PHYSICS COLLOQUIUM

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Number theory and spacetime

Our description of spacetime relies on the real numbers and hence is wedded to arbitrarily small intervals of length and time. But quantum theory hints at the existence of a smallest possible length, the Planck length. Number theory provides an alternative to the real numbers known as the p-adic numbers. Recent work has argued that quantum field theory defined over the p-adic numbers is holographically dual to a discrete spacetime. Constructions related to p-adic numbers also have a surprisingly prominent role in the early development of the renormalization group. I will explain what the p-adic numbers are and provide some intuition for what they are good for in string theory and beyond. The ultimate aim of using them to understand quantum gravity is ambitious indeed, but I will explain some first steps that give hope for the future.

Thursday, October 4, 2018
4:10PM in LL. 316
Refreshments at 3:45PM

Steve Gubser *got his PhD from Princeton University in 1998, working with Igor Klebanov on what became the gauge-string duality. He did a post-doc at Harvard, then joined the faculty at Princeton. After a year at Caltech, he returned to Princeton and has been there ever since. He is now the Associate Chair for Undergraduates in Physics, and he is a recent recipient of a Simons Young Investigator award.*