# Yinuo Han

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## POSITIONS

1. **Barr Fellow, Caltech, USA** Oct 2024 - Sep 2027
   Postdoctoral fellowship, Planetary Sciences, Division of Geological and Planetary Sciences

## EDUCATION

1. **PhD in Astronomy, University of Cambridge, UK** Oct 2020 - Jul 2024
   Institute of Astronomy · Trinity College · Gates Cambridge Scholar
   **Thesis:** *The Structure of Extrasolar Planetesimal Belts in Images*
   **Advisor:** Prof. Mark Wyatt

2. **BSc (Adv) (Hons), University of Sydney, Australia** Feb 2016 - Dec 2019
   Majoring in Physics, Neuroscience · First Class Honours (Physics) and the University Medal
   **Thesis:** *A Dance with Dragons: The Enigmatic Wolf-Rayet Binary Apep*
   **Advisor:** Prof. Peter Tuthill

3. **Study Abroad at University of California, Berkeley, USA** Aug 2017 - Dec 2017

## RESEARCH INTERESTS

- Debris disks, planetary system formation and evolution
- Wolf-Rayet stars, colliding-wind binaries, carbon dust production
- High-resolution imaging, optical/infrared imaging, millimeter interferometry

## RESEARCH STUDENTS

- *Secular perturbation as the origin of the dust and gas clump of Beta Pictoris.* Oct 2022
  Cambridge Part III/Masters project by *Faran Sarwar*, co–supervised with *Mark Wyatt*. – Jun 2023
- *The structure of the Beta Pictoris debris disk inferred from multi–wavelength mid–infrared images.*
  Summer research project by *Andrew Zhang*. Summer 2022

## TEACHING

1. **Topics in Astrophysics** (Distributions, Timescales, Tides, Planet Formation) 2023
   Institute of Astronomy, University of Cambridge
   Regular supervisions/tutorial classes for Part II Astrophysics/final–year undergraduate astrophysics.

2. **Structure and Evolution of Stars** 2022
   Institute of Astronomy, University of Cambridge
   Regular supervisions/tutorial classes for Part II Astrophysics/final–year undergraduate astrophysics.

3. **Oscillating Systems, Waves and Quantum Waves, Fields** 2021
   Trinity College, University of Cambridge
   Weekly supervisions/tutorial classes for Part IA Physics/first–year undergraduate physics.

4. **Physics 1B** (Electromagnetism, Fluids, Quantum Mechanics) 2019
   School of Physics, University of Sydney
   Weekly tutorial classes for first–year undergraduate physics.

## AWARDS

### University of Cambridge

*Gates Cambridge Scholarship* 2020

*Cambridge International Scholarship*, accepted Gates above instead 2020

### University of Sydney

*University Medal* 2019

*Henry Chamberlain Russell Prize for Astronomy* for best astronomy Honours thesis 2019

*University of Sydney Honours Scholarship* 2019

*Faculty of Science Olympiad Scholarship* 2016 - 2019

*Deas-Thomson Scholarship in Physics* for top of class 2018

*W.I.B. Smith Prize in Experimental Physics* 2018

*Dean's List of Academic Excellence* 2016, 2017, 2018

*Sydney Scholars Award* 2016 - 2018

*Denison Summer Research Scholarship* 2016, 2017

*Sydney Abroad International Exchange Scholarship* 2017

*University of Sydney Academic Merit Prize* 2016

*Levey Scholarship in Physics* for top of class 2016

*Smith Prize in Experimental Physics* 2016

### Other

*University of Oxford Clarendon Scholarship*, declined 2020

*International Physics Olympiad Bronze Medal* 2015

## PRESENTATIONS

### Research talks

- Seminar: Columbia Astronomy & Astrophysics Seminar *Mar 2025*
  *Resolving radial substructures in debris disks.* *New York City, USA*

