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Probing inflation with cosmological observations

jeudi 18 mars 2021 14:00 (20 minutes)

Inflation is a hypothetical very early period of the universe when it was expanding exponentially. It has been introduced to explain the homogeneity and the flatness of the observed universe. Remarkably, inflation provides a very nice explanation for the origin of the tiny fluctuations that we observe in the cosmic microwave background: all the known particles come from one single scalar field decay. These primordial fluctuations are the seeds of structure formation (filaments, clusters, galaxies$\cdots$). In addition, the study of this epoch gives us a unique probe of very high energy physics of the order of $10^{15} - 10^{16} GeV$. We will explain two particularly interesting features of the primordial perturbations: Adiabatic/isocurvature and (non-)Gaussianity. A detection of non-Gaussianity and/or isocurvature modes would be interesting since both could rule out the simple single-field inflation models and demonstrate the presence of multiple fields interacting at very high energy and/or modified gravity. To study these features, we usually look at the statistics of the fields that we can observe: temperature and polarization in the case of the CMB and galaxies and/or distribution of matter in the case of large-scale structure.

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