Condensed Matter Physics Seminar Series

Electronic structure of topological materials

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The Topological phases in condensed matter physics have gained significant attention, moving beyond Landau's symmetry-breaking paradigm. Initially, research focused on topological insulators (TIs), where 3D TIs show a bulk energy gap due to spin-orbit coupling and gapless surface states protected by time-reversal symmetry. Recently, the focus shifted to topological semimetals (TSMs), such as Dirac, Weyl, and nodal-line semimetals. Dirac and Weyl semimetals, 3D analogs of graphene, feature linear bulk band dispersion, while nodal-line semimetals exhibit 1D nodal loops in the Brillouin zone. In contrast to their nonmagnetic counterparts, magnetic topological materials, including antiferromagnetic TIs, axion insulators, and Chern insulators, have sparked growing interest due to their unique states and potential to explore symmetry, magnetism, and correlations. This presentation will review material predictions and experimental phenomena in both nonmagnetic and magnetic topological systems using first-principles calculations.

Tay-Rong Chang is a Professor of Physics and serves as the Principal Investigator of the Tainan Hub at the National Center for Theoretical Sciences, National Cheng Kung University. With over a decade of experience in theoretical condensed matter physics, his expertise spans first-principles simulations, tight-binding modeling, and topology/symmetry analysis. His primary research focuses on discovering novel topological materials and low-dimensional materials with potential applications in next-generation spintronics and quantum computing.

Friday, March 21st at 1:30 PM
4-330 PAB