The AGN - galaxy connection: utilising the power of large sky surveys

- **Explore some of the world's most extensive X-ray, optical and IR databases**

- **Probe the intimate connection between galaxies and black hole growth**

- **Learn the advanced techniques used to analyse massive databases**

Level	PhD
First Supervisor	Mike Watson
Second Supervisor	Rhaana Starling
Application Closing Date	19 January 2022
PhD Start date:	26 September 2022

Project Details:

Supermassive black holes are now thought to lurk at the centres of most, if not all, galaxies but it is still unclear how these black holes form and what drives their subsequent growth over the history of the Universe. This project will focus on identifying growing black holes - seen as Active Galactic Nuclei(AGN; objects such as quasars and Seyferts) - and connecting the properties of these AGN with the properties of the galaxies they lie in.
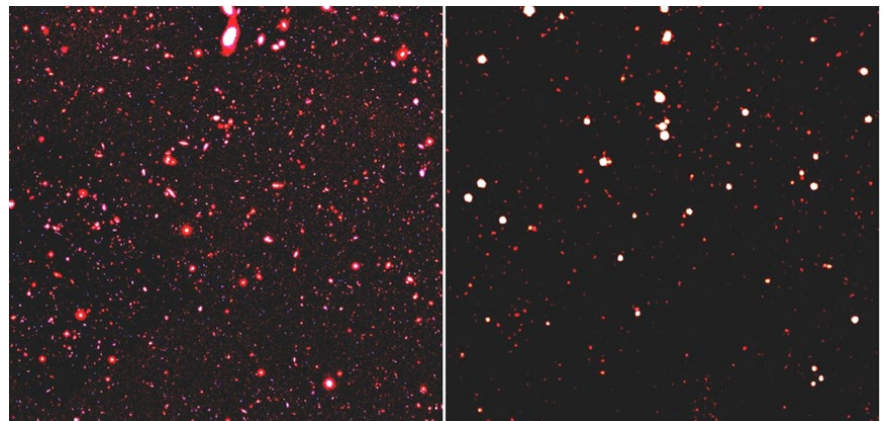
The Chandra Deep Field

You will use the latest galaxy surveys, incorporating data from a wide rangeof facilities such as the Sloan Digital Sky Survey (SDSS) and the upcomingLegacy Survey of Space and Time (LSST) project to identify

ESA's XMM X-ray Observatory

galaxies atdifferent cosmic epochs and in different evolutionary states. You will then use multiwavelength datasets including X-ray survey data from ESA's XMM-Newtonobservatory and NASA's SWIFT and Chandra satellites, togetherwith optical spectroscopy, infrared imaging and radio data, to identify AGN within these galaxies and determine their properties (such as their luminosities, black hole accretion rates, and their level of obscuration). You will track how the levels of AGN activity depend on the galaxy properties (such as mass, morphology and star formation history) to provide new insights into the processes fuelling and regulating black hole growth across the evolving galaxy population.

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

On this project you will have the opportunity to work with three scientists: Prof. Mike Watson and Dr. Rhaana Starling, who have a wealth of experience in AGN surveys and related research and Dr. Keir Birchall who has just completed his PhD. with a thesis focused on studying AGN source populations, characterising their properties in the nearby Universe. The first supervisor, Prof Watson, is a senior UK astronomer who led the international team that created the XMM-Newton catalogues that will be one of the key elements of this project. Prof. Watson also has strong links with the LSST optical survey project.

Outside of Leicester, opportunities will exist for collaboration with a wide range of researchers at other institutes world-wide who are working in this field.

This project is data-intensive and will require advanced analysis techniques. Some familiarity with large astronomical datasets and programming in Python will be an advantage, but full training will be available in these areas and the supervisory team will be on hand to support you as you learn.

References:

1 SDSS: https://classic.sdss.org/ & SDSS value-added catalogs: https://www.sdss.org/dr14/data_access/value-added-catalogs/

2 The LSST project (now renamed the Rubin Observatory): https://www.lsst.org/

3 The XMM X-ray Observatory: https://sci.esa.int/web/xmm-newton

4 SWIFT satellite: https://www.swift.ac.uk/

5 Example research paper: https://arxiv.org/abs/2001.03135