

# Dr. Sam Grafton-Waters

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## Summary

Recently completed my PhD at Mullard Space Science Laboratory where I studied the outflowing winds of active galactic nuclei (AGN) in nearby Seyfert galaxies. My ongoing motivation is to understand the origins and locations of these winds, with the aim of answering the paradigm of how do galaxies and black holes coevolve through the process of feedback.



## PhD

Mullard Space Science Laboratory, UCL

September 2017 - December 2021

### Exploring Photoionised Outflowing Winds in Active Galactic Nuclei.....

Explored the outflowing winds of individual active galactic nuclei (AGN) through photoionisation modelling of high resolution X-ray spectra, using data collected by ESA's XMM-Newton observatory. Comparisons of the warm absorber and emission line region show evidence that these wind types could be part of the same regions within the outflowing wind, but seen along different lines of sight.

**Supervisors:** Prof. Graziella Branduardi-Raymont and Prof. Mathew Page

## Undergraduate Degree

University of Leicester

October 2013 - July 2017

*MPhys Physics with Astrophysics*

*First Class with Hons*

### 4<sup>th</sup> Year Masters Project: Tracking Galactic Black holes in X-rays.....

Studied the properties of the X-ray binary GX 339-4 using XMM-Newton data. The spectral data were modelled to track the changes of the accretion disk properties over different timescales, where evidence of disk truncation could not be confirmed nor rejected.

**Supervisor:** Dr Simon Vaughan.

## Publications

### First Author.....

**S. Grafton-Waters**, J. Mao, G. Branduardi-Raymont, J. Kaastra, M. Mehdipour, et al. *in Prep*, A&A, *Transient obscuration event captured in NGC 3227. IV. Origin of the Obscuration Wind Variability*

**S. Grafton-Waters**, and W. Dunn, 2021c, RNAAS, [5](#), [233](#),

*A Study of the Soft X-ray Emission Lines in NGC 4151 II. The Internal Plasma Properties*

**S. Grafton-Waters**, et al., 2021b, RNAAS, [5](#), [172](#),

*A Study of the Soft X-ray Emission Lines in NGC 4151 I. Kinematic Properties of the Plasma Wind*

**S. Grafton-Waters**, G. Branduardi-Raymont, M. Mehdipour, et al., 2021, A&A, [649](#), [A162](#),

*Photoionisation Modelling of the X-ray Emission Line Regions within the Seyfert 2 AGN NGC 1068*

**S. Grafton-Waters**, G. Branduardi-Raymont, M. Mehdipour, M. Page, et al., 2020, A&A, [633](#) [A62](#),

*Multi-wavelength campaign on NGC 7469. VI. Photoionisation modelling of the emission line regions and the warm absorber*

### Co-author.....

M. Mehdipour, G. Kriss, J. Kaastra, ... **S. Grafton-Waters**, et al., 2021, A&A, [652](#), [A150](#),

*Transient obscuration event captured in NGC 3227. I. Continuum model for the broadband spectral energy distribution*

Y. Wang, J. Kaastra, M. Mehdipour, ... **S. Grafton-Waters**, et al., 2022, A&A, [657](#), [A77](#)

*Transient obscuration event captured in NGC 3227 II. Warm absorbers and obscuration events in archival XMM-Newton and NuSTAR observations*

J. Mao, J. Kaastra, M. Mehdipour, ... **S. Grafton-Waters**, et al., *Submitted*, A&A,

## Talks and Presentations

<b>Origin of the X-ray Narrow Line Region</b> <i>Accretion Disk Winds Conference</i>	<b>9th September 2021</b> <i>Durham, UK (Remote)</i>
<b>Outflowing winds of Active Galactic Nuclei</b> <i>Seminar</i>	<b>10th December 2020</b> <i>Leicester, UK (Remote)</i>
<b>Photoionisation Modelling of the Emission Line Regions in AGN</b> <i>Seminar</i>	<b>10th October 2019</b> <i>MSSL, UK</i>
<b>Photoionisation Modelling of the Emission Line Regions in NGC 7469</b> <i>New Results in X-ray Astronomy 2019 Conference</i>	<b>4th September 2019</b> <i>MSSL, UK</i>
<b>Poster Presentation</b> <i>Xcalibur: Next generation X-ray spectroscopy</i>	<b>15th July 2019</b> <i>Winchester, UK</i>

