Generalizations, computations and symmetries of Vafa-Witten invariants

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Vafa-Witten invariants are invariants of algebraic surfaces defined using moduli of Higgs bundles.
Based on the physics paper of Vafa and Witten they were given a mathematical definition by Tanaka and Thomas.
We will review these invariants and then explain two generalizations of these invariants,
(1) invariants with mu-classes, which interpolate between the Donaldson invariants and the Vafa-Witten invariants
(2) and Vafa-Witten invariants twisted by a line bundle.

The connection of these invariants conjecturally allows to compute them in many cases in terms of modular functions and uncovers remarkable symmetries.