Condensed Matter Theory Center Seminar

Tuesday, April 25
11:00 am – 12:15 pm
2205 John S. Toll Physics Building

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Yale

"Orbital magnetization, geometric phase, and the modern theory of magnetic breakdown"

Abstract: The semiclassical theory of a Bloch electron in a magnetic field now encompasses modern notions that lie beyond the Peierls-Onsager theory -- namely, the orbital magnetization and geometric phase play crucial roles in our refined understanding of magnetic phenomenon. Lying beyond this semiclassical theory is the quantum description of field-induced tunneling between semiclassical orbits, known as magnetic breakdown. I will show how to synthesize the semiclassical notions of orbital magnetization and geometric phase, with the quantum notion of tunneling -- specifically, I will present generalized, Bohr-Sommerfeld quantization conditions that synthesize all three notions. These quantization conditions provide an analytic and quantitative understanding of magnetic energy levels, as well as makes refined predictions about magnetic oscillatory phenomenon of the de-Haas-van-Alphen type. This synthesized theory is essential to describe a host of topological bandstructures with *unremovable* geometric phase that also *unavoidably* undergo breakdown. Specific case studies are discussed for topological metals near a metal-insulator transition, the surface of topological crystalline insulators, as well as tilted Dirac fermions.

Host: Ching-Kai Chiu

Web: http://www.physics.umd.edu/cmtc/seminars.html