# Sophia Vaughan

***DPhil (PhD) Student***
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## Research Interests

- The characterisation of exoplanet atmospheres at high spectral resolution.
- Biosignatures, technosignatures and the search for extraterrestrial life.

## Education

**2020-** **DPhil Astrophysics**
**Oxford University, St John's College**
Thesis: *Reflected light from exoplanet atmospheres: towards rocky worlds*
Supervisors: Prof Jayne Birkby and Prof Raymond Pierrehumbert

**2016-2020** **MPhys Physics, $1^{st}$ Class Honours, $8^{th}$ highest score in the year**
**Oxford University, St John's College**
Masters Project: *Detection of Transiting Exoplanets with the TESS Space Mission*
Supervisor: Prof Suzanne Aigrain

## Research Experience

**2020-** **Oxford University Astrophysics DPhil, Supervisor: Prof. Jayne Birkby**
Worked on high spectral resolution techniques for characterising exoplanets in reflected light.

**2019-2020** **Oxford University Master's Project, Supervisor: Prof. Suzanne Aigrain**
Worked on using Gaussian Processes to model stellar spectra and measure stellar radial velocities.

**2019** **Joint Institute of VLBI - ERIC (JIVE), Supervisor: Prof. Huib Jan van Langevelde**
Worked on inverse phase referencing of MASERs using the Common Astronomy Software Applications package.

**2018** **Oxford University Astrophysics Summer Project, Zooniverse team, Supervisor: Dr Helen Spiers**
Worked with the Zooniverse team on public outreach projects.

## Telescope Observations

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| VLT(16.4m)/ESPRESSO | PI | 2023B | 2.5 nights | VM/dVM | *Mirror in the Desert: a high resolution reflection spectrum of the unusual ultra hot Neptune LTT-9779 b* |
| VLT(8.2m)/CRIRES+ | Co-I | 2023B | 6.6 hours | | *A Desert Island: Probing the Origins of the Desert with Atmospheric Transmission of a Hot Neptune* |
| VLT(8.2m)/ESPRESSO | Co-I | 2022B | 30 hours | | *Through the Looking Glass: a high resolution ESPRESSO survey of exoplanet reflection spectra* |
| VLT(8.2m)/CRIRES+ | Co-I | 2022A | 8 hours | dVM | *Revealing an atmosphere shrouded in mystery with high-resolution spectroscopy* |

## Data Analysis Experience

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| VLT(8.2m)/ESPRESSO | Data | Experience in analysing high-resolution spectroscopy observations of exoplanets in reflected light and of the unique challenges this poses. |
| VLT(16.4m)/ESPRESSO | Data | Experience in analysing high-resolution spectroscopy observations of exoplanets in reflected light with the 4UT mode and the differences between this and single UT mode. |
| VLT(8.2m)/CRIRES+ | Simulation | Experience in simulating high-resolution spectroscopy observations of exoplanets (transit and emission) and analysing them to verify the observational requirements for observing proposals. |
| VLT(8.2m)/ESPRESSO | Simulation | Experience in simulating high-resolution spectroscopy observations of exoplanets (reflection) and analysing them to verify the observational requirements for observing proposals. |
| ELT(39m)/HARMONI | Simulation | Experience in simulating spatially resolved observations of exoplanets (reflection) and analysing them using the 'molecule mapping' method to determine science cases for the present instrument design. |

## Teaching Experience

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| Mentor to Masters Student, Department of Physics, University of Oxford, UK | 2021-2022 |
| Astrophysics TA, Department of Physics, University of Oxford, UK | 2022 |
| Atmospheric Physics Marker, Department of Physics, University of Oxford, UK | 2022-2023 |
| Waynflete Studies Programme tutor, Magdalen College School, Oxford UK | 2023 |

## Grants, Honours and Awards

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| **Gibbs Prize**, Department of Physics, University of Oxford, UK | 2019 | £200 |
| **Gibbs Prize**, Department of Physics, University of Oxford, UK | 2018 | £150 |
| **Casberd Scholarship**, St. John's College, University of Oxford, UK | 2017-2020 | £300/yr |

## Conferences

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| Exoplanets Atmospheres to Architectures | Washington, US | Contributed Talk | Sep 2023 |
| Exoplanets by the Lake | Munich, Germany | Contributed Talk | Aug 2023 |
| Science with the Habitable Worlds Observatory and Beyond | Baltimore, US | Contributed Talk | Jul 2023 |
| National Astronomy Meeting | Cardiff, UK | Contributed Talk | Jul 2023 |
| Optimal Exoplanet Imagers | Leiden, Netherlands | Workshop | Feb 2023 |
| National Astronomy Meeting | Warwick, UK | Contributed Talk | Jul 2022 |
| Rocky Worlds II | Oxford, UK | Contributed Talk | Jul 2022 |
| Spirit of Lyot | Leiden, Netherlands | Poster | Jul 2022 |
| Exoplanets IV | Las Vegas, US | Poster | May 2022 |
| Spatially Resolved Spectroscopy with Extremely Large Telescopes | Oxford, UK | Poster | Sep 2021 |
| EAS Annual Meeting | Online | Poster | Jul 2021 |
| STScI Spring Symposium | Online | Poster | Apr 2021 |
| Habitable Worlds | Online | Poster | Feb 2021 |

## Contributions to Academia

Organisation of Scientific Meetings

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| SOC of breakout session at UK National Astronomy Meeting | Jul 2022 |