- Seminar: JPL Astrophysics Luncheon Seminar *Feb 2025*
  *Interpreting the Resolved Structure of Debris Disks.* *Pasadena, USA*

- Conference: Raising the veil on star formation near and far *Apr 2024*
  *High-resolution ALMA imaging of debris disks with the ARKS program.* *Cambridge, UK*

- Conference: Dust Devils: Debris Disks in the Sonoran Desert *Mar 2024*
  *The radial structure of debris disks in the ARKS ALMA program.* *Tucson, USA*

- Seminar: Department of Applied Mathematics and Theoretical Physics, University of Cambridge *Oct 2023*
  *The radial and vertical structure of debris disks.* *Cambridge, UK*

- Conference: Cosmic Dust 2023 — Aug 2023
  *The physics of dusty Wolf-Rayet binaries revealed by observations of WR140.* — *Kitakyushu, Japan*

- Seminar: Institute of Astronomy, University of Cambridge — Oct 2022
  *Stellar fireworks: the spiral dust plumes of Wolf-Rayet binaries.* — *Cambridge, UK*

- Conference: UK Exoplanet Community Meeting 2022 — Sep 2022
  *Recovering the structure of edge-on debris disks non–parametrically.* — *Edinburgh, UK*

- Conference: Debris Disks at Home and Abroad — Sep 2022
  *Recovering the structure of edge-on debris disks non–parametrically.* — *Jena, Germany*

- Seminar: Institute of Astronomy, University of Cambridge — Mar 2022
  *A non–parametric method to recover the structure of edge-on debris disks.* — *Cambridge, UK*

### Outreach talks

- Institute of Astronomy Open Evening — Oct 2023
  *What are exoplanets doing? Asteroid belts give us a clue.* — *Cambridge, UK*

- Institute of Astronomy Open Evening — Jan 2023
  *Stellar fireworks: a journey through the spirally dust of massive binary stars.* — *Cambridge, UK*

- Integrated Science Class Seminar (Year 6–8), Ming Cheng School — Apr 2022
  *Planets of the Solar System and beyond.* — *Beijing, China*

- Gates Cambridge Teach-a-thon — Feb 2021
  *Planets of the Solar System and beyond.* — *Online*

- Australian Council of Undergraduate Research — Oct 2019
  *Highly anisotropic stellar winds in recently–identified Wolf–Rayet binary.* — *Newcastle, Australia*

### Poster presentations

- Conference: Gordon Research Conference on the Origins of Solar Systems — Jun 2025
  *The radial structure of debris disks in the ARKS ALMA program.* — *South Hadley, USA*

- Conference: Gordon Research Seminar + Conference on the Origins of Solar Systems — Jun 2023
  *Modelling the structure of debris disks and the dust clump of Beta Pictoris.* — *South Hadley, USA*

- Conference: STScI Spring Symposium: Planetary Systems and the Origins of Life in the Era of JWST — May 2023
  *Modelling the structure of debris disks and the dust clump of Beta Pictoris.* — *Baltimore, USA*

- Conference: Protostars and Planets VII — Apr 2023
  *Has the dust clump in the debris disk of Beta Pictoris moved?* — *Kyoto, Japan*

## OBSERVING

- *VLT/VISIR P.I. program*: Testing the giant impact scenario to explain the dust clump and cat's tail in Beta Pictoris (ID 114.27CQ) P114, 2024
- *ALMA P.I. program*: First resolved ALMA imaging of carbon-rich Wolf-Rayet binary dust structures (ID 2024.1.00803.S) C.11, 2024
- *ALMA co-I. program*: Resolving the extended structure associated with Apep's enigmatic wind (ID 2024.1.01244.S, P.I. Joseph Callingham) C.10, 2024
- *JWST P.I. program*: What lies beyond the inner spiral of Apep? (ID 5842) C.3, 2024
- *JWST P.I. program*: What causes warm dust interior to planetesimal belts? (ID 5709) C.3, 2024
- *VLT/VISIR P.I. program*: Wind kinematics in the extreme colliding-wind binary Apep: the first Galactic long-duration gamma-ray burst progenitor? (ID 113.26A7) P113, 2024
- *ALMA P.I. program*: First ALMA imaging of dust around Wolf–Rayet binaries (ID 2023.1.00999.S) C.10, 2023
- *ALMA co-I. program*: Vertical structure and planetary system dynamics (ID 2023.1.00487.S, P.I. Meredith Hughes) C.10, 2023
- *JWST co-I. program*: Fingerprinting the history of episodic dust creation in Wolf-Rayet binaries (ID 4093, P.I. Noel Richardson) C.2, 2023
- *Australia Telescope Compact Array*: Execution of observations of Wolf–Rayet binary Apep 2019

