Project title: Spectrum formation in the most luminous transients: confronting data with models

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Helpful existing knowledge:	Programming skills, atomic physics

Project Description:

All-sky imaging surveys are discovering a wide variety of rare and extreme stellar explosions. One of our most powerful tools for understanding the physical origins of these events is spectroscopy, which reveals information about the composition, mass, velocity, temperature and ionization of the debris. However, to extract this information accurately requires advanced radiative transfer models.

In this project, you will use spectra from leading telescopes (SoXS, 4MOST, VLT) and develop models using cutting edge radiative transfer codes (Sirocco, TARDIS, ARTIS) to address major questions in explosive astrophysics. This could include e.g. investigating how the optical and X-ray emission form when a star is disrupted by a supermassive black hole, or determining the origin of the unique absorption lines seen in the most luminous supernovae.

Useful references

Massive black holes:

https://ui.adsabs.harvard.edu/abs/2022MNRAS.510.5426P/abstract

https://ui.adsabs.harvard.edu/abs/2026enap....3..423M/abstract

Extreme supernovae:

https://ui.adsabs.harvard.edu/abs/2021A%26G....62.5.34N/abstract

https://ui.adsabs.harvard.edu/abs/2025arXiv250301321J/abstract