SYET 2: Emergent Time II

Zeit: Montag 14:00–15:30 Raum: KGI-HS 1199

Plenarvortrag SYET 2.1 Mo 14:00 KGI-HS 1199

Emergence of Time from Quantum Gravity — •Claus Kiefer — Institut für Theoretische Physik, Universität zu Köln

It is generally believed that there is a more fundamental theory than general relativity, which is obtained by employing a quantum description of the gravitational field: a theory of quantum gravity. The fundamental equations of such a theory seem to be of a timeless nature.

In my talk, I shall first review the approach where this issue is most clearly seen: canonical quantum gravity. I shall then discuss a new concept of time and its consequences at the fundamental level. A major part of my talk is devoted to the demonstration of how the classical concept of time can emerge from quantum gravity in appropriate limits. A central role is played therein by the emergence of classical properties through decoherence. I shall conclude with some remarks concerning the arrow of time and its derivation from quantum gravity.

Plenarvortrag SYET 2.2 Mo 14:45 KGI-HS 1199

Time in Emergent Gravity — •Olaf Dreyer — Dept. of Physics, MIT

In canonical gravity the Hamiltonian evolution is replaced by a constraint equation. This leads to the dreaded problem of time: how is one to reconstruct a notion of time in such a theory? I will present a new approach to quantum gravity that has the potential to circumvent this problem. I trace the the problem of time to the unphysical idealization of geometry without matter. I will show how in a quantum mechanical many-body system the notions of geometry and matter arise simultaneously and why their interplay is described by Einstein's equations. I will discuss the novel promises and challenges of this approach.