## Upcoming Talks.....

<b>Transient Obscuration Event in NGC 3227 during 2019</b> <i>Seminar</i>	<b>24th February 2022</b> <i>MSSL, UK</i>
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## Conferences and Workshops

<b>Black hole accretion disk winds conference</b>	<b>6 - 9 September 2021</b> <i>Durham, UK (Remote)</i>
<b>X-ray Astronomy 2019</b>	<b>8 - 13 September 2019</b> <i>Bologna, Italy</i>
<b>Xcalibur</b> <i>Next generation X-ray spectroscopy</i>	<b>15 - 18 July 2019</b> <i>Winchester, UK</i>
<b>AHEAD School</b> <i>High Resolution X-ray Astronomy School</i>	<b>14 - 17 November 2017</b> <i>Alicante, Spain</i>

## Outreach

Nov 2020 - present

## ORBYTS.....

- Created and developed projects in which sixth form students analyse real XMM-Newton data of an individual active galactic nucleus
- Written Python codes for the students to model the X-ray spectra
- Presented and explained complex black hole physics to the students
- Published our findings in Research Notes of the American Astronomical Society; the students were co-authors
- The code can be found on my Github page: [github.com/samgriftonwaters/ORBYTS](https://github.com/samgriftonwaters/ORBYTS)

## Partner School

Nottingham University Academy of Science and Technology (NUAST)	<b>Date</b> Nov 2020 - May 2021
NUAST and Nottingham High School	Feb 2022 - present

## Workshops and Training Sessions.....

- Attended a public engagement workshop in January 2020
- Attended training sessions in how to plan, develop and teach outreach projects to students in Feb and April 2021
- Gained understanding in safeguarding and child safety

## Certificates.....

- Child Protection in Education - Level 2 **Awarded: 8 March 2021**

## Seminar Organiser

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Sept 2019 - Dec 2020

- Organised and was responsible for the weekly seminars held for external speakers.
- I identified that there was a gender discrepancy with previous speakers. Under my leadership, the ratio for male to female speakers decreased from 5:2 (averaged from 2016 - 2019) to 1:1 (averaged for 2020 - 2021).
- During the COVID-19 pandemic, I adapted these seminars, by using Zoom, which proved beneficial because it enabled me to invite speakers who would otherwise have been unable to participate, especially international scientists.

## Proposals

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**Accepted** XMM-Newton AO-20 proposal to study the AGN NGC 5643 for 2021/22 observations.

## Blog Articles

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I have written two blog articles for the MSSL astronomy website:

- **Journey to the Centre of a Galaxy: Active Galactic Nuclei** - Described what supermassive black holes are and explained the impact my research has on understanding such complex objects. [Link](#)
- **XMM-Newton: 20 Years and Counting** - Celebrating the 20th anniversary of XMM-Newton. [Link](#)

## Key Skills

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- **Programming:** *Python, R*
- **Spectral Codes:** *SPEX, XSPEC*
- **Document Processors:** *LATEX, MS Office*
- **Communication Platforms:** *Zoom, MS TEAMS*
- **Website Design:** *HTML, CSS*      **My Website:** [samgriftonwaters.github.io](https://samgriftonwaters.github.io)

## Memberships

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**Fellow of the Royal Astronomical Society.** Elected: February 9th, 2018

## Further Interests

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- Cricket player - I have been both captain and team member with Cheltenham and Cranleigh cricket clubs.
- Keen guitarist

## References

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Graziella Branduardi-Raymont	Primary Supervisor	<a href="mailto:g.branduardi-raymont@ucl.ac.uk">g.branduardi-raymont@ucl.ac.uk</a>
Mathew Page	Secondary Supervisor	<a href="mailto:m.page@ucl.ac.uk">m.page@ucl.ac.uk</a>
Mark Cropper	Head of Astro Group	<a href="mailto:m.cropper@ucl.ac.uk">m.cropper@ucl.ac.uk</a>