Henry Primakoff Award for Early-Career Particle Physics Lecture: Calculating the number of degrees of freedom in supersymmetric quantum field theories in three dimensions

DANIEL JAFFERIS, Harvard University

I will give an overview of supersymmetric quantum field theories in three spacetime dimensions, from the construction of Chern-Simons-matter theories to their relations with string/M-theory and the gauge/gravity correspondence. I will show how the sphere partition function of such theories with 4 supercharges can be computed exactly, and how it leads to an exact determination of the dimensions of all chiral operators in the IR superconformal field theory. Further evidence will be provided that this quantity is a good measure of the number of degrees of freedom in three dimensions, even for non-supersymmetric quantum field theories.