Jiten Dhandha

PhD student - University of Cambridge

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Research Interests

- 21-cm cosmology
- Population III stars
- Cosmic Dawn
- Epoch of Reionization
- Galaxy formation and evolution
- Analytic and semi-numerical modelling
- Simulation acceleration
- Machine learning
- Bayesian inference
- Multi-wavelength synergies

Education

2022 - *present*	**PhD in Astronomy**, Institute of Astronomy, University of Cambridge. Funded by Boustany Astronomy Scholarship & Isaac Newton Studentship at Pembroke College. Supervised by Prof. Anastasia Fialkov and Dr. Eloy de Lera Acedo.
2018 - 2022	**MPhys. Physics with Astrophysics** First Class, University of Manchester. Project involved simulating turbulent molecular clouds in ISM and studying filament and star formation. Performed with Zoe Faes and supervised by Dr. Rowan Smith.
2016 - 2018	**All India Senior School Certificate Examination**, DPS - Modern Indian School, Doha, Qatar. Average of 95.2% in AISSCE examination.

Employment

Jul. 2024 - Aug. 2024	**Summer volunteer internship**, Boustany Foundation, Monaco. Partnering with Open Cultural Center, a humanitarian NGO focused on providing teaching, advice and extracurricular activities to asylum-seekers and refugees in the Nea Kavala camp in Greece.
Jun. 2021 - Aug. 2021	**Summer research project**, University of Manchester. Modelling the cosmological 21-cm signal in `Recfast++` and `CosmoTherm` to study their synergy with CMB spectral distortions. Supervised by Prof. Jens Chluba.
Jun. 2020 - Sep. 2020	**Summer research project**, University of Manchester. Testing and debugging `LOFAR-VLBI` calibration/imaging pipeline for gravitational lenses. Supervised by Dr. Neal Jackson.
Jul. 2019 - Sep. 2019	**Summer intern programme**, British Petroleum / University of Manchester. Simulating mitigation techniques for sulphate reducing bacteria responsible for fouling crude oil. Supervised by Dr. Thomas Waigh.

Publications

First Author

March 2025	**J. Dhandha**, T. Gessey-Jones, H. T. J. Bevins, S. Pochinda, A. Fialkov, S. Tacchella, E. de Lera Acedo, S. Singh, R. Barkana *Exploiting synergies between JWST and cosmic 21-cm observations to uncover star formation in the early Universe*, arXiv e-prints, arXiv:2503.21687
April 2024	**J. Dhandha**, Z. Faes, R. J. Smith *Decaying turbulence in molecular clouds: how does it affect filament networks and star formation?*, Monthly Notices of the Royal Astronomical Society, 529, 4699-4718

Contributing Author

August 2025	B. Liu, D. Kessler, T. Gessey-Jones, **J. Dhandha**, A. Fialkov, Y. Sibony, G. Meynet, V. Bromm, R. Barkana *Effects of chemically homogeneous evolution of the first stars on the 21-cm signal and reionization*, Monthly Notices of the Royal Astronomical Society, 541, 3113-3133
July 2025	J. Wasserman, E. Zackrisson, **J. Dhandha**, A. Fialkov, L. Noble, S. Majumdar *Ultraviolet photon production rates of the first stars: Impact on the He II λ1640Å emission line from primordial star clusters and the 21-cm signal from cosmic dawn*, arXiv e-prints, arXiv:2507.21764
July 2025	S. Munshi, F. G. Mertens, J. K. Chege, L. V. E. Koopmans, A. R. Offringa, B. Semelin, R. Barkana, **J. Dhandha**, A. Fialkov, R. Mériot, S. Sikder, A. Bracco, S. A. Brackenhoff, E. Ceccotti, R. Ghara, S. Ghosh, I. Hothi, M. Mevius, P. Ocvirk, A. K. Shaw, S. Yatawatta, P. Zarka *Improved upper limits on the 21-cm signal power spectrum at $z = 17.0$ and $z = 20.3$ from an optimal field observed with NenuFAR*, arXiv e-prints, arXiv:2507.10533
March 2025	O. S. D. O'Hara, Q. Gueuning, E. de Lera Acedo, F. Dulwich, J. Cumner, D. Anstey, A. Brown, A. Fialkov, **J. Dhandha**, A. Faulkner, Y. Liu *Uncovering the effects of array mutual coupling in 21-cm experiments with the SKA-Low radio telescope*, Monthly Notices of the Royal Astronomical Society, 538, 31-48
February 2025	S. Pochinda, **J. Dhandha**, A. Fialkov, E. de Lera Acedo *Cosmological super-resolution of the 21-cm signal*, arXiv e-prints, arXiv:2502.00852
September 2024	O. S. D. O'Hara, F. Dulwich, E. de Lera Acedo, **J. Dhandha**, T. Gessey-Jones, D. Anstey, A. Fialkov *Understanding spectral artefacts in SKA-Low 21-cm cosmology experiments: the impact of cable reflections*, Monthly Notices of the Royal Astronomical Society, 533, 2876-2892
May 2024	A. Fialkov, T. Gessey-Jones, **J. Dhandha** *Cosmic mysteries and the hydrogen 21-cm line: bridging the gap with lunar observations*, Philosophical Transactions of the Royal Society of London Series A, 382, 20230068
December 2022	S. K. Acharya, **J. Dhandha**, J. Chluba *Can accreting primordial black holes explain the excess radio background?*, Monthly Notices of the Royal Astronomical Society, 517, 2454-2461
February 2022	S. Badole, D. Venkattu, N. Jackson, S. Wallace, **J. Dhandha**, P. Hartley, C. Riddell-Rovira, A. Townsend, L. K. Morabito, J. P. McKean *High-resolution imaging with the International LOFAR Telescope: Observations of the gravitational lenses MG 0751+2716 and CLASS B1600+434*, Astronomy & Astrophysics, 658, A7

