NÉEL INSTITUTE Grenoble

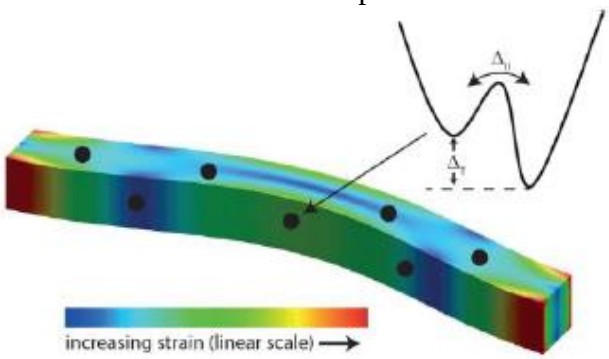
Topic for Master 1 internship – Academic year 2021-2022

Nanomechanics at ultra-low temperatures

General Scope:
The cross-over from atomic-size quantum objects to macroscopic classical systems remains puzzling. We know that macroscopic quantum states exist (e.g. the quantum coherence of the current state in a superconducting loop), but our knowledge is essentially limited to electromagnetic degrees of freedom. Quantum states of moving objects have undergone relatively little experimental study.

Research topic and facilities available:

One of the goals of our research group, to which the intern would contribute, is cooling a glass nanomechanical resonator to the microkelvin range, so that its fundamental mode reaches the quantum ground state. This is essential for probing low energy excitations present in the amorphous lattice of the resonator. New cryogenic technology is required to efficiently carry out this research. In particular, we are developing a continuous nuclear demagnetization refrigerator (CNDR) that will, for the first time, allow measurements below 1 mK on unlimited timescales. Specific activities of the intern will include characterization of nanomechanical resonators at low temperatures, characterization of superconducting microwave resonators at low temperatures and/or tests of CNDR components.



Possible collaboration and networking:
This work may involve collaboration and interactions with researchers at the Institut Néel, elsewhere in Europe, and throughout the world.
Possible extension as a PhD:
Yes
Required skills:
The student should have a strong interest in fundamental research and making challenging measurements at very low temperatures, as well as a thorough understanding of quantum theory at the M1 level.
Starting date: Flexible
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More information: https://neel.cnrs.fr/equipes-poles-et-services/ultra-basses-temperatures-ubt