The universe on edge: Limits of the effective field theory approach in the very early universe

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Citation for published version (APA):
Oberreuter, J. M. (2013). The universe on edge: Limits of the effective field theory approach in the very early universe.
Propositions

accompanying the thesis

The Universe on Edge

Limits of the effective field theory approach

in the very early universe

1. Corrections of order $\frac{1}{N}$ in a quantum field theory dual to an unstable space time with gravity show that effects of quantum gravity can be crucial for the understanding of cosmic singularities.

   This thesis, chapter 2

2. When combining several supersymmetric field theories to a theory of supergravity, the gravitationally induced coupling between the sectors must be controlled. The interactions become minimal by adding the Kähler functions instead of the superpotentials.

   This thesis, section 3.3

3. The sectors of a supergravity theory whose Kähler functions have been added decouple if supersymmetry is restored in one sector, only. In that limit, a massless mode develops.

   This thesis, section 3.4.3

4. The gravitational coupling of a hidden sector, exempli gratia the standard model, albeit Planck suppressed, can render a solution of the $\eta$-problem, which is based on the data of the inflaton sector only, invalid.

   This thesis, section 3.6

5. The sectors of a supergravity theory which is constructed by adding the Kähler functions decouple in the limit to a supersymmetric field theory only, if a second scale besides the Planck mass is used.

   This thesis, section 3.9

6. In principle, an observer can determine experimentally, whether his universe is part of a multiverse, by observation of non-Gaussianities in the cosmic microwave background stemming from correlations between modes inside and outside the bubble.

   Johannes Oberreuter, Jan Pieter van der Schaar, work in progress
7. In supergravity with Chern-Simons terms, the entropy function formalism does not become directly applicable by simply replacing Maxwell with Page charges.

   Hendrik Jennen, Johannes Oberreuter, Jan Perz, work in progress

8. Theoretical physics is not cheap. The average cost of each publication contributing to this thesis is more than 100 000 EUR. Incidentally, a seminar of one hour entails a direct investment of roughly 1000 EUR in personnel costs irrespective of its use.

9. The peer-review process, during which the quality of scientific work is judged by a small number of randomly chosen referees, is outdated. Besides, the impracticality of blinding obstructs its scientific validity. Crowd intelligence can lead to better results.

10. There is no scientific proof for the existence of anything like talent. The only parameter which correlates with outstanding performance appears to be the time which a person spends performing the skill. Hence, the concept of talent must be regarded as a social construction to preserve power or as a psychological construction to excuse sloth.

11. Shared responsibility is no responsibility.

12. In general, someone tends to call a question a good question, if he does not know the answer himself or has spent considerable time finding it. In fact, there is no intrinsic value of a question. It is preferable to consider a question as good, if the purpose of asking it is to gain information. Bad questions are then potentially good questions which are not being asked.

13. The Dutch housing system is a well to study example that a too tightly regulated market is unable to produce the required products.

14. The effects of moving the building for the natural sciences faculty of the University of Amsterdam 2.23 km or 3.3% closer to Kampen were remarkably clearly observable.

   Johannes M. Oberreuter, May MMXIII