MP 6: Quanten+Gravitation HV 1

Zeit: Mittwoch 14:00–14:40   Raum: HS 8

Hauptvortrag   MP 6.1   Mi 14:00   HS 8
Modern foundations for thermodynamics, the matter-gravity entanglement hypothesis and the stringy limit of black-hole equilibria — •BERNARD S. KAY — Department of Mathematics, University of York, York YO10 5DD, UK

In 1998, I pointed out that many puzzles, including the black-hole Information Loss Puzzle, the Schroedinger Cat Puzzle and older puzzles connected with entropy and the Second Law, would all seem to be resolvable with the Matter-Gravity Entanglement Hypothesis. I.e. that the proper framework for resolving all these puzzles is a conventional quantum mechanical theory of (low-energy) quantum gravity, the total state of a closed system is a pure state and the closed system's physical entropy is to be equated with its matter-gravity entanglement entropy.

In this talk, I point out that this hypothesis seems to fit well with modern work (since around 2006) on the foundations of Statistical Mechanics which replaces the traditional explanation for the thermality of a small system weakly coupled to an energy bath in terms of a total microcanonical state by an explanation in terms of a total state which is a random pure state with energy in a given narrow range. I also present new results which generalize this modern work and enable the computation of probable system-energy bath entanglement entropies as a function of total energy.

Relying on these new results, I then argue that the post-1996 explanations of black hole entropy in terms of the logarithm of the degeneracy of certain string states should be and can be modified so as to be consistent with the matter-gravity entanglement hypothesis.