Renormalization group irreversibility in conformal gravity

Stefano Gregorio Giaccari
University Of Padua

Irreversibility of the renormalization group (RG) implies that ultraviolet (UV) and infrared (IR) fixed points of a consistent Quantum Field Theory (QFT) cannot be arbitrary conformal invariant models but must satisfy specific conditions. These are usually expressed in terms of dimensionless charges associated with the fixed points which monotonically decrease along the RG flow. Although the charges have been identified, leading to C, F, A-theorems in d=2,3,4, the physical interpretation of irreversibility is still elusive. On the other hand, one can wonder whether the number of fields in a weakly-coupled QFT can be non-perturbatively defined as a quantity whose change along RG flow can be studied. A connection between a non-perturbative analogue of the “number of fields” in weakly-coupled theories and the RG charges associated with irreversibility theorems is indeed strongly suggested by the latter's identification with the logarithmic universal coefficient of the Entanglement Entropy (EE) of a sphere. We discuss irreversibility of RG flow in the case of Weyl gravity, for which recently an interesting IR behavior was found using the Functional Renormalization Group approach. In particular, we identify a monotonically decreasing charge and discuss its relation to the degrees of freedom associated with UV and IR fixed points.