Joint Oliver Club and Physics Colloquium

pi.math.cornell.edu/~oliver/

Nima Arkani-Hamed, Institute for Advanced Study

Spacetime and Quantum Mechanics, Total Positivity and Motives

Spacetime and Quantum Mechanics form the pillars of our understanding of modern physics, but there are several indications that these concepts are approximate and must emerge from deeper principles, undoubtedly involving new mathematics.

In this talk, I will describe some emerging ideas along these lines and present a new formulation of some very basic physics — fundamental to particle scattering and to cosmology — not following from quantum evolution in space-time, but associated with simple new mathematical structures in "positive geometry." The simplest examples of positive geometries are polytopes old and new, from cyclic polytopes and Associahedra to "cosmological" polytopes. Others, such as the "Amplituhedron," involve generalizations of polytopes into the Grassmannian. In these examples, we can concretely see how the usual rules of space-time and quantum mechanics can arise, joined at the hip, from fundamentally geometric and combinatorial origins.
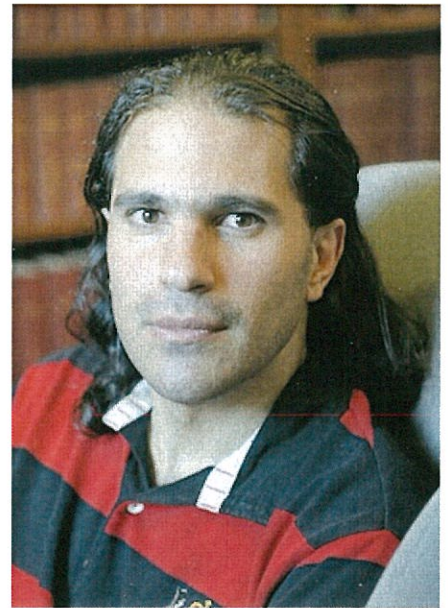
Thursday, April 25, 2019
at 4:00 PM in 200 Baker Hall

Refreshments will be served at 3:00 PM in the Baker Portico of the Physical Sciences Building.