MP 14: Quantengravitation und Quantengravitationsphänomenologie (gemeinsam mit GR)

Zeit: Mittwoch 16:45–19:00 Raum: 30.45: 101

Hauptvortrag MP 14.1 Mi 16:45 30.45: 101

Loop quantum gravity — •Carlo Rovelli — Centre de Physique Thèorique, Université de Aix-Marseille, France

I give a general overview of the state of loop quantum gravity, focusing on its covariant version, and of the main results the theory.

Hauptvortrag MP 14.2 Mi 17:30 30.45: 101

Causal Dynamical Triangulation - A Gateway to Quantum Gravity — •Renate Loll[1], Jan Ambjorn[2], and Jerzy Jurkiewicz[3] — [1]Institute for Theoretical Physics, Utrecht University, Utrecht, The Netherlands — [2]Niels Bohr Institute, Copenhagen University, Copenhagen, Denmark — [3]Jagiellonian University, Krakow, Poland

The nonperturbative theory of Quantum Gravity constructed using the method of Causal Dynamical Triangulation (CDT) has made considerable progress in explaining the macroscopic structure of spacetime from first (quantum) principles. This includes the "postdictions" that spacetime on large scales is four-dimensional and - in the absence of matter - looks like a de Sitter universe. By contrast, near the Planck scale, spacetime behaves highly non-classically and exhibits two-dimensional features, for which corroborating evidence has meanwhile been found in several other approaches. After summarizing the rationale behind CDT and its main achievements, I will highlight some new results and insights, including CDT's phase structure, which may provide a blueprint for models of dynamical, higher-dimensional geometry, as well as short- and large-scale geometric properties of the dynamically generated quantum universe and their potential implications for quantum cosmology.

Hauptvortrag MP 14.3 Mi 18:15 30.45: 101

Geometry and Observables in three-dimensional (Quantum) Gravity — •Catherine Meusburger — Fachbereich Mathematik, Bereich AZ, Universität Hamburg, Bundesstraße 55, 20146 Hamburg

Three-dimensionsional gravity serves as a model in which fundamental questions of quantum gravity can be investigated in a fully and rigorously quantised theory. A central question for its interpretation is the relation between the fundamental diffeomorphism invariant observables of the theory and the geometry of the spacetimes. We show how these observables can be related to concrete measurements by observers in terms of lightrays. These measurements allow the observer to fully determine the geometry of the spacetime in finite eigentime.