Lectures

- **J. Barrett**: *Introduction to Non-Commutative Geometry*

  Abstract: The lectures will introduce the spectral triple description of geometry based on the Dirac operator. It is explained how it can be generalised to non-commutative geometry in a way that captures some of known structure of high-energy physics. The following topics are covered: The algebraic approach to geometry. Fuzzy spaces and their commutative analogues. The Dirac operator and the mathematical formalism of spectral triples. The use of spectral triples in the description of the standard model of particle physics.

- **P. Bouwknegt**: *Surjective submersions, Bundle Gerbes, Group Cohomology and Applications*

  Abstract: In these lectures I will give an introduction to various concepts from homological algebra, algebraic topology and differential geometry, with applications to T-duality. Content: 1. Surjective submersions, 2. Bundle gerbes and T-duality, 3. Group cohomology and toroidal orbifolds, 4. T-duality for toroidal orbifolds.

- **P.Mnev**: *An introduction to the BV-BFV program*

  Abstract: In the mini-course I will explain the "BV-BFV formalism" an enhancement of the cohomological symplectic (Batalin-Vilkovisky) formalism for gauge theories, compatible with the cutting-gluing of the spacetime manifold. At the classical level, spaces of fields attached to the bulk/boundary/corner strata of the spacetime are dg symplectic manifolds with hamiltonian data intertwined by inclusions of incident strata. At the quantum level, one has cochain complexes attached to boundaries and solutions of the modified quantum master equation attached to the bulk. I plan to explain:

  - the idea and examples of the effective BV action,
  - examples of quantization in the BV-BFV formalism, including a subclass of AKSZ sigma models,
  - a cellular model of BV-BFV quantization,
  - an example of a quantum BV-BFV theory with corners,
  - a relation to bulk-boundary ("holographic") correspondences in two examples,
  - (possibly) Fukaya-Morse A-infinity category as an example of an effective BV action.

- **A.Polishchuk**: *Moduli of stable supercurves and the superstring measure*

  Abstract: I will give an introduction to the geometry of moduli spaces of supercurves (or more precisely, of SUSY curves), starting with a review of the relevant supergeometry. I will also talk about the moduli space of stable supercurves and about singularities of the superstring supermeasure along the theta-null divisor and along the boundary divisors. Then I will talk about the regularization procedure to integrate the supermeasure in genus two.

- **K. Rejzner**: *BV formalism in perturbative algebraic quantum field theory*

  Abstract: In this series of lectures I will explain how gauge theories are quantised within the framework of perturbative algebraic quantum field theory (pAQFT), which is a mathematically rigorous approach to perturbative QFT on Lorentzian manifolds. The main idea is to combine the Epstein-Glaser renormalisation techniques with the Batalin-Vilkovisky (BV) formalism.

- **C. Schweigert**: *A skein theoretic approach to CFT correlators*

  Abstract: We explain how correlators of two-dimensional conformal field theories can be described using skein theoretic methods. We will in particular explain how a bicategorical string-net construction leads to "universal correlators" which allow to describe those aspects of worldsheets that can be detected by correlators of a given conformal field theory.