COSMIC INFLATION IN SCALAR-TENSOR THEORIES

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Cosmic inflation is a rapid expansion in the very early universe. Although there is no direct experimental evidence of the occurrence of inflation, it has become a leading paradigm as it solves the initial value problems of standard cosmology. Furthermore, if inflation is driven by a slowly rolling scalar field, the quantum fluctuations of the scalar field after crossing the horizon turn into classical perturbations, which during later epochs re-enter the horizon and trigger the structure formation.

There is a plethora of models of inflation that involve scalar fields as sources of the accelerated expansion. Currently, observations favour models possessing a single slowly rolling scalar field with a suitably flat self-interaction potential. Although it is rather straightforward to fine-tune the potentials in order to accommodate observational restrictions, it is a challenge to incorporate such potentials into the framework of models of particle physics. This fact motivates to construct more complicated models of inflation that involve non-minimal couplings to gravity or non-canonical kinetic terms. Such models can be incorporated in the framework of the first generation of scalar-tensor theories.

Scalar-tensor theories can be formulated in different parametrisations that are seemingly physically inequivalent. However, such theories are still at least mathematically equivalent if they can be related by field redefinitions. We showed that the calculation of inflationary spectral indices up to second order in slow-roll parameters agrees in different parametrisations [1]. Further, we argued that physically distinct models should have the same predictions for inflationary observables if these models are related by field redefinitions [2]. This might also explain the features of inflationary attractors.

References

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