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Adiabatic continuity, TQFT couplings, and calculable confinement

Wednesday, 1 June 2022 16:00 (1 hour)

I will describe the idea of adiabatic continuity which can be used to continuously connect strongly coupled gauge theories on Rˆ4 to compactified gauge theories on two set-ups: Rˆ3 x Sˆ1 and Rˆ2 x Tˆ2. Recall that in standard (thermal) compactifications, there are generically phase transitions. But in the last 15 years, we learned how to go around them and move to weak coupling regimes without phase transitions by employing non-thermal boundary conditions, double-trace operators or more recently ‘t Hooft flux backgrounds. In the weak coupling regime, properties such as confinement, chiral symmetry breaking, and multi-branch structure as a function of theta angle are semi-classically calculable. As opposed to common beliefs emanating from the 70s, which emphasize that these are necessarily strong coupling phenomena, all of them can be realized in weak coupling regimes. I will briefly mention the roles of fractional instantons, resurgence, Lefschetz thimbles, and TQFT couplings, and state some open problems. The presentation will be at the colloquium level.

Presenter: ÜNSAL, Mithat (North Carolina State University)