

Lectures on inflation and cosmological perturbations

David Langlois

(Submitted on 28 Jan 2010)

The purpose of these lectures is to give a pedagogical introduction to inflation and the production of primordial perturbations, as well as a review of some of the latest developments in this domain. After a short introduction, we review the main principles of the Hot Big Bang model, as well as its limitations. This motivates the study of cosmological inflation induced by a slow-rolling scalar field. We then turn to the analysis of cosmological perturbations, and explain how the vacuum quantum fluctuations are amplified during an inflationary phase. The next step consists in relating the perturbations generated during inflation to the perturbations of the cosmological fluid in the radiation dominated phase. The final part of these lectures gives a review of more general models of inflation, involving multiple fields or non standard kinetic terms. Although more complicated, these models are usually motivated by high energy physics and they can lead to specific signatures that are not expected in the simplest models of inflation. After introducing a very general formalism to describe perturbations in multi-field models with arbitrary kinetic terms, several interesting cases are presented. We also stress the role of entropy perturbations in the context of multi-field models. Finally, we discuss in detail the non-Gaussianities of the primordial perturbations and some models that could produce a detectable level of non-Gaussianities.

Comments: 56 pages, 5 figures; Lectures given at the Second TRR33 Winter School on cosmology, Passo del Tonale (Italy), December 2008

Subjects: **Cosmology and Extragalactic Astrophysics (astro-ph.CO)**; General Relativity and Quantum Cosmology (gr-qc); High Energy Physics - Theory (hep-th)

Cite as: [arXiv:1001.5259v1](https://arxiv.org/abs/1001.5259v1) [astro-ph.CO]

Submission history

From: David Langlois [[view email](#)]

[v1] Thu, 28 Jan 2010 20:15:48 GMT (296kb,D)

Which authors of this paper are endorsers?