

Stasis in an Expanding Universe: A Recipe for Stable Mixed-Component Cosmological Eras

Wednesday 8 June 2022 16:30 (15 minutes)

One signature of an expanding universe is the time-variation of the cosmological abundances of its different components. For example, a radiation-dominated universe inevitably gives way to a matter-dominated universe, and critical moments such as matter-radiation equality are fleeting. In this talk, I shall demonstrate that this lore is not always correct. In particular, I shall show how a form of “stasis” can arise wherein the relative cosmological abundances of the different components remain unchanged over extended cosmological epochs, even as the universe expands. Moreover, I shall also demonstrate that such situations are not fine-tuned, but are in fact global attractors within certain cosmological frameworks, with the universe naturally evolving towards such long-lasting periods of stasis for a wide variety of initial conditions. I shall also discuss some of the implications of a stasis epoch for the evolution of primordial density perturbations and the growth of structure, for dark-matter production, and even for the age of the universe.

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Session Classification: Parallel