
An in-depth study of the faintest galaxies with dedicated spectroscopy based on the Pristine survey

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Very faint dwarf galaxies discovered over the last decade have revolutionized our view of the faint-end of galaxy formation, extending the realm of galaxies down to systems of only ~ 1000 Solar luminosities. These systems prove to be powerful constraints on both the formation of galaxies in a cosmological context (the so-called "near-field cosmology") and for the search of the elusive dark matter particle as their low baryonic content means that the properties of the dark matter halos they inhabit can be better modeled. However, these very faint dwarf galaxies remain particularly difficult to study and our understanding of these systems is being plagued by the small number of known member stars in each system. From usual survey data, it is difficult to isolate their few member stars among the foreground Milky Way contamination, especially in their outskirts, despite being these being the most valuable regions to study in order to understand the dynamical state of the dwarf galaxies (Are they dark-matter dominated? Are their dark matter content overestimated because of interactions with the Milky Way? Are they embedded in stellar streams?).

This hurdle is now being overcome thanks to the Pristine survey, a survey of the Milky Way halo with a metallicity-sensitive narrow-band filter on CFHT/MegaCam. One of the main sub-projects of this survey is a dedicated study of all faint dwarf galaxies visible from Hawaii in order to efficiently isolate their metal-poor stars, which will then be studied in detail with spectroscopy. The student will aim to answer the following outstanding questions:

- What are the detailed dynamical properties of the faint dwarf galaxies?
- Do the stars in their outskirts, never studied so far, show signs that these systems are affected by the Milky Way tides?
- What can their most metal-poor stars tell us about chemical enrichment from the very first stars to have formed in the Universe?

This project is novel in its approach as most studies of faint dwarf galaxies so far focused only on less efficient selections of stars in their central regions. It is also novel in its breadth as it is anticipated that, over the course of the PhD project, a systematic study of all 20+ northern dwarf galaxies will be conducted.

The student will be working directly on both survey photometric data and dedicated spectroscopic data, in collaboration with the Pristine team, co-PI'd by Nicolas Martin.