# Luke Titus Parker

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DPhil (PhD) Student, University of Oxford, UK

## Research Interests

- Characterization of exoplanet atmospheres including clouds, chemistry, dynamics, and formation;
- Developing novel uses of high resolution spectroscopy and testing preparatory science for the ELT;
- Direct imaging spectroscopy of young exoplanets and brown dwarf systems;
- The observability of metal-rich atmospheres on warm Sub-Neptunes and ultra-hot super-Earths.

## Education & Research

**DPhil Astrophysics** - University of Oxford, UK — 2022 - Present
PhD Thesis: *A high-resolution view of extreme exoplanet atmospheres*, Supervisor: Prof. Jayne Birkby

**MPhys Physics & Astronomy, 1st Class Honours** - Durham University, UK — 2018 - 2022
Master's Thesis: *Searching for nova shells in IGAPS*, Supervisor: Prof. Simone Scaringi
(Received the J.A. Chalmers Thesis Prize in Physics and Astronomy)
Undergraduate Thesis: *Verification of TOI 2040.01, A TESS Hot Jupiter Candidate*, Supervisor: Prof. Mark Swinbank
(Received the Florence Nightingale Prize for Graphical Excellence)

**HARMONI Research Internship** - University of Oxford, UK — 2021
*Calibrating the Spectra of Arc Lamps for HARMONI/ELT Wavelength Calibration*, Supervisor: Prof. Niranjan Thatte

## Observing Programmes

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| **PI** CRIRES+/VLT(8.2m), **8.1 h** *(Tracing the formation history of super-Jupiters with novel silicate abundance ratios in the M-band)* | 2024 |
| **PI** CRIRES+/VLT(8.2m) (Joint with J. Birkby), **7.2 h** *(Detecting SiO in the atmosphere of a young giant exoplanet)* | 2024 |
| **Co-I** NALES/LBT(8.4m), **2 nights** *(Searching for weather on the HR 8799cde exoplanets)* | 2025 |
| **Co-I** ERIS/VLT(8.2m), **4.5 h** *(Characterising exoplanet and brown dwarf systems with ERIS imaging)* | 2025 |
| **Co-I** CRIRES+/VLT(8.2m), **6.5 h** *(Investigating the role of atmospheric metallicity in inflating the hot Jupiter WASP-193b)* | 2024 |
| **Co-I** MUSE/VLT(8.2m), **16.3 h** *(Unravelling the nature of J0528+2838 - bow-shock or a nova shell?)* | 2023 |

**On-site observing experience:** ERIS/VLT(8.2m), 0.6 nights, Paranal Observatory. **Scheduled Dec 2025**

**Data reduction and analysis experience related to:** Very high resolution infrared echelle spectroscopy (CRIRES & CRIRES+/VLT, IGRINS/Gemini) and low and medium-resolution spectroscopy (NIRSpec/JWST, NIRISS-SOSS/JWST, MIRI/JWST). Familiarity with time-resolved photometry (TESS), wide-field imaging surveys (IGAPS survey), and integral-field spectroscopy (SINFONI/VLT, MUSE/VLT).

## Publications

**First Author:**

**[2]** **Parker, Luke T.**; Mendonça, João M.; Diamond-Lowe, Hannah; Birkby, Jayne L.; Meech, Annabella; Vaughan, Sophia R.; Brogi, Matteo; Fisher, Chloe; Buchhave, Lars A.; Bello-Arufe, Aaron; Kreidberg, Laura; Dittmann, Jason, *Limits on the atmospheric metallicity and aerosols of the sub-Neptune GJ 3090 b from high-resolution CRIRES+ spectroscopy*, **2025**, MNRAS, 538, 3263. 2025MNRAS.538.3263P.

**[1]** **Parker, Luke T.**; Birkby, Jayne L.; Landman, Rico; Wardenier, Joost P.; Young, Mitchell E.; Vaughan, Sophia R.; van Sluijs, Lennart; Brogi, Matteo; Parmentier, Vivien; Line, Michael R., *Into the red: an M-band study of the chemistry and rotation of $\beta$ Pictoris b at high spectral resolution*, **2024**, MNRAS, 531, 2356. 2024MNRAS.531.2356P.

