

## Internship in theoretical nuclear physics

### Study of the fusion of heavy nuclei

Microscopic theories (shell-model) predict that nuclei with a charge of the order of  $Z = 120$  should have a fairly long lifetime. However, the corresponding elements have never been observed on Earth and one of the research axes of nuclear physics is to try to synthesize them by fusion reactions between heavy ions.

Experimentally, it has been observed that the theoretical models, which have been developed to study fusion between light and heavy ions, cannot be extrapolated to the fusion of very heavy nuclei.

Therefore, most of the research carried out on the reaction mechanisms leading to the synthesis of very heavy isotopes consists in developing models that can predict experimental cross-sections. For this purpose, two types of approaches are developed at GANIL:

- non-equilibrium statistical physics studies using stochastic equations;
- the inclusion of uncertainties in the modelling in order to constrain the parameters of the models and to estimate the reliability of the predictions.

The specific topic will depend on the progress of the work and the student's taste. It involves both analytical and numerical resolutions.

#### Requested skills:

Analytical calculations and numerics

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