Centre DE Nanosciences & DE Nanotechnologies

C2N General Seminar

Friday March 29nd 2019 - 10h 00

Amphitheater of C2N

Quantum effects at superconducting phase transitions

Hervé Aubin

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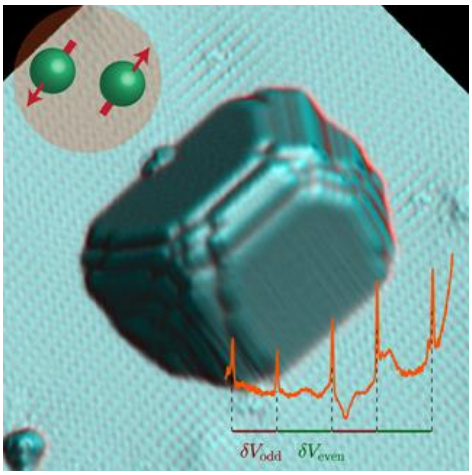
While superconductivity is the archetype of quantum matter, with an entangled ground state of time-reversed states, the superconducting order parameter is essentially a classical field as a consequence of the Bose condensation of a macroscopic number of Cooper pairs. Yet, in some situations, the quantum dynamic of this superconducting order parameter can be observed experimentally. In a first example, I will show that the transport properties of superconducting thin films near the superconductor-insulator transition follow scaling laws that reflect the increased quantum fluctuations across the phase transition. In a second example, I will describe a Scanning Tunneling Spectroscopy (STS) study of the superconducting properties of ultra high vacuum (UHV) grown Pb nanocrystals where we identified a lower size limit for the existence of superconductivity. This size limit, called the Anderson limit, is the consequence of quantum fluctuations in pairing amplitude and is reached when the electronic level spacing becomes larger than the superconducting pairing energy. Finally, I will describe the project of Electron-Spin-Resonant- STM spectroscopy developed in the STM group of C2N, an experimental method that has potential applications for the study of quantum dynamics in atomically precise spin systems.



UHV grown superconducting Pb nanocrystals on InAs

Hervé Aubin is an experimental condensed matter physicist. After a PhD in 1998 (LPS – Paris-Sud) and post-doc (Urbana – US) on high-Tc superconductivity, he joined the LPEM laboratory at ESPCI, where he worked on quantum effects at superconductor-metal-insulator transitions through transport measurements and STM tunneling spectroscopy. More recently, he focused on the study of hybrid semiconducting-superconducting systems and the development of electrically detected magnetic resonance experiments. Hervé joined the group PHYNANO at C2N last year.

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