

Chez Pierre

Presents ...

Monday, October 20, 2025

12:00 pm -1:00 pm

Duboc Room – 4-331



Chez Pierre Seminar

Wang, Yuxuan, University of Florida

“Theory of Quantum Oscillation from Bosonization”.

In a weak external magnetic field B , the magnetization of a metal exhibits the de Haas-van Alphen effect, i.e., oscillatory behaviors as a function of the inverse of the magnetic field. Such a response is highly nonlinear with an essential singularity at $B=0$, which cannot be captured within the conventional framework of many-body response theory. We present a bosonized effective field theory for a 2d Fermi surface in a weak magnetic field using the coadjoint-orbit approach, which was recently developed as a nonlinear bosonization method in phase space for Fermi liquids and non-Fermi liquids. We show that the bosonized action contains topological terms that have been previously neglected. By properly quantizing this theory, we obtain thermal and magnetic responses of a Fermi surface, including linear-in- T specific heat, Landau diamagnetism, and the de Haas-van Alphen effect. In particular, the de Haas-van Alphen effect is shown to be a topological effect. We discuss the application of our method to Fermi surfaces with quantum geometry and to Fermi liquids.