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The symmetry of crystals and the topology of electrons

(I) The necessary translational symmetry breaking of space that underlies the characterization of symmetry protected topological phases is uniquely probed by dislocations.

Chapter 3 of this thesis

(II) Space-group symmetries fulfill a natural and fundamental role in the description of topological band insulators.

Chapter 4 of this thesis

(III) The profound interplay between the space-group classification of topological band insulators and the associated dislocation response mechanism finds its highlight in three spatial dimensions in the form of the K-b-t rule.

Chapter 5 of this thesis

(IV) Grain boundaries in translationally active topological band insulators host self-organized semi-metals, which lead to distinct responses upon the application of external electric and magnetic fields.

Chapter 6 of this thesis

(V) While the weak invariants signify the role of two-dimensional physics in topological band insulators, their physical interpretation is ambiguous in the light of space-group symmetries.

(VI) As the response of topological band insulators to external magnetic and electric fields is intimately tied to the surface states, response theories in the presence of dislocation modes pose an intriguing research direction.

X. -L. Qi, T. L. Hughes and S. C. Zhang,
*Topological field theory of time-reversal invariant insulators*,

(VII) Although the topological entity of HgTe/CdTe quantum wells can adequately be modeled in terms of two time-reversed quantum Hall subsystems, a more generic understanding is desirable.

B. A. Bernevig, T. L. Hughes and S. C. Zhang,
*Quantum spin Hall effect and topological phase transition in HgTe quantum wells*,

(VIII) The key differences between the integer and fractional quantum Hall states, as demonstrated by R. B. Laughlin, are manifestations of the sign problem.

R. B. Laughlin,
*Anomalous Quantum Hall Effect: An Incompressible Quantum Fluid with Fractionally Charged Excitations*,

(IX) The perception that all value can be economically quantified is an illusion that decelerates societal evolution.

Robert-Jan Slager
12 January 2016