Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Aspects of Supersymmetric Field Theories and Complex Geometry

By

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In this thesis we study various aspects of supersymmetric quantum field theory and complex geometry. We focus on three main aspects. The first is general N=(2,2) gauged linear sigma models involving semichiral fields. We show that integrating out the semichiral vector multiplet leads to the generalized potential for a hyperkahler manifold, providing a formulation of the hyperkahler quotient in a generalized setting. We then discuss a new quotient construction which leads to non-Kahler manifolds. The second problem we study is motivated by recent developments in the study of the Coulomb branch of supersymmetric theories with a hyperkahler moduli space. A crucial element in these developments is the expression for Darboux coordinates in the hyperkahler manifold. We give a simple derivation of this expression by using projective superspace techniques and we apply this to the study of the moduli space of theories with eight supercharges on S^3xS^1 and S^3xT^2. Finally, we study the partition function of three-dimensional Chern-Simons theories on S^3 with affine ADE quivers. We give a general formula for the partition function of affine D-type quivers in terms of the Chern-Simons levels, providing a prediction for an infinite family of tri-Sasaki Einstein metrics describing the gravitational duals of such field theories. We will comment on some of these developments as well as work in progress.

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