Seminar: Hard Condensed Matter Theory

JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Room: Gernot-Gräff-Raum (Staudingerweg 9)
Time: December 18th, 2019 at 10:00

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Origin of strong and/or quantized optical properties of topological semimetals

This talk starts by reviewing known examples of how topological materials generate new kinds of electrodynamic couplings and effects. Three-dimensional topological insulators realize a particular electromagnetic coupling known as "axion electrodynamics", and understanding this leads to an improved understanding of magnetoelectricity in all materials. We then turn to how topological Weyl and Dirac semimetals can show unique electromagnetic responses; we argue that in linear response the main observable effect solves an old problem via the orbital moment of Bloch electrons, and how in nonlinear optics there should be a new quantized effect, which may have been seen experimentally. This nonlinear effect has a natural quantum e^3/h^2 and appears in chiral Weyl semimetals over a finite range of frequencies. We discuss interaction and disorder corrections to nonlinear responses in closing.

Work with F. de Juan, A. Grushin, T. Morimoto, D. Parker, J. Orenstein, C. Felser, T. Torchinsky, and others.