Exchange flows in the low Reynolds number flow limit LAURENCE RONGY, Harvard University, HOWARD STONE, Princeton University — We analyze the viscous gravity current that occurs when two fluids with different densities flow into each other in a two-dimensional channel. Assuming that the mixing between them and the surface tension at their interface are negligible, we study the flow within the lubrication approximation. For the general case of two fluids with different viscosities and in the presence of an imposed flow rate, the evolution of the current can be described by a single nonlinear PDE. When the mean flow rate is zero (closed channel) the model admits self-similar solutions for the thickness of the gravity current and solutions are obtained for different viscosity ratios. We also present numerical solutions for the gravity current in the cases of a non-zero imposed flow rate (open channel).