JOINT TUFTS/MIT COSMOLOGY SEMINAR

$\lambda\phi^4$ *in de Sitter*

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Correlation functions in massless $\lambda\phi^4$ in de Sitter space are IR divergent, indicating that the interacting vacuum of the theory is non-perturbatively far from the free vacuum. This gives rise to worries that de Sitter space might actually be unstable. We introduce two different perturbative schemes for sub-horizon and super-horizon modes. While short modes are solved for with the familiar expansion in powers of the coupling constant λ, the long modes are perturbatively solved for by expanding in $\hbar$, gradients and square-root of λ. At leading order in all these parameters, the density matrix for the long modes satisfies a Fokker-Planck equation, as envisioned long-time ago by Starobinsky. A generalized equation allows us to obtain the corrections in all the expansion parameters. We compute explicitly the ones in square-root of λ, which are the leading ones. We provide several checks, such as the fact that, on the static patch, correlation functions are thermal. Our results provide not only a solution to the problem of $\lambda\phi^4$ in de Sitter space, but also offer a rigorous proof of the existence of slow-roll eternal inflation.

Wednesday, November 27, 2019, 2:30 pm

Cosman Seminar Room

Center for Theoretical Physics

Building 6C, Room 6C-442

Massachusetts Institute of Technology

Refreshments at 2:00 in the same room