Particle Physics Seminar

High-Scale Axions without Isocurvature from Inflationary Dynamics

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TUESDAY

FEBRUARY 2

4:00 P.M.

RM 415 NSH

If the PQ-breaking scale f is larger than the inflationary Hubble scale HI, the PQ symmetry is broken during inflation. In the most straightforward models, this gives rise to a light axion field during inflation, which acquires isocurvature fluctuations. Such fluctuations are very stringently constrained by current CMB measurements--in fact, supposing the near-future observation of primordial tensor modes (i.e., a measurement of a non-zero scalar-to-tensor ratio r, indicating a high inflationary scale), these constraints would exclude simple models of QCD axion dark matter in which f is larger than HI. This is particularly problematic for the near-Planckian values of f favored by, for instance, string theory.

A variety of solutions have been proposed to "resurrect" high-scale axions. Many seek to leverage inflationary dynamics to modify the behavior or potential of the PQ field during inflation in order to suppress isocurvature. However, inflation and the axion potential are both very fragile, and readily disrupted by additional interactions or couplings. As such, it is important to carefully consider the viability of influencing the PQ field via inflationary dynamics; in other words, can this really be accomplished without messing up either inflation or the solution to the strong CP problem? In this talk, I'll discuss the variety of issues that can arise in these constructions, and highlight the steps one must take to build a viable model.