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**Interaction effects on 3D topological insulators and semi-metals<sup>1</sup>**

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We discuss the effects of interactions on 3D  $Z_2$  topological insulators and related phases such as axion insulators, Weyl semi-metals and topological Mott insulators. Our analysis is motivated by the pyrochlore iridates but is of general scope. We begin by studying the effects of interactions on topological phases adiabatically connected to non-interacting Hamiltonians using both regular and dynamical mean field theories. Both the bulk and boundary topological signatures are analyzed. We then move to stronger interactions where a Mott transition from a topological insulator to a fractionalized topological Mott insulator can occur. We discuss the effects of gauge fluctuations on the transition and the resulting spin liquid.

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