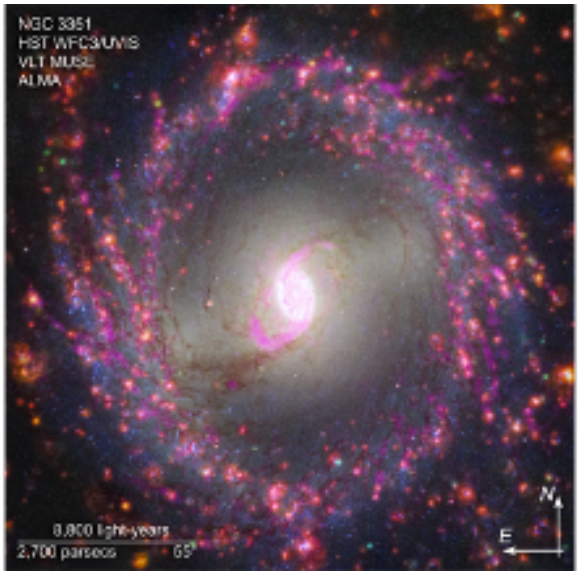
PhD Thesis Project Proposal
INAF – Osservatorio Astrofisico di Arcetri

Title – Stellar feedback processes and their impact on galaxy evolution
Advisor: Francesco Belfiore, francesco.belfiore@inaf.it – INAF-Osservatorio Astrofisico di Arcetri
Co-advisor: Alessandro Marconi, alessandro.marconi@unifi.it – Università di Firenze
Period: November 2023 - November 2026
Funding source: Please indicated your interest in the INAF-funded studentship titled *"Observational and theoretical studies of dynamics of galaxies; stellar populations; interstellar medium and star formation in the Galaxy and in the local Universe; advanced technologies for astronomy"* as well as for the general studentships available via the University of Florence.

Description – One of the fundamental questions of modern astrophysics is to determine how stars form in different environments, and vice-versa how feedback from star formation influences its surroundings. Stellar feedback is responsible for the disruption of molecular clouds, determines the energetics of the interstellar medium and drives the chemical enrichment in galaxies. The aim of this project is to use datasets at high spatial resolution to study the relation between gas, star formation, chemical enrichment and feedback processes, to determine the effect of galactic environment and structure and the impact of feedback on galaxy evolution.



The PhD project will be developed in collaboration with UniFI (Prof. Marconi) and Heidelberg/MPIA (Prof. Kreckel & Dr. Schinnerer). A secondment period of 8 months in Heidelberg is envisioned. Alternative secondment opportunities may include, depending on interest and availability of resources, the European Southern Observatory in Garching bei München (Germany), or the University of Cambridge (UK).

Objectives –
Each Work Package (WP) will correspond to a first-author publication.

- **WP1:** Analysis of MUSE data for a large sample of local galaxies to derive chemical abundances, study the baryon cycle (outflows), also via chemical evolution models.
- **WP2:** Quantify the impact of stellar feedback on the interstellar medium by directly connecting the gas with the feedback sources leveraging multi-wavelength observations with ALMA, HST and very recently with JWST.
- **WP3**: Development of photoionisation models optimized for the different environmental conditions present in the sample and development of a software framework based on machine learning to compare data and models and derive physical parameters.