Astrophysics Seminar

# Before the big bang:
## New insights into the birth of the universe and the dawn of spacetime

TUESDAY

AUGUST 25

12:30 P.M.

RM 184 NSH

Prof. Grant Mathews
University of Notre Dame

This talk will summarize three recent efforts to constrain the first few moments of cosmic creation before and during the epoch of inflation. We will consider two means to explain a slight dip in the power spectrum of the cosmic microwave background for multipoles in the range of l = 10-30 from both the Planck and WMAP data. We show that such a dip could be the result of resonant creation of a massive particle that couples to the inflation field. For best-fit models, the epoch of resonant particle creation reenters the horizon at wave numbers of k_*=0.00011 +- 0.0004 h/Mpc. The amplitude and location of these features constrains of a number of degenerate fermion species, their mass, and the coupling constant between the inflation field and the created fermion species. Alternatively, one can explain the existence of such a dip as due to a jump in the inflation generating potential. We show that such a jump can also resolve the excessively large dark flow predicted from the M-theory landscape. Finally, we summarize our efforts to quantify constraints on the cosmic dark flow from a new analysis of the Type Ia supernova distance-redshift relation.