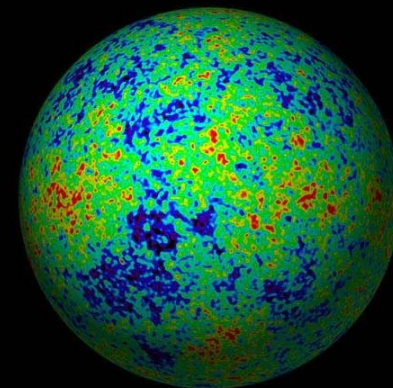


# CU Physics Department Colloquium

Monday, November 28, 2011 4:10 PM 428 Pupin Hall

## The Cosmic Microwave Background as a Probe of the Early Universe and Novel Physics

**Cosmologists are making increasingly accurate measurements of the microwave background temperature and polarization fluctuations. These measurements probe both the physics of the very early universe and the basic properties of the universe today. I will begin by reviewing the WMAP observations, then describe recent results from the Atacama Cosmology Telescope and finally look forward to upcoming results from Planck and upcoming ground based experiments. These CMB measurements rigorously test our standard cosmological model and provide an accurate determination of basic cosmological parameters (the curvature of the universe, its matter density and composition). When combined with other astronomical measurements, the WMAP measurements contain the properties of the dark energy and the mass of the neutrino. The observations also directly probe the physics of inflation: the current data imply that the primordial fluctuations were primarily adiabatic and nearly scale invariant. Many key cosmological questions remain unanswered: what happened during the first moments of the big bang? what is the dark energy? what were the properties of the first stars? I will discuss the role of on-going and future CMB observations in addressing these key cosmological questions and describe how the combination of large-scale structure, supernova and CMB data can be used to address these questions.**



**David Spergel, Princeton University**