

## Characterizing Ionized Gas and HI properties of Nearby Galaxies

**Level:** NASSP Honours

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**Institution:** SALT/SAAO, UCT

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### **Project Description:**

Optical emission lines can be used to determine the kinematics and properties of the ionized gas in galaxies. These can be used to study the star formation in the galaxy, motion of gas in the galaxy, the presence or absence of shocks and AGN, to detect the presence of different gas components and to understand the nature of the gas. Atomic hydrogen (HI) traces the neutral gas in these galaxies, which is the fuel from which stars can eventually form from, and it is traced using radio astronomy observations of the 1.4 GHz spin flip transition. Combining the optical and radio observations of galaxies allows us to better study the kinematics and interstellar medium of galaxies from their central regions all the way to the outer regions. We can use these observations to also to understand how galaxies evolve and how this evolution is affected by different processes such as galaxy interactions, environments and internal processes.

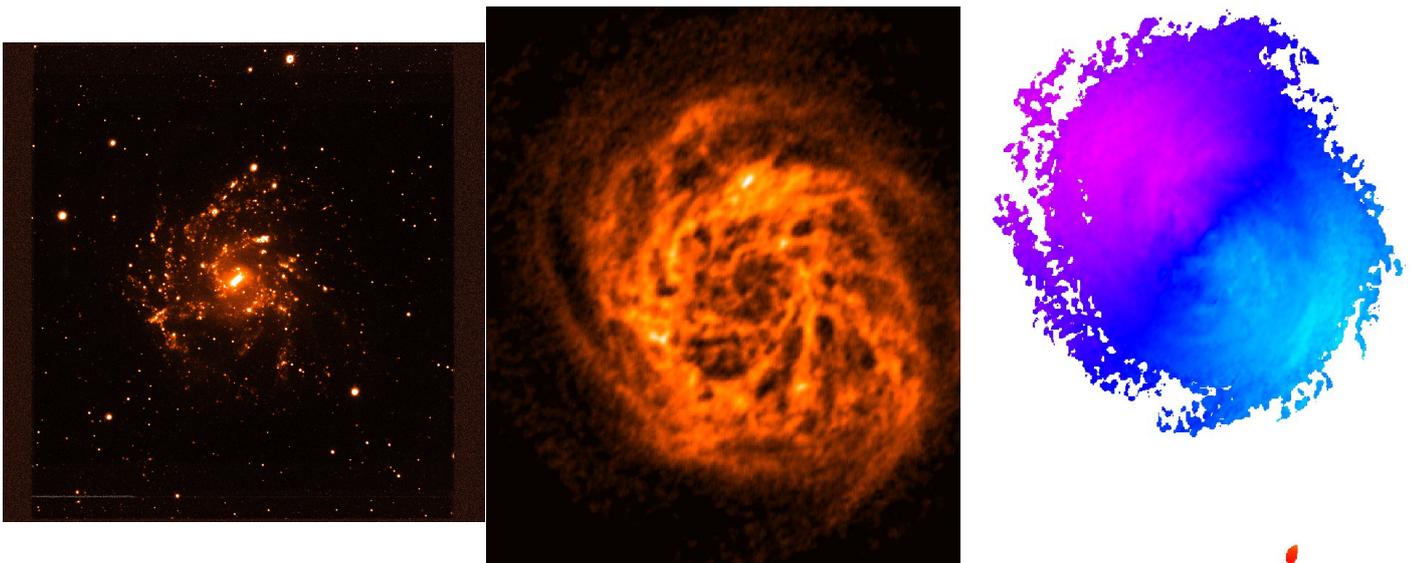


Figure 1: A composite images of MHONGOOSE galaxy: J2257-41. Left: H $\alpha$  image, Middle: HI flux and Right: HI velocity.

This project will involve using optical spectroscopic data from SALT to study the resolved properties of nearby galaxies that are being observed with MeerKAT, with the potential future (or additional) aim of combining the optical and radio HI data to better characterize these galaxies. The project will mainly focus on the H-alpha and [NII] emission lines to study the kinematics of the gas and star formation, but it can be expanded to other emission or absorption lines and to include the HI and continuum data from MeerKAT. The optical data will either be from optical longslit observations or new integral field (IFU) data from SALT's new slitmask IFU (SMI). The project will focus galaxies that are included in of nearby galaxy surveys on MeerKAT. There is also potential to work with optical IFU data from other telescopes or with galaxies from the SUNBIRD or MeerChoirs surveys.

The project can be extended into further work using SALT, MeerKAT and other data. And the project can be extended into a Masters project utilizing the latest MeerKAT HI studies and SALT SMI observations, and contributing to international collaborations.

The project is quite flexible and I would be happy to discuss adjust the project to match the aspects that the student is interested in.

**Requirements:** The student needs to be comfortable using Python, interested in learning more of it and expanding their spectral analysis or data cube analy skillset.