IV) Theory of graphene in the magnetic field and the prediction of the antiferromagnetic ground state at the neutrality point:

I.Herbut, Theory of integer quantum Hall effect in graphene, *Physical Review B* **75**, 165411 (2007).

I. Herbut, SO(3) symmetry between Neel and ferromagnetic order parameters for graphene in magnetic field, *Physical Review B* **76**, 085432 (2007).

Description:

ntial work has been the formulation and the subsequent development of the theory of interacting Dirac electrons in two dimensions, with applications to graphene and related materials. He was the first to propose in 2006 that the interacting electrons on half-filled honeycomb lattice suffer a direct semimetal-Mott insulator quantum phase transitions which belong to the novel universality class related to the Gross-Neveu model in particle physics. In two follow-up papers written with his students (B. Roy, V. Juricic) and a collaborator (O. Vafek) he defined what is now known as the Ising-, XY-, and Heisenberg-Gross-Neveu universality classes, and, in particular, proposed that the latter describes the canonical semimetal-to-antiferromagnetic insulator quantum critical point in two-dimensional Hubbard model on honeycomb lattice.

This work initiated a flurry of activity on interacting two-dimensional Dirac systems, particularly after s work with professor F. Assaad and his group in Wuerzburg, Germany, and later with professor S. Adam and his group in Singapore 8e9 53e 0 1 after