ASTROPHYSICS SEMINAR SERIES

Prof. Grant Mathews

Department of Physics. University of Notre Dame

Tuesday, August 27 12:30 pm - Rm 184 NSH

The Problem with Primordial Lithium

The abundance of primordial lithium is derived from the observed spectroscopy of metal-poor stars in the galactic halo. The observationally inferred abundance remains at about a factor of thee below the abundance predicted by standard big bang nucleosynthesis (BBN)]. The resolution of this dilemma can be either astrophysical (stars destroy lithium after BBN), nuclear (reactions destroy lithium during BBN), or cosmological, i.e. new physics beyond the standard BBN is responsible for destroying lithium. In this talk we will overview each of these possibilities and a variety of possible cosmological solutions. In particular, we examine the possibility of physical processes that modify the velocity distribution of particles from the usually assumed Maxwell-Boltzmann statistics. On the one hand, an inhomogeneous spatial distribution of domains of primordial magnetic field strength has been shown to reduce the primordial lithium abundance. Another possibility is that scattering with the mildly relativistic electrons in the background plasma alters the baryon distribution to one resembling a Fermi-Dirac distribution. This talk will show that neither of these possibilities can adequately resolve the lithium problem. A number of alternate hybrid models will be suggested including a mix of neutrino degeneracy, dark matter, axion cooling, and the presence and/or the decay of exotic particles. All of this highlights the difficulty in solving the problem with primordial lithium.

PHYSICS