Institut Henri Poincaré

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String Theory in Greater Paris

Rencontres Théoriciennes

"Supergravité, théorie des cordes et théorie M"

Jeudi 2 Avril 2015, 11:45

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Entropy and Effective theory of fluid dynamics

Fluid dynamics is commonly believed to be the effective description of high temperature, long distance dynamics. To make this statement precise, we need to know how to do Wilson-style effective field theory over mixed states (or equivalently how to do Wilson-style effective field theory in Schwinger Keldysh path integrals) which we do not know yet. In particular, the emergence of entropy, dissipation and second law of thermodynamics do not have a Wilsonian explanation yet. This field theoretic (and fluid dynamical) problem is in turn dual to some of the outstanding problems of Black hole physics via AdS/CFT. In this talk, I will present some of my recent work (arXiv :1412.1090 and arXiv :1502.00636 with Felix Haehl and Mukund Rangamani) aimed at solving this issue. We propose an emergent abelian symmetry at long distances in order to explain the emergence of entropy and second law within fluid dynamical path integrals. This proposal can be thought of as the field theory/fluid dynamics dual of Wald's statement in gravity that entropy is Noether charge.

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