GR 18: Cosmology

Zeit: Freitag 9:20–10:20 Raum: Phys-SR-SE1

GR 18.1 Fr 9:20 Phys-SR-SE1

Turn back time: Gaussianising the late-time matter density field — •Cora Uhlemann — DAMTP, University of Cambridge

Since the matter distribution in the early universe is nearly perfectly Gaussian, one can extract almost all of the statistical information from the two-point correlation function of densities. However, the growth of structures over time causes significant deviations from Gaussianity which arise due to the nonlinear dynamics of gravitational clustering. This complicates the analysis of late-time observables such as the galaxy distribution extracted from large-scale structure surveys. I will explain how one can infer a gaussianising transformation from recent theoretical insights into the statistics of densities in spheres. This Gaussianisation maps the late-time density to an almost Gaussian field which is in better correspondence to the linear density field - hence essentially turns back time.

GR 18.2 Fr 9:40 Phys-SR-SE1

Scale Invariant Inflation — •Anirudh Gundhi — Universität zu Köln, Zülpicher Straße 77, 50937 Köln, Germany

The inflationary scenario is one of the most natural mechanisms to account for the high precision measurements of the cosmic microwave background radiation. However, in order to fit these observations, it either suffers from assigning arbitrary scalar field potentials (like in chaotic inflation) or a large number of free parameters (like in some string theory motivated multifield models). The challenge remains to come up with a physically motivated model which has just the right number of free parameters to fit the observations completely. We will see that Higgs-Starobinsky inflation is one such candidate. Its Lagrangian is obtained uniquely by demanding scale invariance and avoiding Ostrogradsky instability. With this physical constraint, one ends up with three free parameters and no ambiguity in the scalar field potential. Although Starobinsky inflation fits all the observations to a good precision, this model has the freedom to fit the scalar to tensor ratio better if in future a more accurate measurement is made. The focus of the talk will also be on overcoming some of the non-trivial aspects of having a curved field space metric, while working in the Einstein frame, to compute the inflationary observables.

GR 18.3 Fr 10:00 Phys-SR-SE1

Dirac's Large Numbers in Einstein-Dicke Cosmology — •Alexander Unzicker — Pestalozzi-Gymnasium München

The Large Number Hypothesis reflects a tantalizing observation that, according to Dirac, suggests 'a deep relation between cosmology and atomic physics'. It is shown that Diracs Hypotheses directly follow from a version of general relativity developed by Dicke (1957) that closely matches a precursor theory of general relativity by Einstein (1911) based on variable speed of light. Tragically, Dirac, Dicke and Einstein were unaware of the far-reaching similaritiy of their respective approaches.