Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Time Reversal of a Pseudospin: General Properties and Application to Graphene[1] R. WINKLER, Massey University, New Zealand; Argonne National Lab; Northern Illinois University, U. ZÜLICKE, Massey University, New Zealand — We show that pseudo-spin 1/2 degrees of freedom can be categorized in two types according to their behavior under time reversal. One type exhibits the behavior of ordinary fermionic spin-1/2 whose three Cartesian components are all odd under time reversal. For the second type, which is bosonic in nature, only one of the components is odd while the other two are even. This latter type is realized, e.g., by the pseudo-spin representation of the 2D isotropic harmonic oscillator (Schwinger model of spin-1/2). We show [1] that the sublattice-related pseudospin of charge carriers in graphene is likewise of the second type. Our results imply that, in the absence of true spin-orbit coupling, the quantum correction to the resistance of single-layer graphene will be positive (weak localization). This provides a natural explanation for the hitherto puzzling absence of the proposed [2] weak-antilocalization behaviour of graphene, as observed in recent experiments. [1] R. Winkler and U. Zülicke, arXiv:0909.2169. [2] E. McCann et al, Phys. Rev. Lett. 97, 146805 (2006).

[1]Work supported by the Marsden Fund Council (contract MAU0702), Royal Society of New Zealand. Work at Argonne supported by DOE BES under Contract No. DE-AC02-06CH11357.

Roland Winkler
Northern Illinois University

Date submitted: 19 Nov 2009 Electronic form version 1.4