivity should not exist in two dimensions, yet they do. Ferroelectric materials should not superconduct, and yet some of them do. Recent experimental advances in two-dimensional materials is revolutionizing our understanding of topological and strongly correlated electrons by throwing up many such pleasant surprises. Indeed, stacking layers of two-dimensional materials (often atomically thin) with slight mismatch or misalignment has become an extremely tunable platform for designer quantum materials, where the interplay of strong electronic interactions and non-trivial topology can be studied with great tunability and holds a promise toward solid-state based quantum simulations. In this talk, after overviewing some general aspects, I will discuss some new surprises related to ferroelectricity and superconductivity in two-dimensional systems. First, I will discuss how novel topological polar textures can exist in these materials. Then, I will discuss a new mechanism of superconductivity, where it is mediated by fluctuations in ferroelectric domain walls. I will also show some recent experimental progress that shows encouraging signs for these theoretical ideas. Time permitting, I will also discuss a personal point of view of how the field will evolve, both in shaping our theoretical understanding and in the applications for new quantum devices.

Venue : Madhava Lecture Hall

Zoom Link: <https://icts-res-in.zoom.us/j/93853537657?pwd=NGVj6L7mBa5aba6rZUEWCYsAOmCxm6.1>

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