# Journal Club

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Hunting for Dark Matter with Cosmology

Cosmological observations and galaxy dynamics seem to imply that five out of six parts in mass of all matter in the Universe is composed of dark matter, that is not accounted for by the Standard Model of particles. The particle nature of dark matter is one of the most intriguing puzzles of our time. It is therefore important to identify astrophysical and cosmological processes where the particle interactions of dark matter may be of relevance. In this talk, I will show that dark matter annihilation around the time of recombination can lead to growing ionization perturbations that track the linear collapse of matter overdensities. This amplifies small scale cosmological perturbations to the free electron density by a significant amount compared to the usual acoustic oscillations. Electron density perturbations distort the Cosmic Microwave Background (CMB), inducing secondary non-gaussianity. I will present a novel analytic calculation of CMB non-gaussianity from recombination, providing a clear identification of the relevant physical processes. In the last part of the talk, I will consider the possibility of dark matter-baryon interactions. I will present results from a Markov Chain Monte Carlo likelihood analysis of CMB data from the Planck satellite and measurements of the Lyman-alpha forest from the Sloan Digital Sky Survey that probe the imprints of these interactions both at large and small scales.
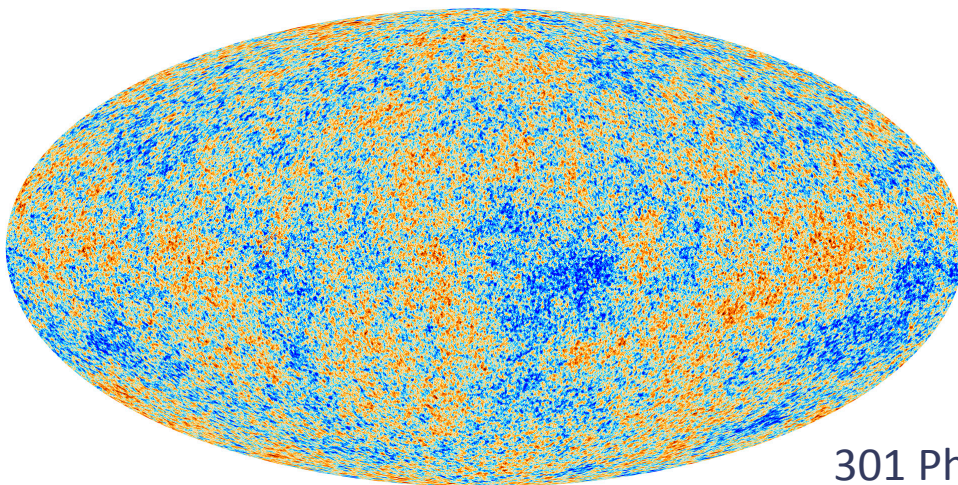
Friday
Sept 5, 2014
4:00pm

301 Physical Sciences Bldg.
Refreshments, 3:45pm