

UNIVERSITY of **HOUSTON**

Department of Physics

Seminar Speaker:

Dr. Qiang Li

*Condensed Matter Physics and Materials Science
Department
Brookhaven National Laboratory, New York*



Date and Location

5/6/2019

634 Science and Research Bldg. 1

2:30PM – 3:30PM

Chiral Fermions in Condensed Matters and Quantum Computing

Abstract: Recent discoveries of new phenomena due to interacting Dirac/Weyl fermions across vastly different energy and length scales have led to a fascinating convergence between condensed matter physics and high energy nuclear physics. In relativistic quantum field theory, Dirac fermions in 3D space and time exhibit so-called chiral anomaly. A consequence of the chiral anomaly is the chiral magnetic effect – the generation of electric current in a magnetic field induced by the chirality imbalance between the left-handed and the right-handed fermions. The powerful notion of chirality, originally discovered in high-energy and nuclear physics, underpins a wide palette of new and useful phenomena, enabling chiral charges, provided chirality is conserved, to travel without resistance. Weyl fermions can be manipulated by optical means, leading to the proposal of chiral qubit. In this seminar, I will report the recent discovery of the chiral magnetic effect in condensed matter systems, accentuate the similarities and differences between the chiral magnetic effect and conventional superconductivity. Finally, I will discuss the prospect of harnessing the power of chirality for quantum computing.

Bio: Dr. Qiang Li received his Ph. D in physics from Iowa State University in 1991. He then joined the Condensed Matter Physics and Materials Science Department at Brookhaven National Lab, where he is now a tenured Physicist and the head of Advanced Energy Materials Group. His research interests range from basic physics and material sciences of quantum electronic materials to their applications. At Brookhaven, he led Basic Energy Science program on superconducting materials, and several US Department of Energy projects on high temperature superconductors for grid scale energy storage, wind power generation, and next generation electrical machine. Recently, he has been leading a basic science research effort on chiral materials and unconventional superconductivity. He is a Fellow of American Physical Society.