## ADDITIONAL EXPERIENCE

### Referee & Peer Review

*Referee for the Monthly Notices of the Royal Astronomical Society*
*ALMA distributed peer review, Cycles 8 – 12*
*ESO distributed peer review*

### Grants

P.I., JWST Program 5842 (USD 78k) 2024
P.I., JWST Program 5709 (USD 74k) 2024

### Collaborations

*ARKS*: ALMA Large Program to image debris disks at high resolution, P.I. Sebastian Marino
- *Leading Radial Structure team* Oct 2022

*JWST High Contrast Imaging*: JWST ERS program imaging exoplanets and disks, P.I. Sasha Hinkley
- *Nonparametric modelling of JWST 4–quadrant phase mask observations and application to HD 141569* Oct 2020

*DustERS*: JWST ERS program on Wolf–Rayet binary dust formation, P.I. Ryan Lau
- *Column density modelling of MIRI imaging and leading follow–up proposals*

### Employment

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| *Supervisor (tutorial teaching)*, Institute of Astronomy, Cambridge | 2022 - 2023 |
| *Supervisor (tutorial teaching)*, Trinity College, Cambridge | 2020 - 2021 |
| *Tutor (tutorial teaching)*, School of Physics, University of Sydney | 2019 |
| *Strategist*, Goldman Sachs | 2018 |

### Community involvement & outreach

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|---|---|
| *Public talk speaker*, Institute of Astronomy, Cambridge open evenings | 2022 - 2023 |
| *Technology Officer*, Gates Cambridge Scholars Council | 2020 - 2021 |
| *General Executive*, Sydney University Mathematics Society | 2017 - 2019 |
| *Ambassador*, Australian Science Innovations | 2016 - 2019 |
| *Interviewer*, Berkeley Scientific Journal | 2017 |

## PUBLICATIONS

### First-author Publications

5. **Y. Han**, M. C. Wyatt, S. Marino. Recovering the structure of debris disks non-parametrically from images. *Monthly Notices of the Royal Astronomical Society* (2025). [doi.org/10.1093/mnras/staf282]

4. **Y. Han**, M. C. Wyatt, W. R. F. Dent. Has the dust clump in the debris disk of Beta Pictoris moved? *Monthly Notices of the Royal Astronomical Society* (2023). doi.org/10.1093/mnras/stac3769

3. **Y. Han**, P. G. Tuthill, R. M. Lau, A. Soulain. Radiation–driven acceleration in the expanding WR140 dust shell. ***Nature*** (2022). doi.org/10.1038/s41586-022-05155-5

2. **Y. Han**, M. C. Wyatt, L. Matrà. RAVE: a non–parametric method for recovering the surface brightness and height profiles of edge–on debris disks. *Monthly Notices of the Royal Astronomical Society* (2022). doi.org/10.1093/mnras/stac373

1. **Y. Han**, P. G. Tuthill, A. Soulain, J. R. Callingham, P. M. Williams, P. A. Crowther, B. J. S. Pope, B. Marcote. The extreme colliding-wind system Apep: resolved imagery of the central binary and dust plume in the infrared. *Monthly Notices of the Royal Astronomical Society* (2020). doi.org/10.1093/mnras/staa2349

### In Preparation or Under Review

4. **Y. Han**, *et al.* The radial structure of debris disks in the ARKS ALMA program.

