Summary of Discussion Session #4 (November 7, 2012)

"Large-scale structure theory"

Question: What does inflation predict for the scale-dependent bias?

Answer: Mass-dependence of the amplitude and the wavenumber dependence.

The scale-dependent bias is given by

$$\Delta b(k,M) = A(M)*k^{-\alpha}$$

where A(M) is the mass-dependent amplitude, and α is the slope.

SLOPE

The slope is related to the long-mode wavenumber dependence of the squeezed-limit bispectrum as

$$B(k_S,k_S,k_L) \sim k_L^{-(\alpha+1)}$$

where $k_L << k_S$.

- Single-field inflation predicts: $\alpha=0$
- Quasi-single-field inflation predicts: $0.5<\sim\alpha<2$
- Multi-field inflation predicts: $\alpha\sim 2$
- Exact local form is: $\alpha=2$
- Some non-Bunch-Davies vacua can give: $\alpha=3$

AMPLITUDE

The amplitude is related to the integral of the bispectrum over k_S:

$$A(M) \sim \int dk_S\, k_S^6[T(k_S)]^2[W_M(k_S)]^2B(k_S,k_S,k_L)$$

where $W_M(k)$ is the Fourier transform of the top-hat filter for a given mass M and T(k) is the linear transfer function. Therefore, while the slope tells us information about the squeezed-limit bispectrum, the amplitude tells us information about the k_S dependence, i.e., the actual shape of the bispectrum.

However, A(M) depends also on other things such as the merger history, and thus actually computing it for an observed population of galaxies would not be so simple. It may be better to measure the galaxy bispectrum if one wishes to obtain the shape information of the primordial bispectrum.