

Summary of the “Pre-Planckian” Inflation 2011 Workshop

Three decades after its proposal, inflation has now become the standard framework for early universe cosmology. The predictions of the simplest inflationary models have been confirmed. Experimental activity is ongoing to improve over these results, and to find two other signatures, tensor modes, and nongaussianity, that would substantially increase our understanding of the early universe. At the same time, significant advances have been made on the theory side. The Workshop was attended by several leading authors in the field, who reviewed the current experimental and theoretical status of Inflation, and discussed directions for future theoretical development.

The Workshop was opened by **Linde**, who first presented an overview of the current status of inflation, and then discussed some supergravity realizations that he has constructed in the recent past. The next three talks, by **Gorski**, **Kogut**, and **Pryke**, were devoted to the most recent and forthcoming experimental results, particularly in connection with the ongoing Planck satellite mission, and with the various searches for the inflationary B-mode (generated by tensor modes): this is probably the most pressing experimental task in the field, given that only this detection will allow us to determine the energy scale of inflation. The first morning was concluded by **Bond**, who discussed recent developments in the theory of reheating (the inflaton decay, and the thermalization of the decay products; this sets the initial conditions for the following big-bang evolution), and by **Wands**, who presented an overview of local and quasi-local non-gaussianity (this is another pressing field, given that non-gaussianity is one of the few possible ways to discriminate between different inflationary models, and given the strong improvement expected from Planck).

The talks in the following afternoon were mostly devoted to theoretical aspects of the primordial perturbations generated during inflation. **Woodard** and **Ng** discussed the possible enhancement of the gravity wave signal from quantum gravity; **Tanaka** showed how to eliminate infrared divergences; **Creminelli** and **Tanaka** showed how to derive several properties of the fluctuations from symmetry principles. Finally, **Yokoyama** and **D'Amico** presented a number of signatures obtained by generic models of inflation with Galilean symmetry.

On the second morning, **Komatsu** reviewed some consistency relations between higher order correlation functions that, if not respected by the data, would falsify single and multi-field inflation. The following talks were devoted to more formal aspects. **Kallosch** presented models of inflation in extended supergravity; **Burgess** provided explicit solutions in two and higher co-dimension brane inflation; **McAllister** presented a number of general features of D-brane inflation; **Bousso** discussed the problem of probability in the string landscape. The last talk of the morning, by **Silverstein**, discussed instead a possible gravity wave signal at interferometers generated by particle and string production in the late inflationary stages.

Signatures from particle production during inflation were also the object of several talks in the afternoon. **Sorbo** also discussed the gravity wave signal generated by a number of particle production mechanisms; **Barnaby** showed how particle production can also result in a distinctive non-gaussian signature in models of axion inflation; **Pajer** compared this signature with the resonant non-gaussianity that characterizes many recent constructions of axion inflation; **Chung** discussed the isocurvature perturbations generated by heavy particles gravitationally produced during inflation; **Berera** reviewed a number of results for warm inflation, where the inflation evolves in a continued dissipative regime. In the

last two talks of the second day, **Antusch** and **Takahashi** returned instead to supergravity models of inflation.

Mukhanov started the third and final day with a review talk on the theory of the cosmological perturbations. **Kaloper** then presented some spherically symmetric solutions in galilean theories. **Freese** showed the results for gravity wave production in chain inflation. **Kinney**, in the last talk of the morning, spelled out the most general conditions under which a scale invariant spectrum of cosmological perturbations can be produced.

The first three talks of the afternoon, by **Soda**, **Huterer**, and **Bartolo**, were devoted to model building and observational tests of broken statistical invariance of the primordial perturbations. After that, **Seto** presented the signatures of curvaton models with double well potential. **Brax** then discussed how the CMB can be used to test modified theories of gravity. In the final talk of the Workshop, **Biswas** discussed signatures that can arise from recurring periods of inflation taking place in stage of alternating expansion and contraction of the universe.

This formal program was integrated by informal discussions over meals and during the breaks. Traditionally, this informal part of the meeting constitutes an ideal occasion for exchanging ideas and starting new projects. The Workshop continued the strong tradition of FTPI-sponsored meetings in Cosmology and theoretical Astrophysics that has been organized in Minnesota over the past decade. Several Workshop participants expressed high appreciation for level of this meeting, and of the whole series.