

## Searching the Skies for Supernova Remnants

When a massive star reaches the end of its life, it explodes in a supernova, ejecting an enormous amount of energy and some of its mass into the surrounding interstellar medium. This fast-moving spherical shockwave expands and emits radiation, glowing brightly in the optical, radio, and X-ray parts of the electromagnetic spectrum; astronomers detect this as a supernova remnant (SNR), and it can last 10 – 100,000 years. Given what we know about star formation in our Milky Way galaxy, we would expect to find about 3,000 of these remnants, but only about 300 are known. This is due to several factors: the older SNRs are very large and faint; the younger SNRs are compact and can be mistaken for other objects without detailed observations; the spectra of SNRs are distinctive, but existing radio surveys often do not have the required frequency coverage to discriminate between SNRs and other Galactic objects.

### Research Field

Radio Astronomy

### Project Suitability

Honours

Masters

PhD

### Project Supervisor

Dr Natasha Hurley-Walker

[nhw@icrar.org](mailto:nhw@icrar.org)

### Co-Supervisors

Prof Werner Becker (MPI)

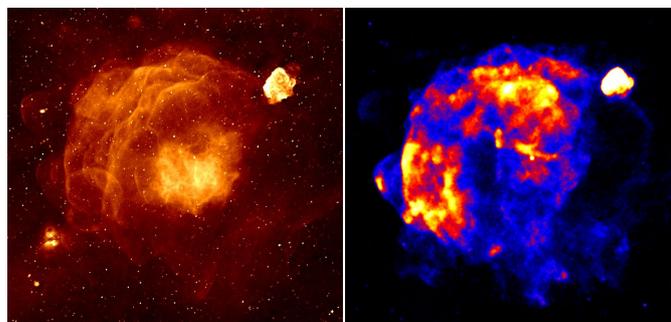
E. Prof Anne Green (USyd)

Fortunately, the GaLactic and Extragalactic All-sky Murchison Widefield Array (GLEAM) survey is sensitive to these objects. Early searches have detected 26 new SNRs, an increase of nearly 10% in known SNR from just half of the GLEAM data. The new Galactic Plane data from the higher-resolution GLEAM-eXtended survey will be particularly rich for finding younger, more compact SNRs. Not only will the project use these novel radio data, it will also use data from the *eROSITA* X-ray satellite, which will confirm GLEAM-X detections, and enable study of the internal physics of the SNRs, and probe their interactions with their environments.

Aims of the project:

- i. Process GLEAM and GLEAM-X Galactic Plane data to produce wideband images of regions of the Galactic plane (at PhD level, the entire visible Galactic Plane);
- ii. Jointly search the radio and X-ray data for new supernova candidates;
- iii. (Masters, PhD-only) Select interesting subsamples of SNRs to follow up with further observations, to probe the physics of the SNR interactions with their environments.

This project is well suited to a student with a strong interest in astrophysics and astronomy, willingness to learn low-frequency radio astronomy, and good computing and organisational skills. The project is part of a collaboration with X-ray astronomers at the Max-Planck Institute for Extraterrestrial Physics in Munich (Germany), and short-term visits to MPI may be possible for Masters and PhD students. **This project is available as a Curtin-funded PhD position in support of Dr Hurley-Walker's ARC Future Fellowship.**



*Figure 1 The Vela SNR and surrounds; left: GLEAM & GLEAM-X: this project will create high-quality wideband images across the Galactic Plane. Right: ROSAT X-ray satellite view. The new eROSITA data will have 10x the resolution and sensitivity, enabling more SNR detections and better understanding of their ages and environments.*