# Relating the Star formation and Gas Kinematics in Nearby Galaxies

**Level**: PhD

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**Project Description**:
Star formation is an important process in the evolution of galaxies. The disc stability, baryon cycle and gas feedback in galaxies are important factors of star formation, and these can be studied by determining the kinematics of galaxies. These all affect the availability of the fuel (cold gas) for star formation and whether star formation can happen in galaxies. Optical integral field unit (IFU) observations of galaxies allow us to study the star formation, ionized properties and star formation of galaxies. HI is a powerful tool to understand the the kinematics of gas from the inner to the outer regions of galaxies, and MeerKAT is the ideal instrument to study the HI in nearby galaxies. HI is also the fuel from which galaxies form stars, therefore it is a critical component to study in order to understand star formation in galaxies.

New deep HI data from MHONGOOSE survey taken with MeerKAT will provide a unprecedented combination of sensitivity and spatial resolution which will allow us to study the HI in nearby galaxies in greater detail than ever before. We combine these with optical IFU and longslit observations of these galaxies from the WiFeS instrument and SALT, along with optical and WISE near-infrared photometry to determine the star formation, gas and stellar kinematics of nearby galaxies. This will include utilizing the new optical slitmask IFUs that have been installed on SALT.

In this project the student will utilize all of this multi-wavelength data to study the resolved star formation of nearby galaxies and and how it relates to galaxy kinematics of nearby galaxies. The HI, optical IFU and longslit data will be used to determine the kinematics of the gas, and all the multi-wavelength data to determine the star formation and other galaxy properties. These will be used to study various star formation laws and measures of disc stability in galaxies. Most of the data has been taken and the student can focus on the analysis, however, there student may have to reduce some reduce optical IFU and longslit data. There may also be opportunities to learn how to reduce HI data, but this is not necessary for the project. The project will enable the student to be involved in the MHONGOOSE collaboration, and this project has the potential to be expanded into a PhD project in the future.

The project is relatively flexible and can be tailored towards the student's interests and strengths.

**Requirements**: The student needs to be very comfortable with Python coding, and be familiar with handling fits files.