Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Emergent Electromagnetism in Bilayer Graphene[1] ROLAND WINKLER, Dept. of Physics, Northern Illinois University and Materials Science Division, Argonne National Laboratory, ULRICH ZÜLICKE, School of Chemical and Physical Sciences and MacDiarmid Institute, Victoria University of Wellington, New Zealand — Recently atomically flat layers of carbon known as graphene have become the rising star in spintronics as their electrons carry not only the ordinary spin degree of freedom, but they also have a pseudospin degree of freedom tied to the electrons' orbital motion which could enable new routes for spintronics. Here we focus on bilayer graphene (BLG). Using group theory we have established a complete description of how electrons in BLG interact with electric and magnetic fields. We show that electrons in BLG experience an unusual type of matter-field interactions where magnetic and electric fields are virtually equivalent: every coupling of an electron's degrees of freedom to a magnetic field is matched by an analogous coupling of the same degrees of freedom to an electric field. This counter-intuitive duality of matter-field interactions allows novel ways to create and manipulate spin and pseudo-spin polarizations via external fields that are not available in other materials. See arXiv:1206.4761.

[1]This work was supported by Marsden Fund contract no. VUW0719, administered by the Royal Society of New Zealand. Work at Argonne was supported by DOE BES under Contract No. DE-AC02-06CH11357.

Roland Winkler
Dept. of Physics, Northern Illinois University and
Materials Science Division, Argonne National Laboratory

Date submitted: 28 Nov 2012 Electronic form version 1.4