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Quantum Hall ferromagnetism in gapped bilayer graphene with trigonal warping effects XIAO LI, Condensed Matter Theory Center, University of Maryland, FAN ZHANG, Department of Physics, The University of Texas at Dallas, QIAN NIU, ALLAN MACDONALD, Department of Physics, The University of Texas at Austin — The interplay between nontrivial Fermi surface topology and electron-electron interactions often leads to interesting phenomena in the quantum Hall regime. Bilayer graphene provides a unique platform to explore such physics, because the combined effects of trigonal warping and interlayer bias give rise to a nontrivial bandstructure at low energies. In the presence of a small perpendicular magnetic field, the highest valence-band Landau level of gapped bilayer graphene becomes three-fold degenerate excluding the spin degrees of freedom, with the three Landau levels corresponding to semiclassical orbits centered on different points in momentum space. Such a Landau level structure has been observed in a recent experiment [Phys. Rev. Lett. 113, 116602 (2014)]. In this work we construct a theory to show how the electron-electron interactions break this three-fold orbital degeneracy, and give rise to a gapped quantum Hall state at all intermediate integer filling factors. We further demonstrate that the resulting ground state breaks rotational symmetry and discuss some experimental consequences.

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