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**Title:** 3-manifolds and Vafa-Witten theory

**Abstract:** We initiate explicit computations of Vafa-Witten invariants of 3-manifolds, analogous to Floer groups in the context of Donaldson theory. In particular, we explicitly compute the Vafa-Witten invariants of 3-manifolds in a family of concrete examples relevant to various surgery operations (the Gluck twist, knot surgeries, log-transforms). We also describe the structural properties that are expected to hold for general 3-manifolds, including the modular group action, relation to Floer homology, infinite-dimensionality for an arbitrary 3-manifold, and the absence of instantons. Based on join work with Artan Sheshmani and Shing-Tung Yau: [2207.05775] 3-manifolds and Vafa-Witten theory (arxiv.org)