

# UCT MSc Project

## Star Formation in Nearby Galaxies

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### Background:

The Physics at High Angular Resolution in Nearby Galaxies (PHANGS) project is seeking to understand the relation between the small-scale physics of gas and star formation with galactic structure and evolution through high-angular resolution, multi-wavelength observations nearby galaxies. Our research group is looking at how the neutral hydrogen (HI) properties in particular compare with the molecular gas (from Atacama Large Millimeter Array; ALMA) dust (traced by JWST), and star formation (traced by H $\alpha$ , UV, and radio continuum) in these galaxies. As HI is the main component of the interstellar medium in spiral galaxies, it is a vital component. We currently have MeerKAT HI and radio continuum data for over 10 PHANGS galaxies with associated CO, dust, H $\alpha$ , UV, and optical data. This allows for a detailed study of the internal kinematics and star forming properties of this sample of galaxies, and an apples-to-apples comparison of the similarities and differences between galaxies based on their global properties.

### Aims:

For this project, we have multiple aims and the student can explore one or more them based on their interests:

1. Comprehensive resolved measurements of star-forming scaling relations
2. Deciphering the dependence of the local H<sub>2</sub>-to-HI gas ratio on disk environment
3. Full dynamic characterization of cold gas disks including gas transport across disks

For any of these the student will also compare and contrast the results for individual galaxies with the global properties of the target galaxies (masses, environment, etc.). Students will take advantage of the iDaVIE software and the resources of the IDIA VisLab to compare data cubes of different tracers on a voxel-by-voxel basis for individual galaxies. For the MSc, the student will focus on a few galaxies, but this projects could be extended into a PhD by examining the full sample of MeerKAT-observed galaxies depending on our pending proposal.

### Requirements:

The student should have experience programming in Python. Familiarity working with data reduction pipelines on *ilifu* and using CASA would be helpful as well. Students will learn how to use the iDaVIE software and VisLab hardware as part of this project.