

# Joseph Murtagh

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## Education

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- PhD** **Queen's University Belfast**, PhD (Physics) Oct. 2022 – present  
(expected Dec. 2025)  
Supervisor: Dr Meg Schwamb  
Thesis: *The Outer Solar System at the Dawn of the Legacy Survey of Space and Time*
- MSci** **Queen's University Belfast**, Masters in Science (Physics w/ Astrophysics) Oct. 2018 - Jul. 2022  
*First-Class Honours*  
Dissertation: *Photometric Analysis of Comets in Wide Field Surveys*

## Publications

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See all my associated publications on the [NASA Astrophysics Data System](#)

- **Murtagh, J.**, Schwamb, M. E., Merritt, S. R., et al., *Predictions of the LSST Solar System Yield: Discovery Rates and Characterizations of Centaurs*, submitted, AJ  
*I constructed a best dynamical+colour model of the Centaur population to place the first limits on their detectability and characterisation potential within the LSST using the survey simulator Sorcha. I led the simulations, analysis, and writing up of this work.*
- Dobson, M. M., Schwamb, M. E., Fitzsimmons, A., et al. (including **Murtagh, J.**), 2024, *Analyzing the Onset of Cometary Activity by the Jupiter-family Comet 2023 RN3*, AJ, 168 286  
*I assisted in providing ZTF data for the analysis of this comet, as well as providing code to gain initial  $A_f\rho$  measurements*
- Dobson, M. M., Schwamb, M. E., Fitzsimmons, A., et al. (including **Murtagh, J.**), 2024, *The Discovery and Evolution of a Possible New Epoch of Cometary Activity by the Centaur (2060) Chiron*, PSJ, 5 165  
*I provided code and discussion for measurements of the zeropoints and aperture corrections for the Gemini data in this work*
- Merritt, S. R., Fedorets, G., Schwamb, M. E., et al. (including **Murtagh, J.**), *Sorcha: A Solar System Survey Simulator for the Legacy Survey of Space and Time*, (in prep.)  
*I contributed to the development of the software detailed in this paper, in particular testing and fixing the linking algorithm *miniDifi*, developing example notebooks for colour determination, and improving logging functionality and documentation*
- Kurlander, J. A., Bernardinelli, P. H., Schwamb, M. E., et al. (including **Murtagh, J.**), *Predictions of the LSST Solar System Yield: The Four Major Populations*, (in prep.)  
*I provided estimated colour measurements in LSST filters for all major populations that are simulated in this work*

## Observing Experience

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- **Liverpool Telescope (20hrs)** 2023B  
Co-I and primary observation programmer on programme seeking to probe the albedo variations across the surface of Eris through its rotation via high signal-to-noise, near-simultaneous multi-filter photometry
- **Liverpool Telescope (8.5hrs)** 2023B  
Co-I and primary observation programmer on programme which monitored the activity level of recently active Centaur Chiron through changes in phase and light-curve brightness
- **Isaac Newton Telescope (4 nights)** 2022B  
Co-observer with on-site experience on programme which investigated the rotation rate and sought to map the surface albedo variegations of mid-sized KBO 2015 RR245 via near-simultaneous multi-filter photometry

## Selected Presentations and Talks

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- **[Outreach Talk]** : Irish Astronomical Association Lecture, Belfast, UK Jan. 2025  
*Exploring our Solar System: Past, Present, and Future*
- **[Seminar]** : Queen's University Belfast, Belfast, UK Dec. 2024  
*Simulating Objects Rotating Circumsolar-ly; Howmany Arethere? (Centaurs in the LSST)*

