Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Axial anomaly and negative longitudinal magnetoresistance: theory vs. experiment PALLAB GOSWAMI, JED PIXLEY, University of Maryland — Traditionally axial anomaly is associated with quantum mechanical violation of U(1) axial symmetry of relativistic Dirac/Weyl fermions in odd spatial dimensions, in the presence of electromagnetic gauge fields. Recently there has been considerable interest in both condensed matter and high energy physics communities in Nielsen and Ninomiya's original proposal that the axial anomaly can lead to a negative longitudinal magnetoresistance for condensed matter realization of Weyl fermions. In this talk I will show that the axial anomaly can arise in any generic three dimensional material placed under parallel electric and quantizing magnetic fields. However, the emergence of negative magnetoresistance depends crucially on the forward scattering nature of the underlying relaxation mechanism. Therefore, sufficiently clean and dilute three dimensional materials without magnetism or magnetic impurities can be promising candidates for observing this phenomenon. I will briefly discuss concrete experimental evidence of this enigmatic effect in quasi-2D layered materials.

Pallab Goswami
University of Maryland

Date submitted: 14 Nov 2014 Electronic form version 1.4