UNIVERSITY OF LEICESTER

Multi-messenger astrophysics

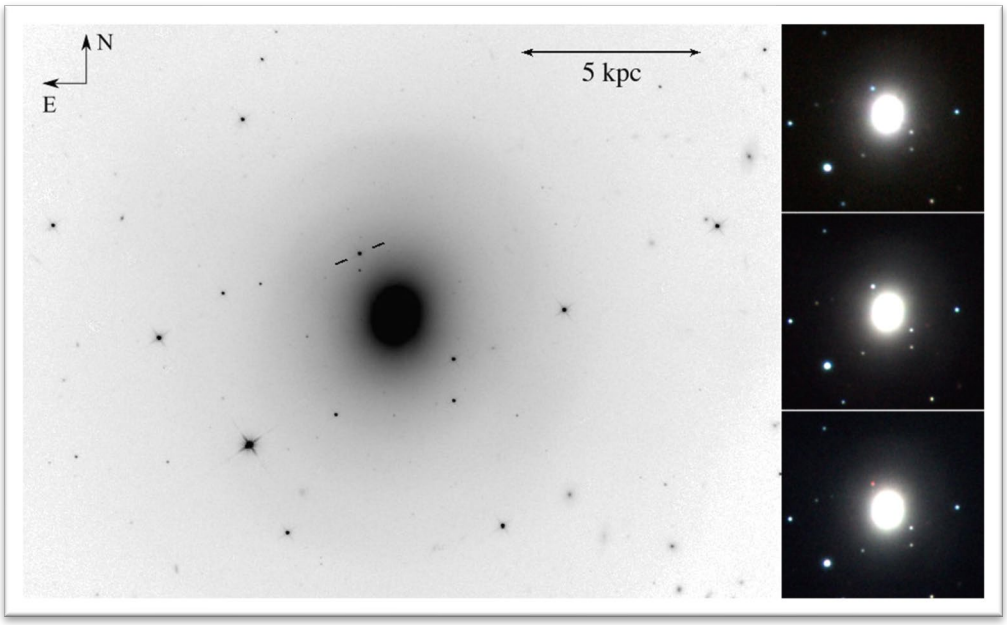
• Addressing fundamental questions, including the origin of heavy elements. • Using data from the world's premier observatories. • Rapidly growing area of astrophysics, pioneered by Leicester group.	**Level**	PhD
	First Supervisor	Prof Nial Tanvir nrt3@le.ac.uk
	Second Supervisor	Dr Rhaana Starling
	Application Closing Date	20th January 2023
	PhD Start date	September 2023

Project Details:

Binaries consisting of two neutron stars or a neutron star and a black hole, will eventually merge due to orbital decay through the emission of gravitational radiation. The mergers themselves release vast amounts of energy, which is thought in some cases to lead to the production of short-duration gamma-ray bursts. They also expel highly radioactive neutron-rich nuclei, which will decay to form the stable r-process elements (such as gold and platinum), while powering an explosion known as a kilonova. Finally, these systems, as they merge, produce gravitational waves that can be detected using the current generation of terrestrial detectors.

In Leicester we have long been at the forefront of research on astrophysics transients, and have led successful observational and theoretical campaigns to advance the understanding of binary mergers, including making the first kilonova discovery in 2013, and being centrally involved in the discovery of the first electromagnetic counterparts to the neutron star binary merger, GW170817.

The project will involve searches for, characterisation of, and modelling of future kilonovae and the relativistic jets found accompanying gravitational wave detections and/or short-duration gamma-ray bursts, using a range of ground- and space-based facilities, such as VLT, Swift, SVOM, JWST, HST. With the gravitational wave network intended to restart observations in spring 2023, this project is particularly timely.



Kilonova associated with GW170817 in NGC4993. [Left panel:] An HST image (negative) of the host galaxy NGC4993 with the kilonova counterpart to the binary neutron star merger indicated, and [right panels:] its evolution shown in the VISTA imaging. (Tanvir et al. 2017)

References:

- . Tanvir et al. 2013 Nature 500 547
- Tanvir et al. 2017 ApJ 848 L27
- Evans et al. 2017 Science 358 1565
- Lamb et al. 2019 ApJ 870 L15

How to apply:

Include with your application:-

- CV
- Degree Certificates and Transcripts
- Details of any study currently being undertaken
- Personal statement
- Enter the supervisor's name and project title in the Proposal Section (no proposal required)
- Enter contact details of two academic referees in the boxes provided or upload reference letters if already obtained.
- Evidence of English language if applicable.
- In the funding section include: Ref: Tanvir - UKRI (STFC)

The University of Leicester School of Physics and Astronomy has advertised a number of PhD opportunities. If you are applying for more than one University of Leicester project, please indicate if this is your first, second or third choice, in your application.

Further information on how to apply and funding can be found here