Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Topological classification of crystalline insulators through band structure combinatorics"

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Abstract: Topology has in the past decades become an organizing principle in the classification and characterization of phases of matter. While all possible topological phases of free fermions in the presence of external (anti-)unitary symmetries have been fully worked out, the inclusion of lattice symmetries relevant to any real-life material provides for an active research area.

In this seminar, I will present a complete classification of all possible gapped topological phases of free fermion matter in the presence of only lattice symmetries. This is done using a very simple counting scheme which matches the perspective on topological classifications of the far more involved mathematical framework known as K-theory. The same combinatorial arguments are then used to study transitions between crystalline topological phases driven by inversions in the band structure at high symmetry points. This allows us to list all possible types of such transitions for any crystal structure, and accordingly stipulate whether or not they give rise to intermediate Weyl semimetallic phases.

Reference:
http://arxiv.org/pdf/1612.02007

12:00pm
Tuesday, March 28, 2017
Duboc Room (4-331)

Host: Jorn Venderbos