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Bilayer graphene under pressure: Electron-hole Symmetry Breaking, Valley Hall Effect, and Landau Levels JORGE O. SOFO, The Pennsylvania State University, FRANCISCO MUOZ, Universidad de Chile, HECTOR P. OJEDA COLLADO, GONZALO USAJ, CARLOS A. BALSEIRO, Centro Atómico Bariloche and Instituto Balseiro — The electronic structure of bilayer graphene under pressure develops an enhancement of the trigonal warping and a splitting of the parabolic touching bands at the K point of the reciprocal space into four Dirac cones, one at K and three along the T symmetry lines. As pressure is increased, these cones separate in reciprocal space and in energy, breaking the electron-hole symmetry. Due to their energy separation, their opposite Berry curvature can be observed in valley Hall effect experiments, in the structure of the Landau levels, and in the rotation of the polarization angle of light. Based on the electronic structure obtained by Density Functional Theory, we develop a low energy Hamiltonian that describes the effects of pressure on measurable quantities such as the Hall conductivity, the Landau levels of the system, and the optical conductivity.

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