PHD project.
TOPIC: Origin of the light elements: Lithium and Beryllium

Lithium is a key astronomical element with multiple and sometimes controversial origins which plays an important role in cosmology, cosmic rays, chemical evolution and stellar structure. It is a primordial element but is also made by spallation reactions of cosmic rays with the atoms in the interstellar medium and is produced in significant amounts by a still unknown Galactic source (s). The two main conundrums are:
1) the Cosmological Lithium problem,
2) the Galactic Li problem.

In the last years we have proposed a stellar fix for the former and made a new discovery which could explain the latter, i.e. the first detection of 7 Li and 7 Be in the outburst of Novae. These observations confirm a theoretical speculation made in the 70's, but which has never been supported by observations before. The measured 7 Be (and 7 Li) in Novae show overabundances of 4 to 5 orders of magnitude over the 7 Li meteoritic-solar value. By means of a detailed chemical evolution model we showed that indeed Novae could be the missing Galactic source for 7 Li and also provide an explanation for the different behaviour of the Thick Disk Li abundances.

Following these seminal observations we have initiated a ToO at the VLT-ESO since 2017 (P100) and ongoing to observe the relatively bright Novae to detect 7 Be with the aim to characterize frequency/abundances/ Nova type. In parallel we triggered a ToO at the INTEGRAL satellite to detect the 478 Kev line produced by the 7 Be decay into 7 Li for the first time.

9Be can be formed only by spallation processes in the interstellar medium. Recently we have succeed to trace the evolution for this element in the accreted dwarf galaxy Gaia Enceladus.

The successful PhD candidate is expected to work either on one or several of the related problems connected to the origin of these two elements. The project can be carried out from an observational perspective with the analysis of Li and Be either in novae, stars (galactic or extragalactic) or in the interstellar and intergalactic medium; the candidate may also choose a more theoretical approach addressing the Cosmological and Galactic problems or the chemical evolution of the light elements in the Galaxy and in external galaxies, such as Enceladus.

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Selected References:
Cescutti & Molaro MNRAS 482; Molaro et al 2020 MNRAS 492; Olive Fields Molaro PDG review http://pdg.lbl.gov/; Molaro, Cescutti Fu 2020 MNRAS in press