SEMPARIS – Séminaires en région parisienne

http ://string.lpthe.jussieu.fr/semparis/

Seminaire exceptionnel

Mercredi 22 Novembre 2017, 11 :00
LPTHE, Bibliotheque du LPTHE, tour 13-14, 4eme etage
Domaines : cond-mat

Titre : *Anomalous Dimensions for Conserved Currents as a loop-hole in Noether's Theorems*

Orateur : **Philip Phillips (University of Illinois)**

Résumé : *For the past 30 years, the transport properties in the unusual metallic phase seen in the cuprate superconductors and many other quantum critical metals, have defied an explanation in terms of the standard building blocks of modern physics — particles with local interactions and conservation laws. A recent proposal suggests that all of the properties of such 'strange metals' can be understood if the current has an anomalous dimension not determined simply by dimensional analysis. My talk will focus on trying to understand this claim. To demystify this claim, I will first show that even in the standard formulation of gauge theories, there is a loop-hole in Noether's theorems which has remained 'almost' (Noether was aware of it) un-noticed until now, that can allow, in principle, for the current to have any allowable dimension. The only quantum theories to date which exhibit such odd behaviour are bulk diatonic models. The corresponding boundary theory is inherently non-local as dictated by the only possible exception to Noether's theorms. The existence of currents having anomalous dimensions, a direct probe of the existence of extra 'hidden' dimensions, can be tested with the Aharonov-Bohm effect. I will describe this effect and its potential impact for unlocking the secret of the strange metal in the cuprates. I will also construct the Virasoro algebra for such fractional currents and discuss the general implications for the bulk-boundary construction in holography.*