

Proposed MSc Project

Investigating the blue stellar clumps in Collisional Ring Galaxies

Supervisor: Zara Randriamanakoto, SAAO

Email: zara@sao.ac.za

Office: SAAO Main Building, West wing, Room 6.2

Student may register at any South African university

Project description:

Collisional ring galaxies (CRGs) are peculiar objects that form through the collision between a small galaxy companion and the rotation axis of a larger disk galaxy. The intense starburst episodes happening in these interacting systems trigger the formation of young massive star clusters (YMCs). With their ages as young as 10 Myr and masses above 10^5 solar masses, these compact star clusters represent the most massive and extreme form of star formation (SF) in nearby galaxies and hence are useful tools to help understand SF mechanisms of their host galaxy environments.

This project aims to investigate the effects of the host environment on the star cluster formation and evolution mechanisms by studying the blue stellar clumps (i.e YMC complexes) hosted by CRGs such as Arp 142 (also known as the Penguin Galaxy). High-resolution multiband BRI-Halpha observations from the HST/WFC3 and ACS cameras will be analysed to derive the photometric and physical properties of the cluster population. These will ultimately help in assessing the influence of the host environment on the YMC properties, an active hot topic in this research field.

Students will conduct a literature review on CRGs and YMCs, and will perform object detection and aperture photometry to draw a multiband cluster catalogue. Diagnostic tools such as color diagrams and luminosity functions will then be used to provide a first order approximation of the cluster properties. In addition, students will run Monte-Carlo completeness simulations and will also fit the cluster ages and masses to SSP models for a comprehensive analysis of the cluster population.

Special requirements: Basic knowledge of python (or similar programming tool) and a desire to learn how to use new astronomy software.

If you are interested, please get in touch over e-mail for further details and to discuss the project.

Figure. HST WFC3/UVIS color composite image of Arp 142, a spiral-elliptical CRG that resembles to a penguin guarding an egg.



Useful literature:

Madore et al. 2009, ApJS, 181, 572

Pellerin et al. 2010, AJ, 139, 1369

Randriamanakoto et al. 2019, MNRAS, 452, 4845

Randriamanakoto et al. 2022, MNRAS (in press), arXiv:2204.07095