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Stuttgarter Physikalisches Kolloquium

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

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Login data will be announced by e-mail and on the colloquium webpage.

Dienstag, 7. Dezember 2021 | **16.15 Uhr** | **Online**

Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

Topological phases and their electromagnetic responses

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Abstract

This talk starts by reviewing known examples of how topological materials generate new kinds of electrodynamic couplings and effects. The most familiar examples happen in insulating materials, including the quantum Hall effect in two dimensions and a kind of magnetoelectric effect known as “axion electrodynamics” in three dimensions, whose understanding helps capture 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 close with a discussion of how optical properties, coupled with advances in theory and computational methods for correlated materials, can aid in the continuing search for fractional topological phases such as spin liquids.