Condensed Matter Theory Center Seminar

Friday, February 1
11:00 am – 12:30 pm, Physics Building 2205

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"Enormous capacitance enhancement driven by correlations in 2D electron systems"

In a standard parallel plate capacitor, the capacitance per unit area is determined by the geometric distance between the two metallic electrodes. If one of these electrodes is replaced by a low-density electron gas, however, then the finite density of states of the electron gas creates a "quantum capacitance" that adds in series with the normal geometric part. It is natural to think that this contribution will lower the overall capacitance, but in this talk I show how electron correlation effects can in fact lead to a capacitance that is enormously enhanced above the geometric value. I present a theory of such capacitance enhancement as it appears both for normal massive electrons (as in semiconductor heterostructures), and for massless Dirac electrons (as in graphene) in a strong magnetic field. Such considerations show how one can use capacitance measurements as a simple thermodynamic probe of the striking correlated, quantum behavior of electron systems.

(All are welcome to attend)

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