Effects of heavy fields on inflationary cosmology

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Stellingen

behorende bij het proefschrift

Effects of Heavy Fields on Inflationary Cosmology

1. It is certainly much too simple to argue that very heavy fields in a dynamical background can be integrated out *à la Fermi* without consequences.

   Chapter 1

2. Current CMB data might already be sufficiently detailed to detect transient reductions in the speed of sound of the inflaton as mild as a few percent. Since this is a signature of interactions, it opens a new window for the detection of extra degrees of freedom during inflation.

   Chapter 2

3. The sgoldstino plane is a geodesically generated surface of the Kähler metric in the parent theory, so there are no derivative interactions with the truncated heavy fields: all turns in the inflationary trajectory are entirely confined to the sgoldstino plane.

   Chapter 4

4. Field configurations minimising the gravitino mass along the supersymmetric directions are the best candidates to remain stabilised for arbitrary values of the supersymmetry breaking scale.

   Chapter 5

5. Given a theory whose parameters can be fitted to experimental data, it is of vital importance to check that the theoretical description is still valid for the parameter range under study. This allows for a robust physical interpretation of the phenomena one aims to describe.

6. Fine-tuning is an issue that many theoreticians worry about. However, the naturalness of the electron mass is rarely questioned, or the value of its electric charge, among many other so-called natural constants. If Nature (or randomness) determined these values, so be it.

7. Theoretical predictions are often difficult to verify or falsify experimentally. It is important to obtain clear predictions that can be currently tested, but if those predictions are coming from a beautiful and well-motivated theory, even if they seem impossible to observe, experimentalists will eventually make it possible.

8. Reheating is a fundamental stage of the early universe between inflation and the standard Big Bang cosmology. Improving the measurements of the spectral index and the tensor-to-scalar ratio of the primordial perturbations will help us determine the reheating temperature, and reheating will become a fascinating scenario that we will be able to explore deeper.

9. Scientific research should be honest and pursue the truth. Ideally, such research should be funded. Unfortunately, it is not rare that the search for funding obscures the search for scientific truth.

10. The terms Nature and God often appear as irrefutable answers to existential questions. Either way, it is the same concept written differently, and therefore neither should be disrespected nor disproved in favour of the other one.

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