

Department of Physics

Condensed Matter Physics

Clarendon Laboratory, Parks Road, Oxford OX1 3PU



CONDENSED MATTER SEMINAR

Thursday 9th of November at 2.15pm

“Nematicity and beyond: emergent electronic states in iron-based high-temperature superconductors”

Prof. Rafael Fernandes

University of Minnesota

The proximity of superconductivity to a magnetic instability is a common feature of many unconventional superconductors. As a result, elucidating the origin and the properties of the magnetic state is an important step to advance our understanding of these materials. In most iron-based materials, superconductivity appears upon suppression of a stripe-orthorhombic magnetic state, in which spins align parallel to each other along one in-plane direction and anti-parallel to each other along the other direction. Partial melting of this stripe magnetic state gives rise to an emergent nematic phase. Recent experiments in nearly optimally doped compounds, however, revealed novel magnetic ground states that remain tetragonal and are inconsistent with spin stripes. In this talk, I will show that these tetragonal magnetic states can be explained as double- \mathbf{Q} orders that arise naturally from an itinerant microscopic description of these materials, and are incompatible with localized spins. I will demonstrate that two types of double- \mathbf{Q} order can appear, and that their partial melting leads to “vestigial” emergent phases that display unusual charge and chiral orders. This model provides an interesting framework connecting magnetic degeneracy and emergent electronic orders.

Host: Dr Amalia Coldea

Audrey Wood Seminar Room, Clarendon Laboratory