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The $SU(N)$ Casson-Lin invariants for links

In 1984, Casson constructed an invariant for homology 3-spheres by performing a signed count of irreducible $SU(2)$ representations, and he applied the invariant to the Hauptvermutung in dimension four. In 1992, X.-S. Lin defined a closely related invariant for knots by counting irreducible traceless $SU(2)$ representations of the knot group. Both invariants admit gauge theoretic interpretations in terms of instanton Floer homology and Instanton Knot homology.

In this talk, I will give a brief survey of the $SU(2)$ Casson-Lin invariant for knots and links, as defined by Lin and Harper–Saveliev, respectively. I will then discuss joint work with E. Harper on the $SU(N)$ Casson-Lin invariant of links. The invariants are defined as a signed count of irreducible projective $SU(N)$ representations of the link group, and key to their definition are certain compactness and irreducibility results. Time permitting, I will present computations of the $SU(3)$ Casson-Lin invariant for the Borromean rings, which represents recent joint work with C. Herald.