

### **30MOLINOS - a molecular inventory of old stars**

Low-mass evolved stars on the asymptotic giant branch (AGB) lose most of their mass in a strong wind that builds up a gigantic circumstellar envelope (CSE) of dust and molecular gas. The CSEs contain a large number of molecules, from CO to SiO and H<sub>2</sub>O. Measuring the exact composition of the CSE by determining the abundances of different molecules and their distribution tells us something about the nucleosynthetic processes inside the star, the evolution of the star, and hence the contribution of AGB stars to the chemical enrichment of the ISM and galaxies.

To obtain a full catalogue of molecules in AGB CSEs it is necessary to observe so-called spectral scans at millimeter and submillimeter wavelengths. These spectral scans cover large ranges in frequency and hence a large number of transitions from the molecules in the CSEs.

The master's student will work on data of spectral scans taken with the IRAM 30 m telescope in Granada, Spain, of two AGB stars. The data are already available and the student will be able to explore the data from initial reduction, creation of a catalogue of observed molecules, and analysis of the measured information. In the process the student will learn to use the relevant software and analysis routines, as well as develop new analysis procedures. While the project gives a solid basis for a master's thesis, it is at the same time very flexible and allows for the student to develop in an independent direction.

Prerequisites:           General physics.  
                              Some astronomy (e.g., a course on Stellar physics) is useful but not a requirement.

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