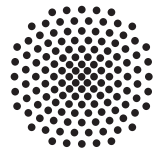


Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Festkörperforschung
Fachbereich Physik, Universität Stuttgart

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Hybrid

Name / email address required

Dienstag, 19. Dezember 2023

16.15 Uhr

Lecture Hall 2D5

Max-Planck-Institut für Festkörperforschung, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

Topology is Everywhere

Maia Vergniory

MPI for Chemical Physics of Solids

Abstract

Quantum materials are a collection of atoms with interacting electrons and nuclei displaying emergent behaviour and topological properties – properties robust to local defects. The past two decades has witnessed an explosion in the field of topological materials: from weak interacting electrons to strongly correlated ones, topological materials represent one of the most exciting discoveries both at fundamental and application level. High performance electronics, quantum information or ultrafast spintronics are just a few of the possible technologies that can be developed based on these materials. In this talk I will discuss the route to go from pure mathematical prediction of topological properties, through high throughput materials search to experimental realization. I will discuss both topological insulators, in non magnetic and magnetic phases as well as topological (chiral) semimetals using the modern theory of topological band structure – Topological Quantum Chemistry – built upon symmetry-based considerations and complemented with chemical theories of bonding, ionization, and covalence. Consequently, it describes the universal global properties of all possible band structures and materials. Going beyond the single-particle perspective, I will introduce our formalism grounded in Green's functions. This approach is designed to uncover topologically correlated phases in materials exhibiting electronic entanglement, such as Mott phases. Additionally, I will discuss recent results centered on Green's function zeros, which are aimed at diagnosing topology in correlated materials.