Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Fullerenes, Zero-modes, and Self-adjoint Extensions[1] ABHISHEK ROY, MICHAEL STONE, University of Illinois Urbana-Champaign — The continuum Dirac hamiltonian provides a good account of the low-energy eigenstates on an infinite sheet of graphene. It is also known that that geoemetric defects, such as the pentagons that occur in fullerenes, may be modelled by a spin connection and a non-abelian gauge field. We show here that to understand the bound states localized in the vicinity of a pair of pentagons one must, in addition to the gauge flux, consider the effect of the short-range lattice disruption near the defect. Although the defect appears as a point object to low wavelength excitations, there is additional information contained in non-trivial boundary conditions that need to be imposed at this point to ensure self-adjointness of the hamiltonian. We demonstrate that by adjusting this boundary conditions one may analytically match the results of a numerical tight-binding calculation. To appear in Journal of Physics A. Archive number: arXiv:0909.1569v1

[1]This work was supported by the National Science Foundadation under grant DMR-06- 03528. Some of the work was carried at the KITP in Santa Barbara, and so supported in part by the National Science Foundation under grant PHY05-51164.

Abhishek Roy
University of Illinois Urbana-Champaign

Date submitted: 03 Dec 2009 Electronic form version 1.4