

## SYKM 1: Cosmological Model-Building

Zeit: Dienstag 16:30–18:30

Raum: HS 4

**Hauptvortrag** SYKM 1.1 Di 16:30 HS 4  
**Conceptual problems with cosmological model-building from the point of view of General Relativity** — ●GEORGE ELLIS — University of Cape Town

General Relativity is a highly non-linear theory without a fixed background space-time. This means that apparently physical properties can be nothing but coordinate effects. One should therefore as far as possible use invariant quantities in covariant equations, and calculate non-local effects in terms of potentially observable quantities (as for example in the case of black hole properties).

Cosmology separates into Kinematics (relations independent of the gravitational field equations), dynamics (relations dependent on those equations), and model confirmation/ testing. These issues arise firstly as regards the background model, giving the overall dynamics of the universe, and then as regards perturbed models where structure formation can be investigated. In the latter case a variety of important issues arise: the gauge issue for perturbations, and the averaging, backreaction, and fitting problems relating the perturbed and background models. Testing models is strongly restricted both by visual horizons, and by limits on testing the relevant physics. The strongest limits on background model parameters come from observations of astronomical structures and associated Cosmic Background Radiation anisotropies, because the background model provides the context for

structure growth.

**Hauptvortrag** SYKM 1.2 Di 17:10 HS 4  
**Inhomogeneities in cosmology and the geometry of spacetime averaging** — ●MAURO CARFORA — Physics Department, Pavia University via Bassi 6, Pavia, Italy

I will discuss the complex mathematical problems arising when one attempts to characterize the average dynamics of matter and geometry inhomogeneities in cosmology.

**Hauptvortrag** SYKM 1.3 Di 17:50 HS 4  
**Bayes, datasets, and priors in the hunt for dark energy** — ●MICHELA MASSIMI — School of Philosophy, University of Edinburgh, UK

Bayesian methods are ubiquitous in contemporary observational cosmology. The Bayes factor enters in at least three main tasks: cross-checking datasets for consistency; estimating cosmological parameters; and model selection. This talk explores some epistemic limits of using the Bayes factor for delivering on these three tasks. The Dark Energy Survey (DES) and its recent Year 1 results nicely illustrate prospects and problems concerning the use of the Bayes factor in the hunt for dark energy.