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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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Hybrid

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

Dienstag, 13. Dezember 2022 | **16.15 Uhr** | **Hörsaal 2D5**

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

From high-dimensional quantum Hall systems to high-order topology and back

Oded Zilberberg
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Abstract

Topological insulators (Tis) are materials with spectral bands associated with an integer-valued index, manifesting through quantized bulk phenomena and robust boundary effects. In my talk, I will show how TIs can be understood to be descendants from a high-dimensional chiral semimetal. Specifically, we apply dimensional reduction to an ancestor four-dimensional Chern insulator, and obtain two-dimensional (2D) second-order topological insulators when the former becomes chiral. Correspondingly, we derive the quantized charge accumulation at the corners of the 2D descendants and relate it to the topological index – the second Chern number – of the ancestor model. Our results provide a clear connection between the boundary states of higher-order topological insulators and topological pumps – the latter being dynamical realizations of the quantum Hall effect in high dimensions. Our results are readily understood using a semiclassical construction and are directly extendable to spinor topological indices.