

**Massachusetts Institute of Technology**  
**Department of Physics**

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## Condensed Matter Theory Seminar

"Crystalline symmetries and topological band theory: from defects to classifying combinatorics."

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**Abstract:** Topological phases of matter entail a prominent research theme, featuring distinct characteristics that include protected metallic edge states and the possibility of fractionalized excitations. With the advent of symmetry protected topological (SPT) phases, many of these phenomena have effectively become accessible in the form of readily available band structures. Whereas the role of (anti-)unitary symmetries in such SPT states has been thoroughly understood, the inclusion of lattice symmetries provides for an active area of research.

In this talk, I will present a short overview of results on defects in SPT states that directly motivate the existence of additional physics beyond the characterization based on (anti-)unitary symmetries. More importantly, I will then connect these ideas to recent work in which we were able to map out all different gapped phases of free fermion systems in the presence of solely lattice symmetries. This revolves around a very simple algorithm that matches a rather involved mathematical perspective in terms of a framework called K-theory. I will then discuss the implications of these combinatorial arguments, such as their impact on the description of Weyl phases, and sketch related ideas and future perspectives.

**12:00pm**  
**Wednesday, October 25, 2017**  
**Duboc Room (4-331)**