Talks

Conference and Workshop talks

June 2025	*Exploiting synergies between JWST and cosmic 21-cm observations to uncover star formation in the early Universe*, SKAO General Science Meeting 2025, Görlitz, Germany.
October 2024	*Constraining star-formation efficiency in the early Universe using JWST and the cosmic 21-cm signal*, Introduction to KICC, Kavli Institute for Cosmology, Cambridge.
September 2024	*Constraining star-formation efficiency in the early Universe using JWST and the cosmic 21-cm signal*, 7th Global 21-cm Workshop, Raman Research Institute.
May 2024	*Synergies between 21-cm experiments and JWST observations*, Reionization in Relic Radiation (R3), Institut d'Astrophysique Spatiale, Université Paris-Saclay.
February 2024	*Synergies between 21-cm experiments and JWST observations*, Science with the 21-cm line, KICC, University of Cambridge.
September 2023	*Bringing 21-cm simulations to the JWST era*, 2nd REACH Annual Meeting, University of Malta.
September 2023	*FIlamEntary STructure Analysis (fiesta)*, AREPO-ISM workshop, University of Manchester.
October 2022	*Can accreting primordial black holes explain the excess radio background?*, PDAT Laboratory, K. N. Toosi University of Technology (virtual webinar).

Outreach talks

October 2022	*Like beads on a string... Where do massive stars in our Universe come from? A brief look into studying our cosmos*, Pembroke Papers, Pembroke College, University of Cambridge.

Grants and awards

April 2024	**DiRAC Resource Allocation Committee 16th Call**, awarded 4.15M CPUh (worth £41,500) on DiRAC's COSMA-8 supercomputer.
July 2022	**Tessella Prize for Software** (£125), for outstanding work implementing software in Mphys project.
April 2019	**BP Achievement Award** (£1000), for best essay on petrophysical logging tools.
December 2018	**Physics Success Scholarship** (£2000), for academic excellence in physics and maths.

Conference organisation

July 2025	One day workshop: Radio cosmology and science with the 21-cm signal, member of Organising Committee and session chair, KICC, University of Cambridge.
February 2024	Kavli Science Focus: Science with the 21-cm line, member of Organising Committee and session chair, KICC, University of Cambridge.

Teaching responsibilities

Oct. 2024 - *present*	**Co-Supervision: Jacques Valkenberg** (MPhil. student) with Prof. Anastasia Fialkov and Dr. Sandro Tacchella. Work on studying the impact of metal enrichment and Population II stellar IMF on the 21-cm signal of neutral hydrogen.
Oct. 2024 - *present*	**Co-Supervision: Kyle Wong** (Part III student) with Prof. Anastasia Fialkov. Work on studying the impact of varying cosmology and matter power spectrum on the 21-cm signal of neutral hydrogen.
Oct. 2023 - *Jul. 2024*	**Co-Supervision: Rachel Incley** (Part III student) with Prof. Anastasia Fialkov. Work on comparison of Epoch of Reionization in simulation codes `21cmSPACE` and `C2-Ray`.
Feb. 2023 - Mar. 2023	**Demonstration of Part IA Scientific Computing** for 22 hours, University of Cambridge.

Software

`21cmExperiments`	Maintainer: Comprehensive public repository/Google sheet of past & ongoing 21-cm experiments.
`CFit`	Main author and maintainer: Smart curve fitting tool using method of least squares in Python.
`fiesta`	Main author and maintainer: Toolkit for analyzing filament networks and density field meshes.
`luminobs`	Main author and maintainer: Compendium of high-redshift galaxy UVLF observations.

In the media

August 2021	Most detailed-ever images of galaxies revealed using LOFAR. Press release for LOFAR observations from ASTRON.
August 2021	Astronomers develop novel way to 'see' first stars through fog of early Universe. Press release for LOFAR observations from BBC.

Extracurricular activities

Feb. 2025 - Mar. 2025	**International Womens Day Committee** member, Institute of Astronomy, UoC.
May 2023 - *present*	**EDI Inclusion and Fairness** subgroup member, Institute of Astronomy, UoC.
Jul. 2023 - Jul. 2024	**Graduate Parlour**, Ethnic Minorities officer, Pembroke College, UoC.
Oct. 2022 - *present*	**Postgraduate Forum** representative, Institute of Astronomy, UoC.
Oct. 2022 - Apr. 2023	**Pembroke Papers** committee memeber, Pembroke College, UoC.
Sep. 2021 - Jul. 2022	**Student Representative** representing astronomy/astrophysics, UoM.
Jul. 2020 - Jul. 2022	**Touch Rugby Society**, Inclusion officer and COVID-19 safety officer, UoM.
Sep. 2019 - Jun. 2020	**Peer-Assisted Study Session** leader, Peer Support Scheme,UoM.
Nov. 2016 - *present*	**English Wikipedia**, volunteer editor.

Skills

Programming	**Proficient**: Python, MATLAB, **Experienced**: C++, Java
Markup	**Experienced**: LaTeX, Wikitext, **Intermediate**: HTML, CSS, reStructuredText, Markdown
Languages	**Proficient**: English, Hindi, **Intermediate**: Gujarati