**Co-Author:**

**[2]** Ilkiewicz, Krystian et al. including **Parker, Luke T.**, *A persistent bow shock in a diskless magnetised accreting white dwarf*, Nature Astronomy, *Accepted.*

**[1]** Ravet, Matthieu et al. including **Parker, Luke T.**, *Multi-modal atmospheric characterization of $\beta$ Pictoris b, Adding high-resolution continuum spectra from GRAVITY*, A&A, 2025, *Accepted.*

## Teaching

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| Tutor for Stellar Astrophysics and Galaxies (4th year course), 1:4 teaching ratio, Oxford University | 2025 |
| Tutor for Astrophysics revision classes (4th year), 1:6 teaching ratio, Oxford University | 2025 |
| Tutor for Cosmology (4th year course), 1:4 teaching ratio, Oxford University | 2024 |

## Computing Skills

Advanced: **Python**; Intermediate: **Bash**, **HTML**, **LaTeX**; Working Knowledge: **C++**

**Technical skills:** Detailed knowledge of ESO data analysis pipelines. Experience with radiative transfer modelling with GENESIS, PETITRADTRANS, and PICASO, chemistry and cloud modelling with FASTCHEM and VIRGA. Familiarity with self-consistent modelling with HELIOS. Experience with high performance computing including slurm scheduling, numba acceleration, and parallelisation. Experience with Bayesian inference including the use of multi-nested sampling and Markov-chain Monte Carlo.

## Conferences & Talks

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| **Invited Talk** - IEA Seminar, Santiago, Chile | Dec 2025 |
| **Contributed Talk** - Planetary Formation and Exoplanets in the ELT Era, ESO Garching, DE | Nov 2025 |
| **Contributed Talk** - 30 years of 51 Pegasi b, OHP, FR | Oct 2025 |
| **Poster** - Exoclimes VII, Montreal, CA | Jul 2025 |
| **Contributed Talk** - HR by the Sun 2, Florence, IT | Jun 2025 |
| Breakthrough Discuss, Oxford, UK | May 2025 |
| **Poster** - Planets Day, Oxford, UK | Mar 2025 |
| **Contributed Talk** - HR by the Sun, Nice, FR | Jan 2025 |
| **Contributed Talk** - Two HoRSEs, Berlin, DE | Jul 2024 |
| **Splinter Talk** - Exoplanets V, Leiden, Nl | Jun 2024 |
| **Poster** - Exoplanets V, Leiden, Nl | Jun 2024 |
| **Contributed Talk** - UKEXOM 2024, Birmingham, UK | Apr 2024 |
| **Contributed Talk** - Rocky Worlds III, Zurich, CH | Jan 2024 |
| **Poster** - The Sagan Summer Workshop, Pasadena, USA | Jul 2023 |
| **Contributed Talk** - National Astronomy Meeting, Cardiff, UK | Jul 2023 |
| **Poster** - Exoclimes VI, Exeter, UK | Jun 2023 |
| STFC Astrophysics Summer School, Dundee, UK | Aug 2022 |
| Spatially resolved Spectroscopy with ELTs, Oxford, UK | Jun 2021 |

## Outreach & Engagement

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| Radcliffe Observatory open doors ($\sim$1000 attendees) outreach event, Oxford, UK | 2024 |
| Outreach talks to summer school students: 'PhDs in Astrophysics', Oxford, UK | 2023 - 2025 |
| Into the Cosmos ($\sim$800 attendees) outreach event, Oxford, UK | 2023 |
| Panel member for outreach events 'PhDs at Oxford', Oxford, UK | 2022 - 2024 |
| Mentorship and careers assistance for $\sim$10 undergraduate students | 2022 - 2025 |
| New Worlds outreach event, Oxford, UK | 2025 |

## Professional activities

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| Organiser, Oxoplanets journal club | 2025 |
| Graduate representative for Astrophysics (staff-student liaison) | 2023 - 2024 |
| Organiser, Astrophysics colloquium speaker-student lunch | 2023 - 2024 |
| Collaboration meeting chair, Oxford-Warwick high resolution spectroscopy | 2022 - 2023 |

## Awards & Prizes

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| J.A. Chalmers Thesis Prize in Physics and Astronomy | 2022 |
| Advanced Astrophysics module prize | 2022 |
| Durham University Physics Outstanding Achievement | 2022 |
| The Florence Nightingale Prize for Graphical Excellence | 2021 |
| The Physics & Mathematics Alumni Award, Trevelyan College | 2020 |

## Grants & Funding

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| Travel grant, Exo-ELT, ESO | 2025 |
| Graduate student grant, Sagan Summer Workshop, JPL | 2023 |
| Graduate student grant, Exoclimes VI, Exeter | 2023 |
| Joint Brasenose College & Astrophysics DPhil Studentship | 2022 |

## References

On request.