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Contribution ID: **129** Type: **not specified**

TALK: Cosmological Stasis and Its Realization from Dynamical Scalars

Thursday, June 27, 2024 10:00 AM (45 minutes)

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It has recently been realized that many extensions of the Standard Model give rise to cosmological histories exhibiting extended epochs of cosmological stasis —epochs wherein the abundances of multiple energy components (such as matter, radiation, or vacuum energy) remain effectively constant despite cosmological expansion. The emergence of a stasis epoch is not a consequence of fine-tuning in cosmologies of this sort; rather, stasis turns out to be a global attractor toward which the universe naturally evolves for a broad range of initial conditions. In this talk, I shall review the general conditions under which stasis emerges in such scenarios and explore some of its potential implications for cosmological observables such as the matter power spectrum and the stochastic gravitational-wave background. I shall also discuss a particular realization of stasis involving a collection of scalar fields, each of which dynamically transitions from a period of slow roll to a period of rapid oscillation around its potential minimum as the universe expands. As I shall demonstrate, not only does cosmological stasis arise in such scenarios, but the system of dynamical scalars also exhibits novel features not seen in previous realizations of stasis, including a tracking behavior wherein the effective equation of state for the universe as a whole evolves toward the equation of state of this energy component. The emergence of such tracking behavior has potential model-building implications in the context of dark-energy and cosmic-inflation scenarios.

Presenter: Prof. THOMAS, Brooks (Lafayette College)