

Joseph Murtagh

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Affiliation & Education

Postdoc	University of Washington , Postdoctoral Fellowship Joint DiRAC Fellowship and Baum Postdoctoral Fellow for Innovative Astronomy	Mar. 2026 – present
PhD	Queen's University Belfast , PhD (Physics) Supervisor: Dr Meg Schwamb Thesis: <i>Small Rocks, Big Data: Towards Centaurs, Neptune Trojans, and Comets in the Legacy Survey of Space and Time</i>	Oct. 2022 – Dec. 2025
MSci	Queen's University Belfast , Masters in Science (Physics w/ Astrophysics) <i>First-Class Honours</i> Dissertation: <i>Photometric Analysis of Comets in Wide Field Surveys</i>	Oct. 2018 - Jul. 2022

Publications

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

- **Murtagh, J.**, Schwamb, M. E., Kelley, M. S. P., et al., *Multi-year Ground-based Survey Photometry of Comet 103P/Hartley 2 and Centaur (2060) Chiron: A Tale of Two Comets in the Pre-LSST Era*, (submitted)
I performed a photometric study of two active cometary objects with wide-field survey photometry from ZTF and ATLAS. I also programmatically obtained follow-up observations with the LCO network. I led the analysis and writing up of this work
- **Murtagh, J.**, Schwamb, M. E., Bernardinelli, P. H., et al., *Predictions of the LSST Solar System Yield: Prospects for the Neptune Trojans*, AJ, 171, 2
I constructed a best dynamical+colour model of the Neptune Trojans 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
- **Murtagh, J.**, Schwamb, M. E., Merritt, S. R., et al., *Predictions of the LSST Solar System Yield: Discovery Rates and Characterizations of Centaurs*, AJ, 170, 98
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
- Chandler, C. O., Bernardinelli, P. H., Jurić, M., et al. (including **Murtagh, J.**), *NSF-DOE Vera C. Rubin Observatory Observations of Interstellar Comet 3I/ATLAS (C/2025 N1)*, (accepted)
I utilised the survey simulator Sorcha to provide predictions for future observations of 3I/ATLAS and wrote a subsection in the manuscript on this
- Gillan, A. F., Fitzsimmons, A., Chandler, C. O., et al. (including **Murtagh, J.**), *On the Border: Searching for Cometary Activity Near the Centaur-JFC Transition Line and Possible Jupiter Trojan Activity*, PSJ, 7, 1
I provided code for the reduction of the optical INT photometry obtained in this study
- Kavelaars, JJ, Buie, M. W., Fraser, W. C., et al. (including **Murtagh, J.**), *An Extremely Deep Rubin Survey to Explore the Extended Kuiper Belt and Identify Objects Observable by New Horizons*, ApJS, 280, 8
I instructed on the usage of the survey simulator Sorcha in section 3.4, and provided high level feedback on this section
- 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*, AJ, 170, 100
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*, AJ, 170, 99
I provided estimated colour measurements in LSST filters for all major populations that are simulated in this work
- Holman, M. J., Bernardinelli, P. H., Schwamb, M. E., et al. (including **Murtagh, J.**), *Sorcha: Optimized Solar System Ephemeris Generation*, AJ, 170, 97
I contributed to the development of the software detailed in this paper

- 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_g 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

Observing Experience

- **Las Cumbres Observatory** (ongoing) 2023-2025
Primary observation programmer on programme to monitor Centaur Chiron over its entire observable period to check for outburst signatures and activity evolution
- **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

- **[Invited Talk]** : ZTF Solar System Working Group (Virtual) Oct. 2025
Multi-year Ground-based Survey Photometry of Comet 103P/Hartley 2 and Centaur (2060) Chiron: A Tale of Two Comets in the Pre-LSST Era
- **[Conference Talk]** : EPSC-DPS, Helsinki, Finland Sep. 2025
The Captured and the Crossing: Predictions for the LSST Discovery Yields for Neptune Trojans and Centaurs
- **[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, Ballyclare, 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

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

Scholarships, Awards, and Grants

- **LSST:UK Travel Grant** (€1.2k)
Travel grant to attend in-person sprint for LINCC Incubator project Layup
- **Royal Astronomical Society Travel Grant** (£1k)
Travel grant to attend the conference EPSC-DPS conference in Helsinki in person
- **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

- **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

- **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

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

Dr. Meg Schwamb

PhD Supervisor

Queen's University Belfast
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Dr. Pedro Bernardinelli

Close Collaborator

University of Washington
(phbern@uw.edu)

Prof. Alan Fitzsimmons

PhD Second Supervisor

Queen's University Belfast
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