CEA – Saclay, 91191 Gif-sur-Yvette Cedex
Service de Physique de l'Etat Condensé - UMR 3680

SÉMINAIRE

Mercredi 24 avril 2019 à 11h15

Orme des Merisiers SPEC, Salle Itzykson, Bât.774

Yvan SIDIS
Laboratoire Léon Brillouin, CEA-CNRS, CEA-Saclay

The enigmatic pseudo-gap state of superconducting cuprates: a dual state of matter?

The phase diagram of high temperature superconducting cuprates exhibits an enigmatic pseudo-gap (PG) phase, out of which superconductivity seems to emerge. Such a state of matter has no equivalent in condensed matter physics. It is characterized by a fragmentation of the Fermi surface, whose large portions become gapped out, while the remaining ones take the form of Fermi arcs. Cooling down below T*, the PG onset temperature, triggers a cascade of electronic instabilities. At T*, one first observes intra-unit-cell orders breaking discrete symmetries (fourfold rotation, parity and time reversal), but preserving translation invariance. At lower temperature, an incipient charge modulated state appears and competes with superconductivity below Tc. The delicate balance between both states can be further tuned under pressure or magnetic field. One way to rationalize such a complex phase diagram is to introduce the idea that multiple phases are born out a primary one: the PG state. In the talk, we will present an interpretation of the PG state in terms of the spontaneous appearance of a two-fold order parameter which entangles preformed particle-particle and particle-hole pairs. Their condensations lead to the coexistence of both superconducting and charge modulated states, whereas composite-orders can emerge from higher-combination of the performed pairs. Then, we will show how such a multi-component order parameter models the spin dynamics, as probed by inelastic neutron scattering. Finally we will show that such a theoretical framework authorizes the existence of an auxiliary state, consistent with the observation of an intra-unit-cell magnetic order highlighted by polarized neutron diffraction and usually associated with nano-scopic loop currents.

A coffee break will be served at 11h00.
