

## Theme: The Transient Universe

Sub-Theme: Astrophysical explosive  
Transients

Sub-Theme: Near Earth transients and time  
-domain surveillance



GRB  
GW – MMA  
SNe  
SNe environments  
High Energy

Key Personnel  
Ass. Prof. David Coward  
Dr Bruce Gendre  
Dr Fiona Panther  
Dr Eric Howell  
Dr John Kennewell  
Eloise Moore

Planetary Defence  
U. Arizona  
UNSW  
CSIRO  
SSA - POLSA Linkage  
2024

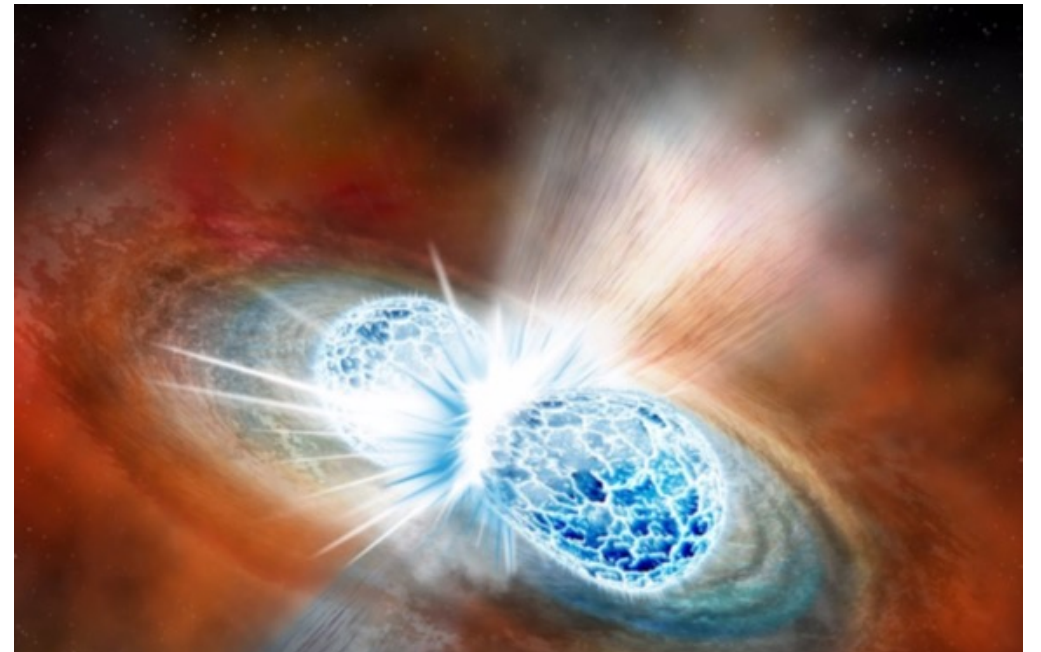
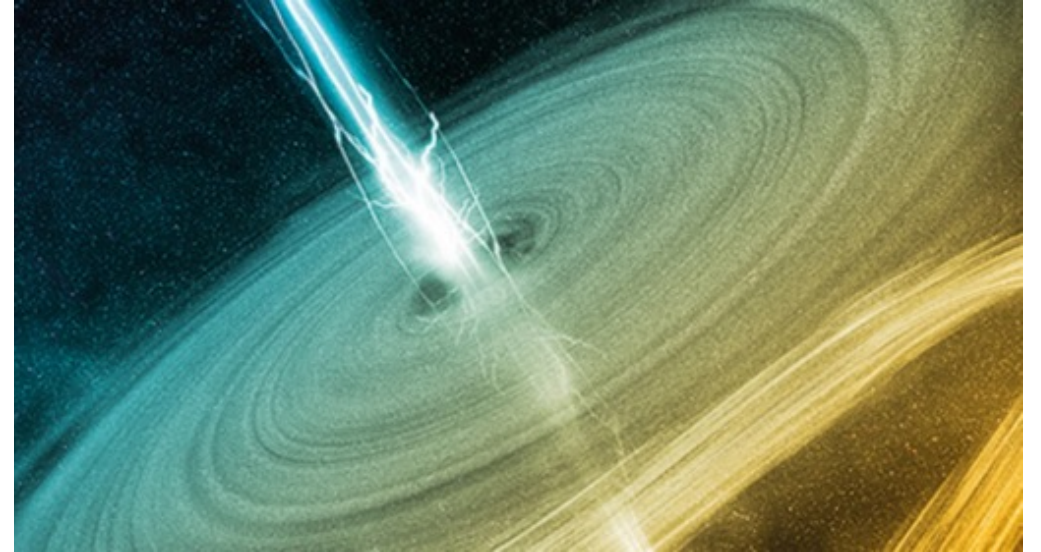
## Sub-theme: Explosive Transients

Studies of the physics of ultra-relativistic jets and their interactions with the surrounding medium

Understanding the nature of ultra-long and sub-luminous gamma ray bursts

Studies of the evolution of the event horizon and the gravitational field within a binary during the merger of two black holes

