Niamh Mallaghan

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Research Interests

Final year PhD student studying exoplanetary systems with a specific interest in finding giant exorings. My research focuses both on finding systems on a larger scale as well as their photometric and spectroscopic characterisation. I am also generally interested in any unique and unusual light curves that push the boundaries of our current understanding of exoplanets and require unconventional modelling and analysis.

Affiliation & Education

PhD **Queen's University Belfast**, PhD (Physics) Oct. 2023 – Sep. 2026

Supervisor: Dr Ernst de Mooij

Thesis: *Searching for Giant Exorings*

MPhys **Queen's University Belfast**, Masters in Physics (Physics) Sep. 2019 - Jul. 2023

Upper Second-Class Honours

Dissertation: *Probing the Spectroscopic Signatures of Stellar Activity*

Publications

- **Mallaghan, N.**, de Mooij, E. J., Watson, C. A., et al., *An Enigmatic Short-Period Circumsecondary Disk Candidate in Orion*, (in prep)
  This paper focuses on an enigmatic transiting object in Orion which shows a deep and asymmetric light curve. I investigated a number of hypotheses to aid in the characterisation of it, including modelling, MCMC fitting and analysing the results. I led the simulations, analysis, and writing up of this work
- **Mallaghan, N.**, de Mooij, E. J., Watson, C. A., et al., *Spectroscopic Analysis of a Multi-Year Transiting Ring Candidate ASASSN-21js*, (in prep)
  This paper focuses on the spectroscopic analysis of ASASSN-21js, a giant exoring candidate. Analysis of this object will help to determine the composition and orientation of the potential rings. I am leading on the observations, analysis, and writing up of this work

Technical Skills

Coding Languages: Extensive knowledge in Python (`numpy`, `pandas`, `astropy`, `batman`, `numba`, etc.) for data analysis, manipulation, modelling, and visualisation

Other Software: Experience using DS9, hipercam pipeline, and DRAGONS pipeline for data reduction and analysis

Languages: English (native), intermediate proficiency in French

Observing Programs

- ***GHOST Spectrograph*** *(1.5hrs)* Gemini 2025A
  One epoch of observations using the GHOST spectrograph for the object ASASSN-21js that was accepted as a Fast Turnaround Proposal. I led on the proposal writing, as well as the Phase II set up. This analysis gave us the basis for a further proposal to study the proposed rings over the course of a number of epochs.
- ***GHOST Spectrograph*** *(4.5hrs)* Gemini 2025B
  Three further epochs of observations using the GHOST spectrograph for the ASASSN-21js that was accepted and have been scheduled for later this year. I led on the proposal writing, as well as the Phase II set up. These spectra will lead on from the analysis already completed on data taken earlier this year. We hope to investigate how the proposed rings are changing over time.

Selected Presentations and Talks

- **Conference Talk** : UK & Ireland Disks Meeting 2025, London, UK — Sep. 2025
  The Search for Exorings and a Short-Period Circumsecondary Disk Candidate
- **Conference Talk** : DDE 2025, Coimbra, Portugal — Jul. 2025
  The Search for Exorings and a Short-Period Circumsecondary Disk Candidate
- **Conference Talk** : EAS 2025, Cork, Ireland — Jun. 2025
  The Search for Exorings and a Short-Period Circumsecondary Disk Candidate
- **Seminar** : Queen's University Belfast, Belfast, UK — Apr. 2025
  The Dusty Object in Orion and the Search for Giant Exorings
- **Conference Talk** : UKExoM 2025, Leeds, UK — Mar. 2025
  The Dusty Object in Orion and the search for Giant Exorings
- **Poster Presentation** : INAM 2024, Galway, Ireland — Aug. 2024
  The Dusty Object in Orion and the search for Giant Exorings

Teaching and Supervision

- **GCSE and A-Level Tutor** — Sep. 2019 - present
  Tutoring GCSE and A-level students in Physics, Mathematics and Further Mathematics, including both one-on-one and group classes, as well as creating questions and resources for students to use in their studies
- **Physics Level 2 Labs** — Sep. 2023 - Jan. 2025
  Supervising for second year undergraduate lab experiments, including teaching students the theoretical background to experiments, instructing students on how to complete experiments over a range of areas in physics, and fixing experimental equipment for students
- **Undergraduate Mathematics Teaching** — Sep. 2025 - present
  Marking weekly mathematics assignments for first year undergraduates, leading tutorial classes, and creating worked examples

Outreach and Service

- **QUB Women in STEM Society** // *Co-founder / President / Secretary* — Nov. 2022 - Jul. 2025
  Co-founded and served, in different terms, as President and Secretary. I helped to organise bi-weekly events, some of the largest of which include a Networking Night with over 25 companies and 300 attendees, and the first NI Women in STEM conference, as well as applying for and attaining over £3000 in grants/sponsorship to run these events and more
- **ARC contribution to the Northern Ireland Science Festival** // *Organiser* — Feb. 2024/25
  Co-organiser for annual research centre outreach day, planned and ran hands-on kid-friendly activities, and presented exoplanetary science in talks for Astronomy on Tap
- **ARC Equitea Committee** // *Chair / Member* — Jul. 2024 - present
  Current chair and member of graduate student-led DEI (Diversity, Equity and Inclusion) committee. Hosted, chaired, and presented several seminars on DEI topics such as imposter syndrome, unconscious bias, and relocation. Secured university funding (£350) for future external speakers

Outreach and DEI talks

- **Seminar** : Queen's University Belfast, Belfast, UK — Jun. 2025
  Academic Publishing Discussion (presenter and discussion chair) – approx. 30 attendees
- **Outreach Talk** : U3a Group, Bangor, UK — Mar. 2025
  Searching for Giant Exorings – approx. 30 attendees
- **DEI Seminar** : Queen's University Belfast, Belfast, UK — Mar. 2025
  Equitea: Unconscious Bias in Academia (presenter and discussion chair) – approx. 30 attendees
- **Outreach Talk** : Astronomy on Tap, Belfast, UK — Feb. 2025
  Why You Should Care About Rings – approx. 50 attendees

- **Outreach Talk** : Irish Astronomical Association Lecture, Belfast, UK — Dec. 2024
  Searching for Giant Exorings – approx. 30 attendees
- **Outreach Talk** : Three Minute Thesis Competition, Queen's Unverisity Belfast, UK — Oct. 2024
  Searching for Giant Exorings – approx. 50 attendees – second place prize
- **Outreach Talk** : Northern Ireland Amateur Astronomy Society, Ballyclare, UK — Oct. 2024
  Searching for Giant Exorings – approx. 40 attendees
- **DEI Seminar** : Queen's University Belfast, Belfast, UK — Oct. 2024
  Equitea: 'Survival Guide' to Academia (co-presenter and discussion chair) – approx. 30 attendees
- **Outreach Talk** : Astronomy on Tap, Belfast, UK — Feb. 2024
  Why The Sun Is In My Way – approx. 40 attendees

Affiliations

Member of the Institute of Physics (**IOP**); Fellow of the Royal Astronomical Society (**RAS**); member of the NGTS Consortium (**NGTS**)

References

Dr. Ernst de Mooij
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Queen's University Belfast
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Prof. Christopher Watson
PhD Second Supervisor
Queen's University Belfast
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Leiden Observatory
(kenworthy@strw.leidenuniv.nl)