

Cyclotron Colloquium on Tuesday, October 4, 2010 at 3:45 pm

"Primordial Nucleosynthesis After WMAP: The Lithium Problem and New Physics"

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Abstract:

The early universe is a central arena for the interplay among nuclear, particle, and astrophysics, and big-bang nucleosynthesis remains particularly important because it represents our earliest reliable probe of the cosmos. We will review the physics of primordial nucleosynthesis which represents a symphony of the fundamental forces, and summarize the observational measures of cosmic abundances which test this theory. Comparing theory and observation, we will evaluate the current status of nucleosynthesis, highlighting the transformative influence of the WMAP determination of the cosmic baryon density based on observations of the cosmic microwave background (CMB). The unprecedented precision brought by the CMB has vindicated basic soundness of our understanding of light element formation, but also has confirmed and added urgency to the "lithium problem." Namely, the CMB and nucleosynthesis together predict a primordial lithium abundance which is substantially higher than the level indicated by observations. We will discuss several possible resolutions to this discrepancy, including the possibility that the lithium problem might point to new physics such as supersymmetric dark matter decays. We will conclude by suggesting nuclear measurements which bear directly upon the lithium problem.