Bethany Westoby
Curriculum Vitae

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Research Interests

My research interests are Active Galactic Nuclei (AGN), black holes and machine learning. I am experienced in python and data analysis and have strong written and spoken communication skills. I am looking for a phD studentship where I can expand my knowledge beyond my degree and contribute to an exciting project.

Research Placements

The Wind-jet Connection & Accretion Disk Modelling in Active Galactic Nuclei, *Durham University Summer Studentship,* Supervisors- Dr. Leah Morabito and Prof. Chris Done, 8 Weeks **July-Aug 2021**
I studied both radio-quiet and radio-loud AGN from the recent LOFAR-Chandra Boötes field data. The relationship between radio loudness and column density was investigated and the qsosed accretion disk model was validated. Python was extensively used in this project to analyse and visualise data. I participated actively in weekly meetings of the Durham QSO Group, presenting my research progress, receiving feedback and asking questions, and giving a talk on my research results at the end of the project. I produced a detailed project report that summarised my method and findings so that the work could be expanded upon in the future.

Research Experience

The Disk-jet Connection & Data Mining SDSS using Neural Networks, *Durham University Masters Project*, Supervisors -Dr. Leah Morabito and Dr. Simone Scaringi, **2022-Current**
I am currently building and training a neural network, using Python, Tensorflow and Google Keras, to find black hole masses and Eddington ratios from observed Mgii lines in SDSS spectra. I will then use these new black hole masses, along with multiwavelength data, to fit accretion disk models to estimate accretion rate. How the accretion disk is related to the radio jets of relativistic plasma is a major open question that I will investigate with this project. If the accretion rate is related to the black hole mass, the radio emission might be from jets. Exploring how black hole masses influence radio properties can tell us more about the sources of radio emission in AGN.

Spinning Black Holes and the Temperature of their Accretion Disks (Python Project), *Durham University Python Project*, Supervisor -Dr. Nigel Metcalfe, **2021-22**
I used Python to simulate black holes, investigating how the spin of a black hole changes the inner radius of it's accretion disk, how the spectra produced using Newtonian Approximation and General Relativity equations of accretion disk temperature are different and how the spin and temperature equation used changes the efficiency of the black hole. I was awarded the runner-up prize for best computing project poster (determined by quality of research and aesthetics), coming in the top three out of 150 students.

Solar Investigations, *Liverpool John Moores University Work Experience,* Supervisors: Prof. Andy Newsam and Prof. Chris Collins, 1 Week **July 2019**
I experienced what the life of a professional researcher is like at the Astrophysics Research Institute, working with data from the National Schools Observatory (NSO) Liverpool Telescope. The report about sunspots and solar cycles that I worked on won an award and I delivered a presentation on this report to senior LJMU academics.

'What Is The Most Important Element of Astronaut Training?' and 'Is Time Travel Possible?', *Extended and Higher Project Qualifications,* Supervisor: Ms Helen Riebold, **2019** and **2017**
I conducted extensive academic research on the topics for the essays and I learned how to cite using Havard referencing. I also gave presentations on my findings to an audience of my peers and teachers. I achieved an A* for both projects.

Observing Experience

Orbits of the Trojan Asteroids, *Durham University Advanced Laboratory Project*, Supervisors - Prof. Mark Swinbank and Prof. Alastair Edge, **2022**
I used the telescopes on the roof of the Durham physics building to observe the positions of Trojan asteroids over two months. The goal of the project was to calculate the orbits of the asteroids from the observations. Five targets were studied: Eurybates and Orus, which are targets for the NASA Lucy mission (the first mission to the Trojan Asteroids), and Agamemnon, Hektor and Diomedes in addition. I also achieved the secondary aim to make a prediction for the positions of the Lucy targets for at the time of the mission's arrival.

Senior Space School UK, *University of Leicester,* 1 Week **August 2019**
I was awarded a scholarship to SSSUK from Lockheed Martin. During the week, I used the 20-inch telescope at the University of Leicester's Observatory to view Jupiter and its moons and I was inspired to pursue a career in Astrophysics.

Education

Physics and Astronomy MPhys, *Durham University*, Durham, **2019-Current**

Secondary School, *Southend High School for Girls*, Southend-On-Sea, State Grammar School, **2012-2019**

Programming/Technological Skills

Python - I can confidently use and have experience in using Python to analyse data and solve physics and maths based problems. Some key packages that I have experience with are Astropy when working with astronomical data and Matplotlib for graph construction.

Machine Learning - I am skilled in using Tensorflow and Google Keras for building and training a Neural Network, as I have done for my masters project.

Software- Software that I have astronomical experience in using includes XSPEC, for flux and accretion disk modelling, and TOPCAT, for cross-matching catalogues. I have proficiency in using Microsoft Word in writing research reports, Microsoft Excel in data analysis including LINEST and chi-squared data analysis techniques, Microsoft Teams and Zoom in collaboration with my laboratory teams remotely and Microsoft Powerpoint in presenting data results. I'm able to pick up new software quickly.

Community Involvement

<u>Paid</u>
Mentor, *Institute of Physics IGB programme,* 8 weeks **Feb-March 2021**
I mentored three year 12 Physics A-level students as part of the Improving Gender Balance programme run by the IoP. I provided feedback on activities they completed on the Brightside web platform and supported them by answering their queries about studying and university. I was awarded a certificate for going above and beyond the requirements of the role.

Part-time Tutor, *Explore Learning,* **2017-2020**
I tutored members, aged 4-14, in English and Maths. I provided assistance and guidance in completing academic tasks and communicated progress to parents. I led the Succeed in Secondary programme for over a year, doing the planning for and delivering the weekly sessions to build the members' skills.

Volunteer

Ecliptic Newsletter Content Writer, *UKSEDS,* **2022-Current**
I research, write and create graphics for the UK Students for the Exploration and Development of Space society (UKSEDS)'s monthly newsletter 'Ecliptic'. The newsletter keeps the society members up to date about news, events and opportunities in the space sector. The varied roles allow me to practise summarising and communicating information clearly, a valuable skill for my studies. As part of the marketing team, I have also contributed to planning for the National Student Space Conference NSSC '23.

Scout Leader, *UK Scouting,* **2016-2022**
I am currently a Section Assistant at a Cub Scout group (aged 8-10) and was previously a Young Leader at a Beaver Scout Group (aged 5-8). I help the Cubs/Beavers accomplish badges and I lead activities and games. As part of my science outreach in my local community, I ran the Astronomy badge for the Cubs and the Space Activity badge for the Beavers, teaching about planets and constellations and inspiring the next generation.

Chorister, *Southend Girls Choir,* **2012-2019**
I sang in Southend Girls Choir for seven years in many concerts at prestigious venues such as in the BBC proms at the Royal Albert Hall, St Martin-in-the-Fields, Claridge's Hotel and St Peter's Basilica. Through this I have experience with high pressure situations, advanced teamwork skills and high levels of concentration and focus.

References

Dr. Leah Morabito
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Dr. Simone Scaringi
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Prof. Alastair Edge
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