Abstract: Recent explorations of quantum field theories have unearthed a host of novel exact and infrared dualities. Certain classes of supersymmetric dualities in (6-d) dimensions—those arising from compactification of the enigmatic 6d N=(2, 0) theory on interesting d-manifolds—admit a geometric interpretation. Indeed, one can generate new classes of infrared dualities by performing sequences of geometric operations between topologically equivalent d-manifolds and studying the corresponding field theories. In turn, one can compute protected quantities in the supersymmetric field theories to obtain interesting geometric invariants of the d-manifolds. As d increases, this program becomes more challenging; 4-dimensional manifolds in particular present a zoo of exotica and obstructions to complete classification.

The study of these field theories and their dualities was initiated by Gadde, Gukov, and Putrov using geometric operations associated to smooth manifolds. Leveraging recent work in collaboration with Dimofte and Gaiotto, as well as earlier work by Dimofte, Gaiotto, and Gukov, we initiate a program to use coupled systems of 2d interfaces and 3d ‘bulk’ theories to study the geometry of “triangulated” 4-manifolds with 3-dimensional triangulated boundaries. These theories enjoy explicit Lagrangian descriptions. We verify that a simple topological equivalence of the 4-manifolds reproduces an infrared duality of the interface theories, giving this proposed geometry/field theory correspondence legs. This work is in collaboration with T. Dimofte.