Project leader: Dr Bruce Gendre





## Sub-theme: Explosive Transients

### Project topics

Multi-messenger studies of the parameters of gamma ray burst

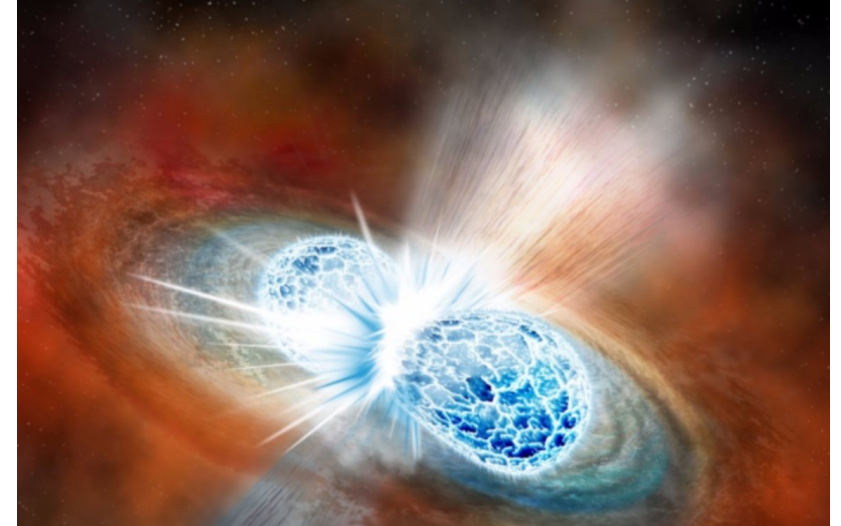
Multi-messenger studies of the formation and evolution of compact object binaries in stellar clusters

Archival searches for transients (Zadko Telescope image archive)

Exploit Optical transients data - optical counterparts to gravitational waves, gamma-ray bursts, fast radio bursts

SKILLS Robotic astronomy, space industry related skills  
Image analysis

Project leader: Dr Bruce Gendre



## Sub-theme: Explosive Transients

Title: Bayesian Estimation of the Rate of Neutron Star-Black Hole Mergers using Gravitational Wave Observations

Dr E.J. Howell & Ass. Prof. David Coward

NSBH mergers are of profound astrophysical importance, offering insights into the evolution of compact object binaries. Leveraging the capabilities of gravitational wave detections, this research also investigates the rates of these events within the context of multi-messenger observations, considering the implications of BH spin.



Title: The rate evolution of gamma ray bursts over cosmic time

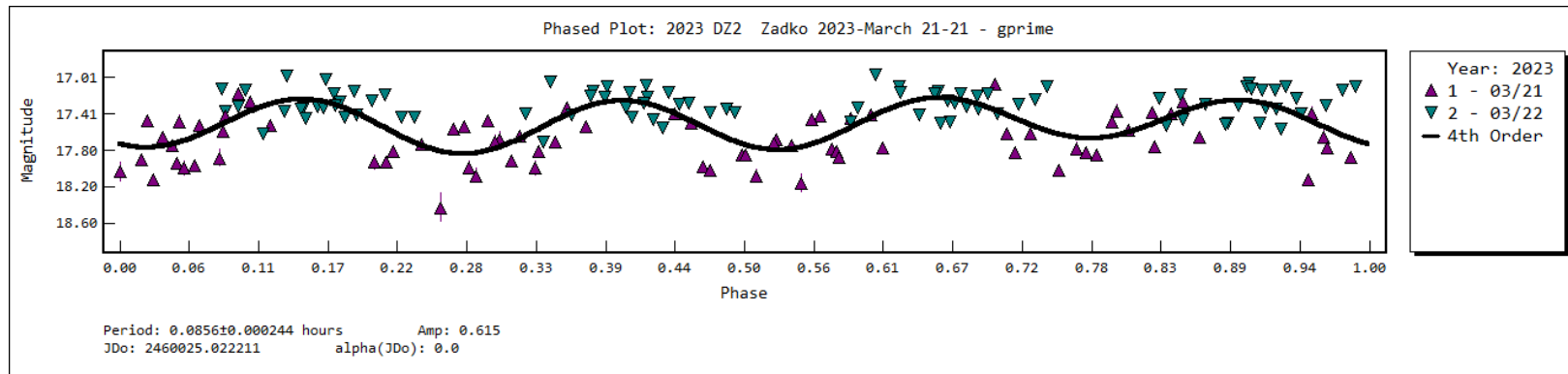
Ass. Prof. David Coward & Dr Eric Howell

The Swift Satellite has enabled hundreds of gamma ray burst (GRB) redshifts to be obtained. This data is now becoming a useful tool for probing how the rate of gamma ray bursts have evolved over cosmic time and their links to star formation history. The project will use GRB redshift data to explore these links.

## Sub-theme : Near Earth transients and time-domain space surveillance

Title: Near Earth Asteroid characterization using joint radar and optical tracking  
Ass. Prof. David Coward, Dr John Kennewell, Arie Verveer, Ed Kuzins (UNSW / CSIRO)

Using optical and radar data from the CSIRO, the project aims to characterize the resident population of Near Earth Asteroids, especially in relation to anomalies in their motion and rotation.



Title: Characterising satellites using un-resolved observations  
Ass. Prof. David Coward, Dr John Kennewell, Arie Verveer, Ed Kuzins (UNSW / CSIRO)

Polarimetry and low resolution spectrometry (colourimetry) will be used to determine object surface characteristics and degradation due to the space environment.