

# Physics Colloquium

Bitan Roy

**“Topology: A new viewpoint of condensed matter physics”**

Topological defects are often found in nature, extending from macroscale, such as whirlpool in a lake, to microscale, such as superconducting vortex. Furthermore, the notion of topological defects in the momentum space nowadays offers a new perspective on various quantum materials. In this talk, starting from a minimal model of a quantum Hall insulator, I will demonstrate the essential features of a topological phase of matter, namely the topological invariant and existence of metallic edge states, encoding a bulk-boundary correspondence. I will then show how one can generalize these concepts to metallic systems, and promote Dirac and Weyl fermions, originally introduced in the context of high-energy physics, as their paradigmatic constituents. The hallmark signature of Weyl fermions, namely the Adler-Bell-Jackiw chiral anomaly and its imprint on longitudinal magneto-transport will be presented. I will also present an overview on the stability of a dirty Weyl liquid and gradual melting of topological Fermi arc surface states in this system. As a final topic, I will introduce the notion of emergent topology in various magnetic phases and discuss its experimental relevance in strongly correlated materials, such as iridium based pyrochlore oxides.

*Bitan Roy is currently a Staff Scientist at the Max Planck Institute for the Physics of Complex Systems, Dresden, Germany. Dr. Roy obtained his Ph.D degree in 2011 from Simon Fraser University, Canada under the supervision of Prof. Igor Herbut. During his Ph.D. studies Dr. Roy worked on various aspects of interacting electrons in graphene and related systems. After obtaining Ph.D. degree, he moved to National High Magnetic Field Laboratory, Florida for a two-year postdoc position. Subsequently Dr. Roy spent three years in University of Maryland and one year at Rice University as a postdoctoral researcher. His current research focus is on topological condensed matter physics, as well as on quantum critical phenomena in strongly correlated and disordered systems.*

Physics Faculty and Search Committee Candidate

**Thursday, February 22<sup>nd</sup> in LL 316 at 4:10**

**Refreshments available at 3:45**