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Geometry, Topology, and Physics Seminar

Two-manifolds, three-manifolds, and supersymmetric gauge theory

Dave Morrison
UCSB

Friday, September 30, 2011, 4:00 p.m.
Room 6635 South Hall

Abstract: During the past two and a half years, much new progress has been made in studying supersymmetric gauge field theories by using techniques from low-dimensional topology. The starting point from the physics side is a class of mysterious physical theories in 6 dimensions with maximal supersymmetry, which should lead to supersymmetric gauge theories in 4 dimensions or 3 dimensions if appropriately "compactified." The "compactification" involves a 2-manifold or a 3-manifold, respectively, and the topology and geometry of these compactification spaces turns out to be closely related to the physics. For example, with Drukker and Okuda I found a close connection between a result in 2-manifold topology called the Dehn-Thurston theorem and certain aspects of 4-dimensional supersymmetric gauge theories. Much work has been done on the case of 2-manifolds (Riemann surfaces) and gauge theories in 4 dimensions; more recently, work has begun on 3-manifolds and theories in 3 dimensions.

We will have a series of lectures on this general topic this quarter (perhaps continuing into next quarter); this first lecture will be introductory. I will sketch the key idea: cut the compactifying manifold into simple pieces which can be described geometrically, and learn how both the pieces and the gluing data for reassembling pieces can be interpreted in both mathematics and physics.

For an introductory reference, see: Gauge Theories Labelled by Three-Manifolds by Tudor Dimofte, Davide Gaiotto and Sergei Gukov, arXiv:1108.4389 [hep-th].

This seminar is part of the NSF/UCSB 'Research Training in Groups' in Topology and Geometry. Information about future meetings can be found at http://www.math.ucsb.edu/~drm/GTPseminar/