

Stanford Department of Mathematics Colloquium

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Gauge-String duality in lattice gauge theories

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Abstract

Quantum Yang-Mills theories, also known as quantum gauge theories, are the mathematically ill-defined building blocks of the Standard Model of quantum mechanics. String theories, on the other hand, were built to serve as models of quantum gravity. Physicists have long been aware of the existence of a duality between quantum Yang-Mills theories and string theories. This is sometimes called “gauge-string duality” or “gauge-gravity duality”. Making sense of the duality formulas is still well beyond the reach of rigorous mathematics, partly because the models in question have not yet been rigorously defined. In this talk I will present a rigorously proved version of gauge-string duality in a discrete setting. Specifically, I will take a lattice gauge theory, which is a discrete approximation of a quantum Yang-Mills theory, and prove an explicit duality with a kind of string theory on the lattice. The duality has the appearance of a natural discrete analog of the formulas conjectured for the continuum models.