

School of Physical Sciences Seminar

Speaker: **Dr. Samuel McKeague** (DCU).

Date: Thursday 18th Nov 13:00

Title: **Observing High-Mass X-ray Binaries with Athena X-IFU**

Abstract: Over 50% of the known X-ray sources within our galaxy are X-ray binaries (XRBs). The most powerful of these systems in particular are High-Mass X-ray Binaries (HMXBs). These are composed of a neutron star or black hole orbiting a massive star that has a mass of at least 10 solar masses. These systems are powered by the extremely efficient process of accretion, where matter from the massive star is accreted by the compact object.

The archetypical example of these systems, which I will present, is Vela X-1. This is a HMXB consisting of a neutron (X-ray pulsar) and a blue supergiant of ~ 30 solar masses. Stellar wind outflow from the supergiant is accreted by the neutron star and leads to highly luminous X-ray emission and the formations of multiple regions of photoionization around the neutron star. Due to the high inclination of the system ($i > 79^\circ$), Vela X-1 is an eclipsing binary system with a periodicity of 8.964 days.

Despite years of extensive observations and study, we have begun to reach the limit of what we can observe and resolve from HMXBs, like Vela X-1, with our current X-ray telescopes. Flaring has been observed on timescales too small to resolve the spectrum of the during these periods. The geometry of accretion within these systems can only be observed to an extremely limited extent, as the sensitivity of current instruments is not sufficient to observe gradual changes in the spectrum of these sources during events such as an eclipse. With the next generation X-ray telescope, Athena, there is an opportunity to observe these sources in more detail than ever before. I will present some of my own simulations of Vela X-1 and theoretical photoionization regions being observed by the X-ray Integrated Field Unit that will be on board Athena to demonstrate the power Athena promises and provide an idea of the new science that will be possible with such instruments.

Everyone welcome!