

Cathal Maguire

Ph.D. Student in Astrophysics · Trinity College Dublin

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Education

- 2020–Present **Ph.D. in Astrophysics**, *Trinity College Dublin*, Dublin, Ireland
- Expected Graduation: September 2024.
- 2016–2020 **B.A. in Physics & Astrophysics**, *Trinity College Dublin*, Dublin, Ireland
- Graduated with First Class Honours.
 - Received a Gold Medal for “exceptional merit at degree examinations”.

Research Experience

- Sep 2020–Present **Postgraduate Researcher**, *Trinity College Dublin*, Dublin, Ireland
- Primarily focused on high-resolution transmission spectroscopy observations of exoplanetary atmospheres, under the supervision of Prof. Neale Gibson.
 - Applied advanced Bayesian inference techniques to constrain the atmospheric composition and dynamics of ultra-hot Jupiters.
- Mar 2023–May 2023 **SSDF Studentship**, *European Southern Observatory*, Santiago, Chile
- Compared efficacy of high-resolution telluric removal techniques, under the co-supervision of Elyar Sedaghati and Alain Smette.
 - Conducted multiple nights of observations at the Very Large Telescope (VLT), Paranal Observatory.
 - Utilised the ESPRESSO instrument for both scientific and calibration observations.
- Jun 2020–Aug 2020 **Research Assistant**, *PRACE*, CINECA, Bologna, Italy
- Worked remotely as part of the PRACE Summer of High-Performance Computing (SoHPC), under the supervision of Prof. Salvatore Orlando.
 - Simulated highly energetic supernova explosions, and investigated the morphology and interactions of their ejecta with their surrounding environments.
- Sep 2019–Jan 2020 **Undergraduate Research Project**, *Trinity College Dublin*, Dublin, Ireland
- Modelled the 1D velocity and temperature profile of the stellar wind of the red supergiant Alpha Orionis, under the supervision of Prof. Aline Vidotto.
 - Radiative transfer modelling of the stellar wind simulations were compared with radio observations, culminating in my undergraduate thesis.

Teaching & Outreach

- Sep 2020–May 2023 **Teaching Assistant**, *Trinity College Dublin*, Dublin, Ireland
- Undergraduate teaching assistant for Junior Sophister astrophysical labs.
 - Facilitated laboratory exercises, providing hands-on support to students.
 - Maintained lab manuals and equipment, ensuring a conducive learning environment.
 - Successfully completed a postgraduate course focusing on pedagogical methods and best practices.

Sep 2020–May 2022 **STEM Mentor**, *Innumeris Education*

- Mentored final year secondary school students from underrepresented backgrounds in STEM.
- Provided assistance with university admissions procedures, offering insights and support.
- Delivered tailored tutoring sessions, addressing individual learning needs.

Publications & Conference Talks (selected)

First-author peer-reviewed publications

C. Maguire, N. P. Gibson, S. K. Nugroho, S. Ramkumar, M. Fortune, S. R. Merritt, & E. de Mooij (2023). *High-resolution atmospheric retrievals of WASP-121b transmission spectroscopy with ESPRESSO: Consistent relative abundance constraints across multiple epochs and instruments*, *MNRAS*, **519**, 1030.

Conference Talks

August 2023 **Irish National Astronomy Meeting (INAM) 2023**, *University College Cork*, Ireland

July 2023 **Exoplanets by the Lake**, *Vier Jahreszeiten Hotel*, Starnberg, Germany

November 2022 **DUBlin STar formation, DeBris disks and plaNets (DUSTBIN) Meeting**, *Maynooth University*, Ireland

September 2022 **AIP Thinkshop 2022: High-resolution spectroscopy for exoplanet atmospheres and biomarkers**, *Leibniz Institute for Astrophysics*, Potsdam, Germany

August 2022 **Irish National Astronomy Meeting (INAM) 2022**, *Dunsink Observatory*, Ireland

Professional Skills

Research Interests Exoplanetary atmospheres (observations & modelling),
High-resolution spectroscopy,
Atmospheric retrievals of low- & high-resolution spectra,
Planet formation, High-performance computing,
Telluric correction of high-resolution spectra.

Programming Languages Python (advanced), IDL (intermediate), C/C++ (intermediate),
bash (intermediate), JavaScript (basic).

Web Interface & Misc. LaTeX (advanced), HTML/CSS (intermediate).

Data Analysis Techniques Bayesian inference, Cross-correlation analysis.

Languages English (native), Irish (native), Spanish (intermediate).

Miscellaneous

Dec 2015–Jun 2020 **Sales Consultant**, *Next Retail Plc.*, Dublin, Ireland

Jun 2018–Aug 2018 **Rides Operator**, *Canada's Wonderland*, Vaughan, Canada

Interests & Activities

I am passionate about sports, having participated in teams across a variety of sports, including soccer and gaelic football.

I am also interested in science and advancing technologies, with my main interests coming in the physical and space sciences.