# GR 10: Hauptvorträge Donnerstag

Zeit: Donnerstag 8:30–10:30 Raum: KGI-HS 1010

**Hauptvortrag** GR 10.1 Do 8:30 KGI-HS 1010

**3D mapping-class groups in canonical General Relativity** — •Domenico Giulini — Albert-Einstein-Institut, Am Mühlenberg 1, 14476 Golm

Mapping-Class-Groups of 3-dimensional manifolds (the Cauchy surfaces) act as discrete symmetries on the constraint-reduced spaces of states in classical as well as quantum gravity. These groups are generically infinite and non-abelian and therefore not easy to understand. I review some of the progress that has been made in understanding their structure and also comment on their relevance in current approaches to quantum gravity.

**Hauptvortrag** GR 10.2 Do 9:00 KGI-HS 1010

**An isoperimetric concept for mass and energy of isolated systems** — •Gerhard Huisken — Albert-Einstein-Institut, Am Mühlenberg 1, 14476 Golm

It is a basic problem of General Relativity to represent physical concepts like mass, center of mass, momentum or angular momentum of isolated gravitating systems by natural geometric structures in order to ensure invariance of these concepts under coordinate changes. The lecture explains how a 4-dimensional spacetime representing an isolated gravitating system can be decomposed in a narural way into 3-dimensional timeslices carrying 2-dimensional radial foliations that allow geometric definitions for mass and momentum. It is shown how the "total mass" of the system can then be interpreted in terms of the classical isoperimetric inequality relating volume and perimeter of regions in the 3-dimensional timeslice. The lecture also discusses how methods from geometric analysis justify these concepts and imply sharp lower bounds such as the Penrose inequality on the energy systems containing black holes.

**Hauptvortrag** GR 10.3 Do 9:45 KGI-HS 1010

**Black Hole Production at the LHC** — •Matthew W. Choptuik — Albert-Einstein-Institute, Golm — Dept of Physics & Astronomy, UBC, Vancouver, Canada

One of the most exciting and provocative claims arising from the possibilty that the Planck scale energy might lie near the TeV scale, is that the LHC may in fact turn out to be a mini-black-hole factory. In this talk I will briefly summarize the reasoning that underlies the claim, and discuss some possible weaknesses in the arguments. I will then report on numerical calculations aimed at determining to what extent some of the key assumptions used in the estimation of black-hole cross-sections in accelerator experiments can be expected to hold.