

Chez Pierre

Presents ...

Friday, November 30, 2012

12:00pm

MIT Room 4-331



SPECIAL CHEZ PIERRE SEMINAR

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“Quantum transport in one dimension: from integrability to many-body localization”

Recent advances in analytical theory and numerical methods enable some long-standing questions about transport in one dimension to be answered; these questions are closely related to transport experiments in quasi-1D compounds. The spinless fermion chain with nearest-neighbor interactions at half-filling, or equivalently the XXZ model in zero magnetic field, is an example of an integrable system in which no conventional conserved quantity forces dissipationless transport (Drude weight); we show that there is nevertheless a Drude weight and that at some points its contribution is from a new type of conserved quantity recently constructed by Prosen. Adding an integrability-breaking perturbation leads to a scaling theory of conductivity at low temperature. Adding disorder, we study the question of how Anderson localization is modified by interactions when the system remains fully quantum coherent ("many-body localization"). We find that even weak interactions are a singular perturbation on some quantities: entanglement grows slowly but without limit, suggesting that dynamics in the possible many-body localized phase are glass-like.