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The dangerous negative energy sea and the N=0 fractional quantum Hall effect in bilayer graphene ROHIT HEGDE, INTI SODEMANN, FENGCHENG WU, ALLAN H. MACDONALD, University of Texas at Austin — The $N = 0$ Landau level of bilayer graphene is nearly eight-fold degenerate because it contains states with $n = 0$ and $n = 1$ cyclotron quantum numbers in addition to spin and valley indices. Because the self energy due to exchange with the negative energy sea is n-dependent, it plays an essential role in choosing between competing correlated states at both integer and fractional filling factors. We show that this interaction must be included in a systematic theory controlled by the ratio of Coulomb to cyclotron energies. We will discuss the implications of this vacuum exchange effect for integer and fractional quantum Hall ground states and low lying charged and neutral excitations, and its interplay with the valley symmetry breaking and Zeeman terms that are also important in single-layer graphene.

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