Project Title: Feedback in SUNBIRD Galaxy Interactions

Level: MSc

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Note to interested student: Please contact supervisor before selecting the project.

Introduction :
Starburst galaxies, Luminous Infrared Galaxies (LIRGs) and Ultraluminous Infrared Galaxies (ULIRGS) have much more intense star formation rates than typical star forming galaxies. Nearby galaxies, in particular starburst galaxies and LIRGs, are great laboratories to study star formation, feedback and the baryon cycle. The intense star formation in starbursts and U/LIRGs can power strong winds and outflows which can lead to quenching and morphological changes. Studies of these processes are important in order to understand how galaxies evolved from the early universe to what we see today. The processes involve changes to the multi-phase interstellar medium (ISM) in galaxies. Multi-wavelength studies are crucial to unravelling the properties and dynamics of the multi-phase ISM involved in feedback and other processes related to the baryon cycle. New instruments such as MUSE and radio facilities such as ALMA and MeerKAT are providing powerful insights into these processes. We have conducted multi-wavelength follow-up studies of some starbursts and U/LIRGs in the SUNBIRD survey (a near-infrared survey with the VLT) using state of the art telescopes and instruments such as SALT, MeerKAT, MUSE and ALMA. This data will provide powerful insights into feedback processes and the baryon cycle.

The new SALT slitmask integral field units (SMI) will provide insights into the resolved ionized gas properties and star formation across these galaxies. Many of the SUNBIRD targets are interacting galaxies and the SMI studies will allow us to study the disturbances in the galaxy discs and to better characterize and identify outflows and the interactions. Atomic hydrogen (HI) observations trace the reservoir of star forming gas and the gas is one of the best tracers of galaxy interactions. The MeerKAT observations of our SUNBIRD galaxies provide the deepest HI observations of these galaxies and will provide new insights into the galaxy interactions, especially outside the galaxy discs.

Project Goals:
The aim of this project is to study the relationship between star formation and the multi-phase gas kinematics using multi-wavelength data. I will work with the candidate to focus on a specific theme in line with their mutual interests and capabilities. A major component of the analysis will be to study the optical kinematics and optical line ratios using SALT longslit and SMI data, and the MeerKAT HI data, in order to determine whether there are gas flows in the galaxies and how these relate to star formation and ISM. The student will also have an opportunity to be involved in obtaining more extragalactic data.

Requirements:
The project will mainly focus on analysis of multi-wavelength astronomy data, so the student must be able to program in Python and be familiar with working with astronomy data (e.g. fits files).