Major International Collaborations and Consortia

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| HARMONI consortium | 2023 |

## Press Releases and Outreach

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| Outreach | *Passport to the Solar System*, Oxford, UK | Volunteer | Jun 2021 |
| Outreach | *Into the cosmos*, Oxford, UK | Volunteer | Jan 2023 |
| Press | Commentary: Sophia Vaughan on searching for an exo-rainbow | Commentary | Jul 2023 |

## Languages

**Computing:** Python, LaTeX and bash. Basic knowledge of: AIPS and Matlab
**Spoken:** English (native)

## References

| | | |
|---|---|---|
| Prof Jayne Birkby | University of Oxford | jayne.birkby@physics.ox.ac.uk |
| Dr. Matthew Kenworthy | Universiteit Leiden | kenworthy@strw.leidenuniv.nl |
| Prof Matteo Brogi | Università degli Studi di Torino | matteo.brogi@unito.it |
| Dr. Sarah Casewell | University of Leicester | slc25@leicester.ac.uk |

## Publications

**First Author:**

[1] Sophia R. Vaughan, Timothy D. Gebhard, Kimberly Bott, Sarah L. Casewell, Nicolas B. Cowan, David S. Doelman, Matthew Kenworthy, Johan Mazoyer, Maxwell A. Millar-Blanchaer, Victor J. H. Trees, Daphne M. Stam, Olivier Absil, Lisa Altinier, Pierre Baudoz, Ruslan Belikov, Alexis Bidot, Jayne L. Birkby, Markus J. Bonse, Bernhard Brandl, Alexis Carlotti, Elodie Choquet, Dirk van Dam, Niyati Desai, Kevin Fogarty, J. Fowler, Kyle van Gorkom, Yann Gutierrez, Olivier Guyon, Sebastiaan Y. Haffert, Olivier Herscovici-Schiller, Adrien Hours, Roser Juanola-Parramon, Evangelia Kleisioti, Lorenzo König, Maaike van Kooten, Mariya Krasteva, Iva Laginja, Rico Landman, Lucie Leboulleux, David Mouillet, Mamadou

N'Diaye, Emiel H. Por, Laurent Pueyo, and Frans Snik. Chasing rainbows and ocean glints: Inner working angle constraints for the Habitable Worlds Observatory. MNRAS, 524(4):5477–5485, October 2023.

**Co-author:**

[2] N. L. Eisner, O. Barragán, C. Lintott, S. Aigrain, B. Nicholson, T. S. Boyajian, S. Howell, C. Johnston, B. Lakeland, G. Miller, A. McMaster, H. Parviainen, E. J. Safron, M. E. Schwamb, L. Trouille, S. Vaughan, N. Zicher, C. Allen, S. Allen, M. Bouslog, C. Johnson, M. N. Simon, Z. Wolfenbarger, E. M. L. Baeten, D. M. Bundy, and T. Hoffman. Planet Hunters TESS II: findings from the first two years of TESS. MNRAS, 501(4):4669–4690, March 2021.

[3] J. Fowler, Sebastiaan Y. Haffert, Maaike A. M. van Kooten, Rico Landman, Alexis Bidot, Adrien Hours, Mamadou N'Diaye, Olivier Absil, Lisa Altinier, Pierre Baudoz, Ruslan Belikov, Markus Johannes Bonse, Kimberly Bott, Bernhard Brandl, Alexis Carlotti, Sarah L. Casewell, Elodie Choquet, Nicolas B. Cowan, Niyati Desai, David Doelman, Kevin Fogarty, Timothy D. Gebhard, Yann Gutierrez, Olivier Guyon, Olivier Herscovici-Schiller, Roser Juanola-Parramon, Matthew Kenworthy, Elina Kleisioti, Lorenzo Konig, Mariya Krasteva, Iva Laginja, Lucie Leboulleux, Johan Mazoyer, Maxwell A. Millar-Blanchaer, David Mouillet, Emiel Por, Laurent Pueyo, Frans Snik, Dirk van Dam, Kyle van Gorkom, and Sophia R. Vaughan. Visible extreme adaptive optics on extremely large telescopes: Towards detecting oxygen in Proxima Centauri b and analogs. *arXiv e-prints*, page arXiv:2309.00725, September 2023.

[4] Niyati Desai, Lorenzo König, Emiel Por, Roser Juanola-Parramon, Ruslan Belikov, Iva Laginja, Olivier Guyon, Laurent Pueyo, Kevin Fogarty, Olivier Absil, Lisa Altinier, Pierre Baudoz, Alexis Bidot, Markus Johannes Bonse, Kimberly Bott, Bernhard Brandl, Alexis Carlotti, Sarah L. Casewell, Elodie Choquet, Nicolas B. Cowan, David Doelman, J. Fowler, Timothy D. Gebhard, Yann Gutierrez, Sebastiaan Y. Haffert, Olivier Herscovici-Schiller, Adrien Hours, Matthew Kenworthy, Elina Kleisioti, Mariya Krasteva, Rico Landman, Lucie Leboulleux, Johan Mazoyer, Maxwell A. Millar-Blanchaer, David Mouillet, Mamadou NDiaye, Frans Snik, Dirk van Dam, Kyle van Gorkom, Maaike van Kooten, and Sophia R. Vaughan. Integrated photonic-based coronagraphic systems for future space telescopes. *arXiv e-prints*, page arXiv:2309.04925, September 2023.