

UNDERSTANDING THE HOLOGRAPHIC CORRESPONDENCE AS A SPECIAL RG FLOW

One-day workshop

Friday March 7, 2014 from 10:00 at the conference room

LPTHE – Université Pierre et Marie Curie – T 13-14 4e étage, 4 Place Jussieu

Reduced descriptions and entropies in quantum statistical mechanics

Roger BALIAN – IPhT CEA – Saclay

Abstract: Statistical mechanics often aims at reducing the number of variables, keeping only “macroscopic” ones. The elimination of the other, “irrelevant” variables can be guided by use of the maximum entropy criterion, which sheds light on the projection operator method. The dynamical equations thus obtained formally can be given a geometric interpretation. The concept of relevant entropy enlightens the question of irreversibility (Amer. J. Phys. 67 (1999) 1078).

*An introduction to the non-perturbative renormalization group and
some applications in the $O(N)$ models*

Bertrand DELAMOTTE – LPTMC – Université Paris 6

Abstract: An introduction to the modern version of Wilson's renormalization group will be given together with the two non-perturbative approximation schemes that have effectively been implemented (the derivative expansion and the Blaizot-Mendez-Wschebor scheme). The $O(N)$ scalar models will be our favourite playground. Then, some results obtained in out of equilibrium statistical mechanics will be presented showing that fully non-perturbative physics can be captured by the non-perturbative renormalization group.

Space-time emergence from holographic RG flow

Ayan MUKHOPADHYAY – CPHT – EP and IPhT CEA – Saclay

Abstract: I will show how holographic RG flow can be constructed from Einstein's equations such that it corresponds to emergence of space-time from special field-theoretic data, which are background independent. I will work this out in the fluid-gravity limit. The values of the transport coefficients and the counter-terms can be uniquely determined by requiring that the holographic RG flow has a fixed point at the horizon, corresponding to non-relativistic incompressible Navier-Stokes fluid, in a certain scaling limit. I will conjecture about what this RG flow means in the field-theory and also about the correspondence between an arbitrary hyper-surface in the bulk and a local choice of scale in the field theory.

Holographic RG flows and quantum effective actions

Francesco NITTI – APC – Université Paris 7

Abstract: The AdS/ CFT correspondence offers a geometric realization of the quantum field theory RG flows. I will describe the connection between QFT local RG transformations and radial diffeomorphisms, and show how beta-functions for homogeneous as well space-time-dependent couplings can be computed from the bulk Einstein equations. The resulting RG-flows for the metric and scalar operators that have the form of generalized Ricci flows. The same beta-functions govern the local quantum action principle for the renormalized holographic quantum effective action.

Quantum RG and holography

Giuseppe POLICASTRO – LPT – Ecole Normale Supérieure

Abstract: I will review the recent proposal of S.-S. Lee for an alternative renormalization scheme that allows to show both the emergence of the holographic dual space-time and the diffeomorphism invariance of the bulk theory, via the freedom to redefine the length scale in a space-time dependent way.

Organizers : *N. Halmagyi, A. Mukhopadhyay and P.M. Petropoulos*