

Title: Crystalline symmetries and topological band theory: from defects to classifying combinatorics - Robert-Jan Slager

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Abstract: <p>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.</p>

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