3. **Y. Han**, *et al.* The formation and evolution of dust in the colliding-wind Wolf-Rayet binary Apep observed by JWST.

2. **Y. Han**, *et al.* The vertical structure of the Beta Pictoris debris disk viewed at mid–infrared and mm wavelengths.

1. **Y. Han**, *et al.* The debris disk of $\gamma$ Oph imaged by JWST.

### Co-authored Publications

12. N. D. Richardson *et al.* Carbon-rich dust injected into the interstellar medium by Galactic WC binaries survives for hundreds of years. *The Astrophysical Journal* (2025). doi.org/10.48550/arXiv.2505.11616

11. M. Sommer, M. C. Wyatt, **Y. Han**. A PR drag origin for the Fomalhaut disk's pervasive inner dust: constraints on collisional strengths, icy composition, and embedded planets. *Monthly Notices of the Royal Astronomical Society* (2025). doi.org/10.1093/mnras/staf494

10. E. P. Lieb *et al.* Dynamic imprints of colliding-wind dust formation from WR140. *The Astrophysical Journal Letters* (2025). doi.org/10.3847/2041-8213/ad9aa9

9. R. M. Lau *et al.* A first look with JWST aperture masking interferometry (AMI): resolving circumstellar dust around the Wolf-Rayet binary WR 137 beyond the Rayleigh limit. *The Astrophysical Journal* (2024). doi.org/10.3847/2041-8213/ad9aa9

8. J. Terrill, S. Marino, R. A. Booth, **Y. Han**, J. Jennings, M. C. Wyatt. Deprojecting and constraining the vertical thickness of exoKuiper belts. *Monthly Notices of the Royal Astronomical Society* (2023). doi.org/10.1093/mnras/stad1847

7. R. M. Lau *et al.* From dust to nanodust: resolving circumstellar dust from the colliding-wind binary Wolf-Rayet 140. *The Astrophysical Journal* (2022). doi.org/10.3847/1538-4357/acd4c5

6. R. M. Lau, M. J. Hankins, **Y. Han** *et al.* Nested dust shells around the Wolf–Rayet binary WR 140 observed with JWST. *Nature Astronomy* (2022). doi.org/10.1038/s41550-022-01812-x

5. P. A. Robinson, X. Gao, **Y. Han**. Relationships between lognormal distributions of neural properties, activity, criticality, and connectivity. *Biological Cybernetics* (2021). doi.org/10.1007/s00422-021-00871-z

4. B. Marcote, J. R. Callingham, M. De Becker, P. G. Edwards, **Y. Han**, R. Schulz, J. Stevens, P. G. Tuthill. AU–scale radio imaging of the wind collision region in the brightest and most luminous non-thermal colliding wind binary Apep. *Monthly Notices of the Royal Astronomical Society* (2021). doi.org/10.1093/mnras/staa3863

3. R. M. Lau, M. J. Hankins, **Y. Han** *et al.* Resolving periodic spirals and shadows from the Wolf-Rayet dust factory WR112. *The Astrophysical Journal* (2020). doi.org/10.3847/1538-4357/abaab8

2. J. R. Callingham, P. A. Crowther, P. M. Williams, P. G. Tuthill, **Y. Han**, B. J. S. Pope. Two Wolf-Rayet stars at the heart of colliding-wind binary Apep. *Monthly Notices of the Royal Astronomical Society* (2020). doi.org/10.1093/mnras/staa1244

1. M. Li, **Y. Han**, M. J. Aburn, M. Breakspear, R. Q. Poldrack, J. M. Shine, J. T. Lizier. Transitions in information processing dynamics at the whole-brain network level are driven by alterations in neural gain. *PLOS Computational Biology* (2019). doi.org/10.1371/journal.pcbi.1006957