

## Rozansky-Witten Weight Systems

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Rozansky and Witten explained how to pair a compact oriented 3-manifold and a compact hyperkähler manifold to obtain a complex number. Kapranov generalised their construction, showing how one can pair a knot in a 3-manifold with a holomorphic vector bundle on the hyperkähler manifold (and that in fact the construction makes sense for not necessarily compact holomorphic symplectic manifolds).

The pairing can be viewed as giving families of invariants of hyperkähler manifolds or as giving families of 3-manifold invariants. In the first approach, one hopes to derive theorems about the geometry of hyperkähler manifolds (this has been initiated by Hitchin and Sawon). In the second approach, the invariants obtained are finite-type invariants, so their computation factorises into two parts: the computation of the universal finite type invariant of the knot or 3-manifold (Kontsevich integral or LMO invariant) and then the application of a weight system defined by the hyperkähler manifold (and bundle, if necessary).

We use these weight systems as a tool with which to probe the mysterious diagrammatic algebras and maps which permeate the theory of finite-type invariants. This theory has previously been studied "at the level of metrised Lie algebras"; we study it "at the level of holomorphic symplectic manifolds", finding that most Lie algebraic constructions have natural counterparts in this world, and trying to find geometric interpretations of the results.