Electronic transport in a bi-layer system of total Landau filling $\nu = 1$ – from Coulomb drag to a *dc* voltage step-up transformer

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In this talk I will review several transport phenomena associated with a bi-layer electronic system at a total Landau filling $\nu = 1$. In particular,

1. I will discuss the transition of the bi-layer from the weak- to the strong- coupling regime. Making the assumption that in the transition region the system is made of puddles of the (1,1,1) phase embedded in a bulk of the weakly coupled state, I will show that the transition is accompanied by a strong increase in longitudinal Coulomb drag, that reaches a maximum of approximately $h/2e^2$. In that regime the longitudinal drag is increased with decreasing temperature.

2. I will show that a properly designed geometry of a $\nu = 1$ bi-layer system may serve as a *dc* voltage step-up transformer, in which the output *dc* voltage may be made arbitrarily larger than the input *dc* voltage.

3. If time permits, I will make a few comments regarding the physics of paired quantum Hall states, e.g., at a bi-layer of a total Landau filling of $\nu = 1/2$.

My collaborators in the works I will present are **Bertrand I. Halperin** (Harvard) and **Steven M. Girvin** (Yale).