

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

Date: Jan 24, 2018 01:00 PM

URL: <http://pirsa.org/18010089>

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.  
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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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