Dr. Cathal Maguire

Postdoctoral Researcher · University of Bristol

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Education

Ph.D., Astrophysics — *Trinity College Dublin*, Dublin, Ireland — *2020 – 2024*

B.A. (Mod), Physics & Astrophysics — *Trinity College Dublin*, Dublin, Ireland — *2016 – 2020*

Graduated with First Class Honours

Awarded a Trinity Gold Medal for "exceptional merit at degree examinations"

Research Experience

Postdoctoral Researcher | PI: Dr. Hannah Wakeford — *University of Bristol*, Bristol, UK

- *JWST transmission spectroscopy observations of exoplanetary atmospheres* — *Jan 2025 – Present*
- *Applied advanced light curve modelling techniques to study multi-dimensionality of exoplanetary atmospheres*

PhD Researcher | Supervisor: Prof. Neale Gibson — *Trinity College Dublin*, Dublin, Ireland

- *High-resolution transmission spectroscopy observations of exoplanetary atmospheres with VLT/ESPRESSO* — *Sep 2020 – Sep 2024*
- *Applied advanced Bayesian inference techniques to large high-resolution data sets to constrain atmospheric composition, vertical T-P profiles, and dynamics of ultra-hot Jupiters*
- *Monitored ultra-hot Jupiter atmospheres over months/years via novel and archival observations*
- *Developed a novel rotational broadening kernel which allows distinct atmospheric limbs to be separated in velocity and modelled/retrieved separately*

SSDF Visitor | Supervisor: Dr. Elyar Sedaghati — *European Southern Observatory*, Santiago, Chile

- *Compared efficacy of high-resolution telluric removal techniques from high-resolution observations* — *Mar 2023 – May 2023*
- *Conducted multiple nights of observations at the Very Large Telescope (VLT), Paranal Observatory*
- *Utilised the ESPRESSO instrument for both scientific and calibration observations*

Research Assistant | Supervisor: Prof. Salvatore Orlando — *PRACE*, Cineca, Bologna, Italy

- *Worked remotely as part of the PRACE Summer of High-Performance Computing (SoHPC)* — *Jun 2020 – Aug 2020*
- *Simulated highly energetic supernovae and investigated the interaction of their ejecta with their surrounding environments*
- *Focused on efficient data management and remote high-performance computing with the GALILEO supercomputer*

Undergraduate Researcher | Supervisor: Prof. Aline Vidotto — *Trinity College Dublin*, Dublin, Ireland

- *Modelled the 1D velocity and temperature profile of the stellar wind of the red supergiant Alpha Orionis* — *Sep 2019 – Jan 2020*
- *Compared radiative transfer modelling of stellar wind with radio observations*

Teaching & Outreach

Teaching Assistant — *Trinity College Dublin*, Dublin, Ireland

- *Undergraduate teaching assistant for Junior Sophister astrophysical labs* — *2020 – 2024*
- *Facilitated laboratory exercises, providing hands-on support to students and ensuring a conducive learning environment*
- *Completed a postgraduate course focusing on pedagogical methods and best practices*

STEM Mentor — *Innumeris Education*, Dublin, Ireland

- *Mentored final year secondary school students from underrepresented backgrounds* — *2020 – 2022*
- *Assisted with university admissions procedures, offering insights and support*
- *Delivered tailored tutoring sessions, addressing individual learning needs*

Publications

Peer-reviewed Publications

9 Gressier, Amélie; *et al.* (incl. **Maguire, Cathal**), 2025, *JWST-TST DREAMS: Sulfur Dioxide in the Atmosphere of the Neptune-mass Planet HAT-P-26 b from NIRSpec G395H Transmission Spectroscopy,* ***AJ, 170, 292***.

8 Ramkumar, Swaetha; *et al.* (incl. **Maguire, Cathal**), 2025, *New perspectives on MASCARA-1b: A combined analysis of pre- and post-eclipse emission data using CRIRES$^+$,* ***A&A, 695, A110***.

7 **Maguire, Cathal**; *et al.*, 2024b, *Assessing methods for telluric removal on atmospheric retrievals of high-resolution optical exoplanetary transmission spectra,* ***A&A, 692, A8***.

6 **Maguire, Cathal**; *et al.*, 2024a, *High-resolution atmospheric retrievals of WASP-76b transmission spectroscopy with ESPRESSO: Monitoring limb asymmetries across multiple transits,* ***A&A, 687, A49***.

5 Fortune, Mark; *et al.* (incl. **Maguire, Cathal**), 2024, *How do wavelength correlations affect your transmission spectrum? Application of a new fast and flexible 2D Gaussian process framework to transiting exoplanet spectroscopy,* ***A&A, 686, A89***.

