Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

New structures in graphene FQHE CSABA TOKE, PAUL LAMMERT, VINCENT CRESPI, JAINENDRA JAIN, Penn State University — We explore how the specific properties of graphene - valley degeneracy and linear dispersion of low-energy carriers - affect the fractional quantum Hall effect. We consider the SU(2) and SU(4) limits, which are relevant depending on whether the Zeeman splitting is large or small. In the former limit interaction-induced integral plateaus, large pseudoskyrmions, fractional sequences, even/odd numerator effects, composite-fermion pseudoskyrmions, and a pseudospin-singlet composite-fermion Fermi sea are expected to occur. While the lowest graphene Landau level is formally equivalent to the lowest GaAs Landau level with zero Zeeman splitting, it is predicted that the second Landau level of graphene shows more robust fractional quantum Hall effect than the second Landau level of GaAs. In the SU(4) symmetric limit new composite fermions states become possible without analog in GaAs; these involve an essential interplay between the spin and valley degeneracies. The structure of these states, their excitations, and their experimental consequences will be described. A composite fermion Fermi sea with an SU(2)xSU(2) symmetry is predicted at certain even denominator filling factors.

Csaba Toke
Penn State University

Date submitted: 17 Nov 2006 Electronic form version 1.4