Contribution ID: **16** Type: **not specified**

Mitchell Weaver:Reading between the Special Kähler Structures of Coulomb branch geometries: N=4 sYM

Thursday, July 17, 2025 2:00 PM (30 minutes)

Quantum field theories (QFTs) possess both local data, e.g. the spectrum and OPEs of local operators, and global data. Global data determines the topologically non-trivial manifolds the theory can be placed on, and the distinct sets of such data define the global variants of the QFT, all of which contain the same local data. For gauge theories, global variants are described by the (maximal) spectra of genuine Wilson-'t Hooft line operators, but it is natural to ask: what other field theory data can characterize the global variants of the theory? For example, is there a correspondence between the geometry of a theory's moduli space of vacua and its global variant? Four-dimensional N=2 supersymmetric quantum field theories always possess a moduli space of vacua with a Coulomb branch (CB) component (conjecturally) that is known to encode some local data, e.g. the OPEs of chiral BPS operators. Since 4d N=4 super Yang-Mills (sYM) theories are conformal gauge theories whose global variants are known, we can readily test the ability of their moduli space geometry to capture its global variants. To this end, we classify certain moduli spaces of putative 4d N=4 superconformal field theories (SCFTs). For a generic N=2 SCFT, the geometry of the CB component is described by a special Kähler structure (SKS), and when equipped with N=4 supersymmetry, part of this structure is determined by a (compact) semi-simple Lie algebra. For simple Lie algebras, we classify the inequivalent SKSs and compare these results with the inequivalent global variants of the corresponding 4d N=4 sYM theory under S-duality. Generically, the SKS distinguishes between all inequivalent global variants, but it can fail to do so for BCn (n > 2) and Dn theories where it represents slightly coarser global data that fails to capture either the size of an S-duality orbit or the self-duality group of an orbit. Our results suggest that the global variants of 4d N=2 SCFTs, which often don't admit a weakly coupled/Lagrangian description, can be determined and/or defined by the inequivalent SKSs of their CB geometries. This gives a powerful tool to explore the global variants of strongly interacting QFTs.