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# Inflation and the Measurement Problem

Inflation is a very successful paradigm in cosmology, solving the Horizon, Flatness and Monopole problems with the Hot Big Bang theory. But perhaps the biggest selling point of inflation is that, it provides an elegant, quantum mechanical origin of large scale structure in the universe, described originally in [Starobinsky 1980, Guth and Pi 1982] and others. However, while this description of the emergence of primordial structure from quantum zero-point fluctuations of the inflaton field has been studied in detail for decades [Prokopec et al 1992, Polarski and Starobinsky 1995, Kiefer et al 2007], a number of prominent authors acknowledge important gaps in our understanding of the mechanism [Weinberg OUP 2008, Lyth and Liddle CUP 2009, Padmanabhan CUP 1996]. (For a review see [Sudarsky et al 2005]). Even some of the leading proponents of the theory concede that the current description, the so-called quantum-to-classical transition, is only "pragmatic" and needs eventually to be fully justified. [Kiefer and Polarski 2009] In our upcoming paper [Alexander, Jyoti and Magueijo (to appear)], we discuss and define this cosmological quantum measurement problem, and propose a solution. Our work is similar in spirit to that of [Martin et al 2012, Cañate et al 2012], except that we propose an effective collapse mechanism arising from interaction of Fourier modes, rather than a fundamental modification to the Schrodinger equation. This Measurement problem in Inflation is a rich and compelling arena for both foundational issues of quantum mechanics as well as a deep understanding of early universe cosmology, and our research may potentially teach us about aspects of quantum gravity.

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