RESOLVED STELLAR POPULATIONS IN NEARBY GALAXIES

Main Supervisor: Dr. Anna McLeod anna.mcleod@durham.ac.uk
Office: Ogden Centre West 120

Funding: STFC and all other funding schemes (DDS, CSC, ...)

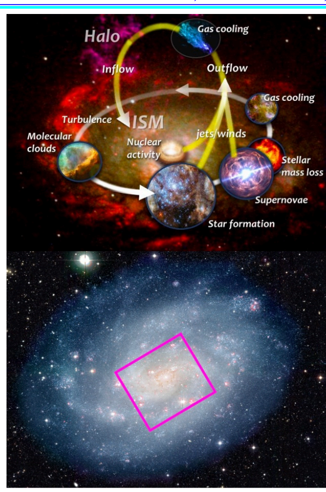
Description:

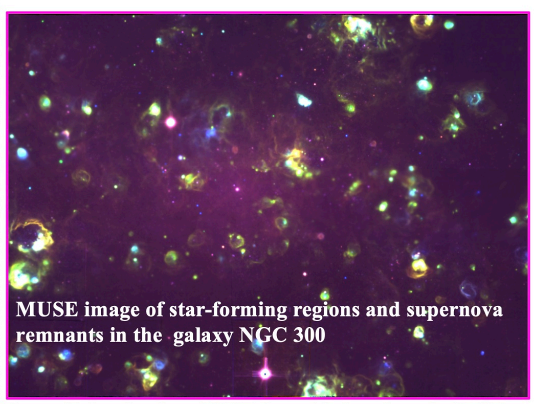
The life-cycle of star-forming galaxies is very complex: cold gas is turned into stars; the formed stellar populations stir, mix, enrich, heat, and expel the gas via stellar winds, radiation, and supernova explosions; the gas can then fall back onto the galaxy, cool, and form new generations of stars. While we qualitatively understand the involved physical processes governing the gas recycle, we still do not have a clear quantitative description of them. As a consequence, constraining how galaxies turn their gas into stars, how feedback from these stars disrupts gas and regulates the growth of galaxies, and how these processes have changed with galactic environment across cosmic time, is one of the fundamental problems in modern astrophysics.

In this project you will address a key part in solving this problem by revealing and studying stellar populations in nearby galaxies. Indeed, nearby galaxies are our best laboratories to study the interplay between stars and gas: they provide the necessary numbers to study star formation across many different environments and, crucially, on the small and resolved scales at which the relevant physics happens. By combining data from the highly competitive MUSE on the Very Large Telescope with data from the Hubble Space Telescope, you will study the stellar population of the nearby galaxy NGC 300 at unprecedented levels of detail. For this, you will develop an automated algorithm to identify and classify the stars and star clusters in the galaxy. Once in place, the developed analysis methods can then be applied to other nearby galaxies (observed e.g. with the SITELLE instrument on the Canada-France-Hawaii Telescope), therefore providing a framework to quantify the galactic life-cycle of gas and stars. You will then directly connect the stellar population to the star-forming gas reservoir and the star formation history of this galaxy.

The results from this work will serve as important empirical benchmarks for state-of-the-art numerical simulations of star cluster formation and galaxy evolution. You will get the opportunity to write proposals to obtain new observations, and closely collaborate with leading experts in the field at world-class institutes.

More about this topic:
Stellar Feedback and Resolved Stellar IFU Spectroscopy in the Nearby Spiral Galaxy NGC 300
SIGNALS: the Star formation, Ionized Gas, and Nebular Abundances Legacy Survey





By combining the above MUSE data with data from the Hubble Space Telescope, the stellar and gaseous content of the galaxy can be studied simultaneously at unprecedented high resolution.

Upper left. *The galactic lifecycle: cold molecular clouds form stars; the combined feedback from these stars (together with feedback activity from the nuclear region) disrupts the gas and drives galactic outflows; the feedback-affected gas can then cool and form new generations of stars (credit: SPICA collaboration).* **Lower left.** *ESO/WFI image of the nearby star-forming galaxy NGC 300, bright pink traces regions in which massive stars have formed (credit: ESO). The white region corresponds to the footprint of the MUSE image.* **Right.** *MUSE integral field mosaic of the central part of NGC 300 tracing regions in which gas is being ionized by star-formation and supernova events. This data is the central focus of this PhD project.*