Physics & Astronomy PhD Project Proposal

Project Title: Gamma-ray bursts and the interstellar medium

Project Reference: STFC - Blain

Groups: Astrophysics

Supervision Team:

- Prof. Andrew Blain, ab520@le.ac.uk

Three Key Points

- GRBs are the most energetic events in the Universe and are being detected in every increasing numbers
- They provide an interesting new way to probe the interstellar material in galaxies.
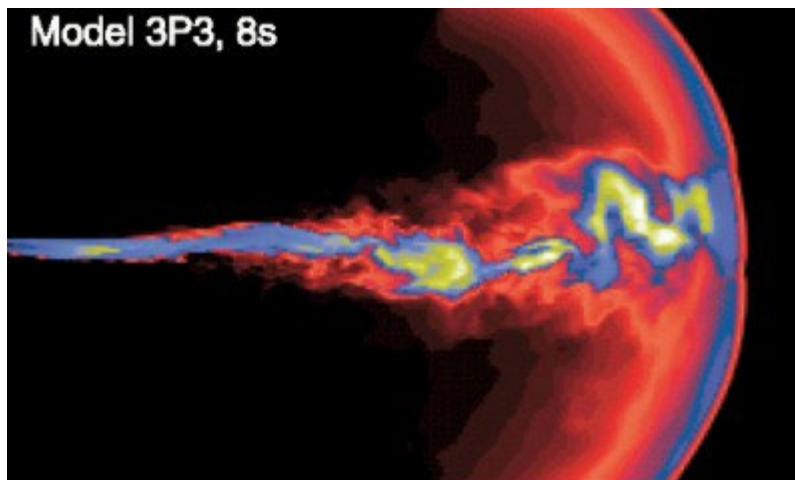- Come and help link them to the evolution of the Universe.

Project Description

The most powerful events in the Universe are gamma-ray bursts. They launch relativistic jets of material away from a cataclysmic event in the life of a star, and thus produce extremely powerful particle and radiation fluxes. The jet would have a profound effect on the surroundings of the burst and transfer huge amounts of energy to the interstellar material (ISM) that is impacted. They may have an important role to play in producing the most energetic cosmic-ray particles that cross the Universe. We will investigate the possibilities of accounting for extremely-high-energy particles in the Universe due to the complex interplay of astrophysical process in the jet, as it interacts with the ISM in galaxies. There are potentially important observational features to discover that can help explain the formation and lifecycle of both stars and galaxies. The project will involve modelling the GRB jet and the ISM, both of which are complex and contain many interesting opportunities for probing physical processes via comparison with data gathered for the extensive archive of GRBs. We will always seek to tie models and predictions to observable features wherever possible.

Further Reading:

- https://www.swift.ac.uk/about/grb.php
- https://www.aavso.org/grb-links-resources-related-gamma-ray-bursts
- https://www.eso.org/public/science/grb/

Images/Graphics:

Picture courtesy of Zhang, Woosley & Heger, 2004, ApJ 608, 365

Application advice: Please see web page

https://le.ac.uk/study/research-degrees/funded-opportunities/stfc