



Contribution ID: 15

Type: Talk

## Supersymmetry, multi-instantons, and the necessity of Lefschetz thimbles

*Thursday 7 July 2016 14:00 (20 minutes)*

Studies of four-dimensional confining supersymmetric theories on  $R^3 \times S^1$  have shown, via the power of supersymmetry, that instanton-antiinstanton “topological molecules” have profound effects on their vacuum structure. In the calculable semiclassical regime, these are found responsible for center stability, confinement, and discrete chiral symmetry breaking. These configurations also play crucial role in recent studies of “resurgence”-the fascinating interplay of perturbative and nonperturbative physics. They also exist in nonsupersymmetric theories, but their identification has been hampered by the lack of a controlled way to distinguish them from the perturbative vacuum.

We shall argue, using non-supersymmetric path integral methods, that the inclusion of instanton-antiinstanton configurations in the path integral requires the use of “Lefschetz thimbles”, i.e. the complexification of (at least some) the integration paths in field space. We show that the corresponding results agree with those predicted by supersymmetry and discuss avenues for current and future work.

**Primary author:** POPPITZ, Erich

**Presenter:** POPPITZ, Erich

**Session Classification:** Formal Field and String Theory

**Track Classification:** Formal Field and String Theory