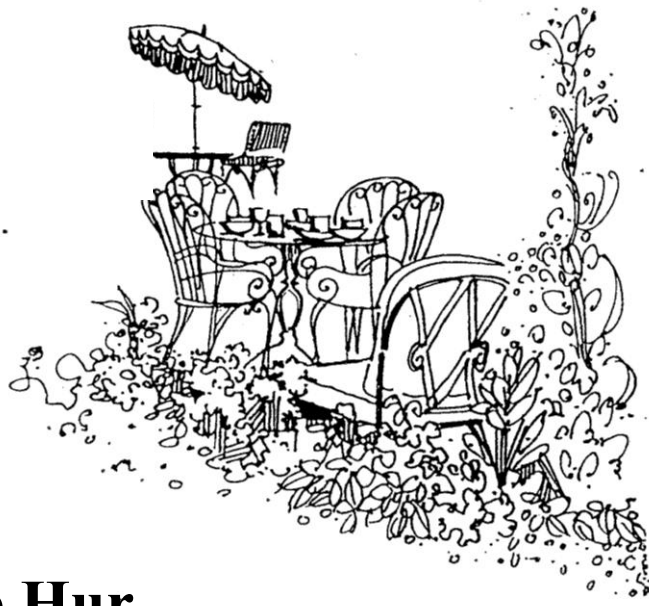
Chez Pierre

Presents ...

Monday, December 12, 2011
12:00pm
MIT Room 4-331



Karyn Le Hur
Yale University

"Charge Relaxation Resistance as a Probe of Many-Body Correlations"

Mesoscopic Circuits witness marked non-local effects in their transport properties because of electron coherence. One important consequence is the quantization of the maximum of the DC conductance in one dimension. Here, we extend the concept of universal quantized resistance to the AC regime and we make a connection with the many-body quantum physics of low-energy models. In particular, we introduce and discuss the results for the quantum RC circuit [1]. For large cavities, we relate the charge relaxation resistance and the Korringa-Shiba relation of the Kondo model [2]. Then, we introduce a larger class of models with a universal charge relaxation resistance. For quantum Hall systems, we show that fractional charges at the edges can be probed through the charge relaxation resistance. The quantum RC circuit can also be built in two-dimensional topological insulators revealing important features of the charge dynamics of the helical Luttinger liquid [3]. In the context of the Anderson model, we show that the mesoscopic charge relaxation can exhibit a giant magneto-resistance when applying a magnetic field [4]. Finally, we explore the limit of many conducting channels and build an analogy with a dissipative particle on a ring [5].

[1] M. Buettiker, T. Pretre and H. Thomas, Phys. Rev. Lett. 70, 4114 (1993). J. Gabelli et al., Science 313, 499 (2006).
[2] Christophe Mora and Karyn Le Hur, Nature Physics 6, 697 (2010).
[3] Ion Garate and Karyn Le Hur, arXiv:1111.4581
[4] M. Filippone, Karyn Le Hur and Christophe Mora, Phys. Rev. Lett. 107, 176601 (2011)
[5] P. Dutt, T. Schmidt and K. Le Hur, in progress