**Corentin Morice**
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# Internship in theoretical physics

## Prediction of charge density wave states under biaxial strain

**Project description:**

At the Laboratoire de Physique des Solides (LPS) of the University Paris-Saclay, we conduct world-class research to improve our understanding of novel properties of matter, including quantum phenomena such as superconductivity and magnetism, nanosciences, and soft matter. Our laboratory has a long history of close collaborations between experiments and theory, exemplified by its two Nobel prize winners: Pierre-Gilles de Gennes (1991) and Albert Fert (2007). This research has led to tremendous improvements of technology in the last decades, including spintronics and quantum computation.

Charge density waves are exotic states of matter in which electrons form a standing wave pattern different from the periodic lattice. Their peculiar physics is still not well understood, and could lead to exciting discoveries both in fundamental physics, in particular in connection with superconductivity, and in applied physics, where they could be used for nano-transistors. $RTe_3$, where R is a rare earth element, hosts multiple charge density wave states and superconducting states and is therefore an interesting platform for the study of these states. A new experiment, designed at the LPS, will allow for the first time the full exploration of its phase diagram, using biaxial strain. This exciting experiment needs theoretical prediction to guide experimentalists in this huge phase diagram.

**Your job:**

We are looking for a Master's student (1$^{st}$ or 2$^{nd}$ year) to calculate charge density wave behaviour of $RTe_3$ under biaxial strain using numerical calculations on tight-binding lattice models for electrons, and/or first principles techniques such as density functional theory. The results will be used to interpret the experimental data. This internship is a great opportunity to work closely with experimentalists and learn about quantum matter and the rich physics of charge density waves.

**How to apply**

Please send a CV and transcripts to Andrej Meszaros (andrej.meszaros@universite-paris-saclay.fr and Corentin Morice (corentin.morice@universite-paris-saclay.fr).