- **[Outreach Talk]** : Northern Ireland Amateur Astronomy Society, Ballyclaire, UK Dec. 2024  
*Exploring our Solar System: Past, Present, and Future*
- **[Conference Talk]** : LSST@Europe 6, La Palma (Virtual) Sep. 2024  
*Predicted Detections and Characterisations of Centaurs in the Era of LSST*
- **[Invited Talk]** : Institute for Astronomy, University of Edinburgh Sep. 2024  
*Predictions for the Discoveries of Centaurs in the LSST*
- **[Conference Talk]** : TNO 2024, Taiwan Jun. 2024  
*Predicted Detections and Characterisations of Centaurs in the Era of LSST*
- **[Seminar]** : Queen’s University Belfast, Belfast, UK May. 2024  
*Predictions for Detections and Characterisations of Centaurs in the Era of LSST*
- **[DEI Seminar]** : Queen’s University Belfast, Belfast, UK Feb. 2024  
*Equitea: Relocating in Academia (host and discussion chair)*
- **[DEI Seminar]** : Queen’s University Belfast, Belfast, UK Oct. 2023  
*Equitea: Imposter Syndrome in Academia (co-presenter)*

## Technical Skills

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**Coding Languages:** Extensive knowledge in Python (`numpy`, `pandas`, `astropy`, `multiprocessing`, `numba`, etc.) for data analysis, manipulation, modelling, and visualisation; MySQL for large database management/querying; Bash (incl. `vim`, `cron`, etc.) for accessing and creating scripts for remote HPC and local workstation usage; working proficiency in C, HTML/CSS

**Software:** Extensive experience using `sorcha`, a survey simulator for LSST; `Slurm` for efficient CPU allocation and management in large-scale model simulations on multiple HPC systems; `git`/`GitHub` for local and remote version management of both personal work and collaborative projects, developing unit tests, and building documentation; `SAOImageDS9`/`IRAF` for reduction and visualisation of observational data; working proficiency in virtual machines such as `Docker` and `UTM`

**Human Languages:** English (native), working proficiency in French and Irish

## Scholarships, Awards, and Grants

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- **LSST:UK Travel Grant** (£1.5k)  
Travel grant to attend the conference TNO 2024 in Taiwan in person
- **LSST-DA Data Science Fellowship** (~\$6k)  
Training programme to bolster PhD skills in large data manipulation in the era of LSST
- **Department for the Economy (DfE) Postgraduate Studentship** (~£72k)  
Studentship awarded to pay tuition costs and moderate stipend for three years of doctoral research (2022-2025)
- **Greer Prize** (£0.5k)  
Annual award made to the top MSci Physics graduand at Queen’s University Belfast

## Teaching and Supervision

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- **Student Supervision** Jun. 2023 - Aug. 2023  
Lead supervisor for an undergraduate summer internship project which created high quality outreach material, including posters and bookmarks
- **Undergraduate Mathematics Teaching** Jan. 2023 - present  
Marking weekly mathematics assignments for first year undergraduates, leading tutorial classes, and creating worked examples
- **Physics Computer Labs** Oct. 2023 - Jan. 2024  
Supervising for third year undergraduate computer programming modules, including training students in Python skills for data analysis, creating physical models in Python, and writing up reports based on simulations

## Outreach and Service

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- **Northern Ireland Science Festival** // *Organiser* Feb. 2023/24/25  
Co-organiser for annual research centre outreach day, planned and ran hands-on kid-friendly activities, designed promotional material and posters to advertise, and presented solar system science in Astronomy on Tap talk
- **ARC Equitea Committee** // *Chair/Co-Founder* Jul. 2023 - present  
Current chair and co-founder of graduate student-led DEI committee. Hosted, chaired, and presented several seminars on DEI topics such as imposter syndrome, relocation, and hiring processes. Secured university funding (£350) for future external speakers
- **TNO 2024 Session Co-Chair** // *Grad Student Co-Chair* Jun. 2024  
Co-chaired conference session, including introducing speakers and managing audience questions

## Affiliations

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Member of the Institute of Physics (**IOP**); Fellow of the Royal Astronomical Society (**RAS**); member of the LSST Solar System Science Collaboration (**LSST SSSC**); LSST:UK Junior Associate w/ LSST data rights (**LSST:UK JA**)

## References

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**Dr. Meg Schwamb**  
*PhD Supervisor*  
Queen's University Belfast  
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**Dr. Pedro Bernardinelli**  
*Close Collaborator*  
University of Washington  
([phbern@uw.edu](mailto:phbern@uw.edu))

**Prof. Alan Fitzsimmons**  
*PhD Second Supervisor*  
Queen's University Belfast  
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