CONDENSED MATTER SCIENCES SEMINAR

Professor Brian Skinner

Ohio State University

Host

Dr Kun Yang / Dr Cyprian Lewandowski

Title

Chiral electron crystal phases induced by Berry curvature

Friday, November 14th, 2025

1st Floor – B101

15:00-16:00

Abstract

An electron system at low density has an instability toward spontaneous crystallization, called "Wigner crystallization", due to the Coulomb interaction between electrons. Here we show that in systems with nontrivial Berry curvature, the spin and orbital properties of this crystal can be strongly modified relative to the conventional expectation. Specifically, we show that Berry curvature can lead to a new kind of crystal state in which the electrons acquire a spontaneous orbital angular momentum. We then derive the general effective Hamiltonian that governs the ordering of the physical electron spin. We show that this Hamiltonian includes a chiral term that can drive the system into chiral spin-density wave or spin liquid phases. The phenomena we discuss are particularly relevant for the valley-polarized electron states observed in multilayer graphene.

Does (condensed matter) physics need to worry about a replication crisis?

Thursday, November 13th, 2025

Physics Colloquium in 101 UPL 15:15-16:15pm

Abstract

During the past decade, the social and medical sciences have been going through a painful process of grappling with the "replication crisis": the acknowledgment that many published results, and even entire lines of inquiry, are built on results that cannot be consistently reproduced. Many of the underlying causes of the replication crisis -- including publication bias, narrative bias, and a competitive "publish or perish" culture -- are at work in physics as well. So to what degree do we need to worry about a replication crisis? In this talk I discuss some of the issues of reproducibility in physics research, focusing on case studies from condensed matter physics. I draw comparisons and contrasts with the social sciences and discuss recent efforts and recommendations for improving reproducibility practices.