THESIS ABSTRACT

Spectral Energy Distribution Modelling of X-Ray-Selected AGNs and Their Host Galaxies

By Adam Marshall

The nature of the relation between active galactic nuclei (AGN), and their host galaxies has been observed in detail throughout the Universe. Such work has found an intrinsic link between central supermassive-black-hole (SMBH) masses, and host-galaxy properties such as the velocity dispersion of stars, and bulge mass. However, the difference in scale between SMBH and their host galaxies has led to debate on how this relation might form and develop over time. In order to aid in understanding the relation between AGN and their host galaxies, the work throughout this thesis has therefore focussed on the development and implementation of a new spectral-energy-distribution (SED) fitting code, using an up-to-date AGN SED to infer accurately both AGN and host-galaxy properties. To this end, we explore the intricacies involved in producing useful property inferences using a Bayesian MCMC fitting method, whilst working to avoid common issues such as bimodality and lack of convergence. We then perform SED fitting using our methods to 711 luminous X-ray AGN at $0{\cdot}7 < z < 4{\cdot}5$ using 10 bands of optical and infrared photometric data for objects within *XMM*-SERVS. Using these fits, we study the relation between AGN X-ray luminosity and host-galaxy stellar mass, along with our ability to predict emission-line strength and morphology from photometry alone. In order to understand further the intricacies of SED fitting, we also provide a case study into the effect of AGN-SED choice on host-galaxy and AGN-property inferences by comparing our AGN SED to another commonly used template. In this work, we show that it is important to consider host-galaxy contamination when trying to produce a pure AGN template, and the effect that this contamination can have on AGN and host-galaxy-property inferences. We also find that the use of lower-resolution SEDs can lead to repercussions on property inferences such as host-galaxy stellar mass, which may provide incorrect assumptions on the relation between AGN and their host galaxies. — *University of Cambridge; accepted 2023 February*.

OBITUARY

Phillip John David Gething (*1929–2023*)

Phillip was born on 1929 August 22 and brought up in Luton, where he attended Luton Grammar School from 1939 to 1946. He won a Royal Scholarship to Imperial College and in 1946 October, at the age of 17, began a compressed two-year course for a maths degree in the company of many ex-servicemen and a few school leavers. A third year was compulsory for school leavers so, having become increasingly interested in astronomy, he chose the MSc course in optics and then returned to the maths department as a PhD student under Dr. Whitrow from 1949–51.