4 Ramkumar, Swaetha; *et al.* (incl. **Maguire, Cathal**), 2023, *High-resolution emission spectroscopy retrievals of MASCARA-1b with CRIRES$^+$: strong detections of CO, H2O, and Fe emission lines and a C/O consistent with solar,* ***MNRAS, 525, 2985***.

3 Gandhi, Siddharth; *et al.* (incl. **Maguire, Cathal**), 2023, *Retrieval Survey of Metals in Six Ultrahot Jupiters: Trends in Chemistry, Rain-out, Ionization, and Atmospheric Dynamics,* ***AJ, 165, 242***.

2 **Maguire, Cathal**; *et al.*, 2023, *High-resolution atmospheric retrievals of WASP-121b transmission spectroscopy with ESPRESSO: Consistent relative abundance constraints across multiple epochs and instruments,* ***MNRAS, 519, 1030***.

1 Gibson, Neale P.; *et al.* (incl. **Maguire, Cathal**), 2022, *Relative abundance constraints from high-resolution optical transmission spectroscopy of WASP-121b, and a fast model-filtering technique for accelerating retrievals,* ***MNRAS, 512, 4161***.

Conference & Seminar Talks

14 **May 2026**, "Limb from Limb: Observing Exoplanet Atmospheric Asymmetries from the Ground and Space", *Astronomy Seminar*, University of Warwick, UK*

13 **May 2026**, "Observing the 3D-ness of Exoplanet Atmospheres", *Pint of Science UK*, Bristol, UK*

12 **April 2026**, "Limb from Limb: Observing Atmospheric Asymmetries from the Ground and Space.", *BOWIE+ Seminar Series*, UK*

11 **April 2026**, "Resolving the Limbs of HD 209458 b with JWST NIRCam Transmission Spectroscopy", *UKExoM 2026*, University of Bristol, UK†

10 **November 2025**, "Observing the 3D-ness of Exoplanet Atmospheres", *Astronomy Ireland Public Lecture*, Ireland*

9 **July 2025**, "Multi-dimensional insights from high- and low-resolution spectroscopy.", *Exoclimes VII*, Université de Montréal, Montréal, Canada†

8 **November 2024**, "Probing the atmospheres of ultra-hot Jupiters at high-resolution.", *Astrophysics Seminar*, University of Bristol, UK*

7 **August 2023**, "Optimising the removal of telluric contamination from high-resolution transmission spectra.", *Irish National Astronomy Meeting (INAM)*, University College Cork, Ireland†

6 **July 2023**, "Optimising the removal of telluric contamination from high-resolution transmission spectra.", *Exoplanets by the Lake*, Starnberg, Germany†

5 **May 2023**, "Optimising the removal of telluric contamination from high-resolution transmission spectra.", *European Southern Observatory*, Santiago, Chile*

4 **April 2023**, "Transmission Spectroscopy of WASP-121b with ESPRESSO.", *Universidad Adolfo Ibáñez*, Santiago, Chile*

3 **December 2022**, "Transmission Spectroscopy of WASP-121b with ESPRESSO.", *DUblin STar formation, DeBris dIsks and plaNets (DUSTBIN) Meeting*, Maynooth University, Ireland*

2 **September 2022**, "Above the Clouds: Probing the atmosphere of the ultra-hot Jupiter WASP-121b with VLT/ESPRESSO.", *AIP Thinkshop 2022: High-resolution spectroscopy for exoplanet atmospheres and biomarkers*, Leibniz Institute for Astrophysics, Potsdam, Germany†

1 **August 2022**, "Above the Clouds: Probing the atmosphere of the ultra-hot Jupiter WASP-121b with VLT/ESPRESSO.", *Irish National Astronomy Meeting (INAM)*, Dunsink Observatory, Ireland†

(*Invited, †Contributed)

Current Research Interests (selected)

- Exoplanetary atmospheres (observations & modelling)
- Bayesian inference methods
- Low- and High-resolution spectroscopy
- High-performance computing

References are available upon request. Last updated: 2026-06-02.

Professional Skills

- **Programming / Markup Languages**: Python, IDL, C/C++, JavaScript, HTML/CSS, LaTeX
- **Data Analysis Techniques**: Bayesian inference, Cross-correlation analysis, Astronomical image reduction, Radiative transfer, Open-source code management, Web development
- **Languages**: English (native), Irish (native), Spanish (intermediate)

References are available upon request. Last updated: 2026-06-02.