# GR 9: Invited Talks 4

Time: Wednesday 9:30–12:30 Location: H 2013

**Invited Talk** GR 9.1 Wed 9:30 H 2013

**Gravitational radiation from compact binary systems** — •Luc Blanchet — Institut d'Astrophysique de Paris, France

To be observed and analyzed by the gravitational wave detectors LIGO/VIRGO on ground and LISA in space, inspiralling compact binaries (binary star systems composed of neutron stars and/or black holes) require high-accuracy predictions from general relativity. These very relativistic systems are accurately described by the post-Newtonian approximation, which is the flagship of approximation methods in general relativity. In this talk, after relevant motivating introduction, we shall review the current state of the art on post-Newtonian methods as applied to the motion and gravitational radiation of compact binaries. Then we shall make a comparison between the post-Newtonian results and numerical calculations of the gravitational self-force based on black-hole perturbation theory. Finally we shall present some recent work on the so-called "first law of black hole binary dynamics"

**Invited Talk** GR 9.2 Wed 10:10 H 2013

**Black Holes and Neutron Stars in Numerical General Relativity** — •Bernd Bruegmann — University of Jena, Germany

Black holes and neutron stars are paradigms of extreme gravity described by Einstein's theory of general relativity. This talk reviews recent progress in numerical relativity that allows the simulation of the general relativistic two body problem for black holes and neutron stars. A key result is how such binaries generate gravitational waves that provide information about astrophysical phenomena like collisions and mergers at the endpoint of the gravitational inspiral. As a recent development we discuss simulations of binary neutron stars with realistic spin, which go beyond the conventional approximation of corotating or irrotational neutron stars.

**20 min. break**

**Invited Talk** GR 9.3 Wed 11:10 H 2013

**Supernova Cosmology** — •Bruno Leibundgut — European Southern Observatory, Garching, Germany

Mapping the universal expansion history has been a goal of cosmologists for decades. Thermonuclear supernovae have provided a tool to measure (relative) distances over more than half the age of the universe, were instrumental in the detection of accelerated expansion and the inference of Dark Energy. A constant equation of state parameter has been determined to better than 10 percent and is fully consistent with Einstein's cosmological constant.

During the decade after discovery the original result was confirmed and refined through larger samples and improved techniques. The existing data sets now have reached statistical levels, where the systematic uncertainties dominate the result. New ideas and techniques are required to measure a potential evolution of the equation of state parameter and rule out certain models of gravity or particle physics.

Upcoming surveys will assemble unprecedented supernova samples with thousands of objects. Provide the analysis procedures are developed sufficiently they may have the power to test for deviations from the cosmological constant.

**Invited Talk** GR 9.4 Wed 11:50 H 2013

**Large scale structures in the universe** — •Volker Mueller — Leibniz Institut fuer Astrophysik Potsdam, Deutschland

The galaxy distribution in the universe forms a hierarchical network of knots, filaments and walls around large void regions. New methods for quantifying these structures allow detailed investigations of their origin and our facility to explain them within the standard cosmological model. We present new results on the clustering of galaxies, on properties of groups and clusters of galaxies, and the supercluster-void distribution.