

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

PI CRIRES+ / VLT(8.2m), 8.1 h (<i>Tracing the formation history of super-Jupiters with novel silicate abundance ratios in the M-band</i>)	2024
PI CRIRES+ / VLT(8.2m) (Joint with J. Birkby), 7.2 h (<i>Detecting SiO in the atmosphere of a young giant exoplanet</i>)	2024
Co-I NALES / LBT(8.4m), 2 nights (<i>Searching for weather on the HR 8799cde exoplanets</i>)	2025
Co-I ERIS / VLT(8.2m), 4.5 h (<i>Characterising exoplanet and brown dwarf systems with ERIS imaging</i>)	2025
Co-I CRIRES+ / VLT(8.2m), 6.5 h (<i>Investigating the role of atmospheric metallicity in inflating the hot Jupiter WASP-193b</i>)	2024
Co-I MUSE / VLT(8.2m), 16.3 h (<i>Unravelling the nature of J0528+2838 - bow-shock or a nova shell?</i>)	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 β Pictoris b at high spectral resolution*, **2024**, MNRAS, 531, 2356. [2024MNRAS.531.2356P](#).

Co-Author:

- [4] Vaughan, Sophia R.; Birkby, Jayne L.; Batalha, Natasha E.; **Parker, Luke T.** et al. *No TiO detected in the hot Neptune-desert planet LTT-9779 b in reflected light at high spectral resolution*, A&A, 2025, Accepted.
- [3] Sutcliffe, Ben J. et al. including **Parker, Luke T.**, *Chasing the storm: Investigating the application of high-contrast imaging techniques in producing precise exoplanet light curves*, 2025, MNRAS, Accepted.
- [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 β Pictoris b, Adding high-resolution continuum spectra from GRAVITY*, A&A, 2025, Accepted.

TEACHING

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, L^AT_EX**; 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

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 - Exoclines 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 - Exoclines VI, Exeter, UK	Jun 2023
STFC Astrophysics Summer School, Dundee, UK	Aug 2022
Spatially resolved Spectroscopy with ELTs, Oxford, UK	Jun 2021

OUTREACH & ENGAGEMENT

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

PROFESSIONAL ACTIVITIES

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

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

Brasenose College travel grant	2025
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.