Keir K. Rogers

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Research interests: theoretical and observational cosmology, dark matter, simulations
artificial intelligence, statistics, active learning, simulation-based inference

Research employment

Nov 2025 –	*Proleptic Senior Lecturer in Physics & Ernest Rutherford Fellow* **Department of Physics, King's College London, UK**	
Jan 2025 – Oct 2025	*UKRI STFC Ernest Rutherford Fellow* **Department of Physics, Imperial College London, UK**	
Oct 2020 – Oct 2024	*Dunlap Fellow* **Dunlap Institute, University of Toronto, Canada**	
Oct 2017 – Sep 2020	*Oskar Klein Centre Fellow* **Oskar Klein Centre, Stockholm University, Sweden**	
Jul 2013 – Sep 2013	*Undergraduate research intern* **STFC Rutherford Appleton Laboratory, Oxfordshire, UK**	

Education

Oct 2014 – Sep 2017	*PhD in Physics and Astronomy* **University College London, University of London, UK** *PhD thesis*: A clear view of the primordial universe *Supervisors*: Prof. Hiranya Peiris & Prof. Andrew Pontzen
Oct 2010 – Sep 2014	*MPhys in Physics* **Lady Margaret Hall, University of Oxford, UK** *MPhys thesis*: Axisymmetric models of boxy galaxies (first class) *Supervisors*: Prof. James Binney & Prof. Martin Bureau

Grants and awards

2025 - 29	*Identifying the nature of dark matter using the cosmic web*, UKRI STFC Ernest Rutherford Fellowship, £1,043,277
2025 - 28	*Interstellar asteroids, black holes and the Big Bang*, Marsden Award, Royal Society of New Zealand Te Apārangi, NZ$3,000,000, co-I
2025 - 26	Student funding, Imperial College London (£4070)
2024	Conference organisation funding, University of Toronto (CA$11,265)
2021 - 24	Student funding, University of Toronto/Canada Research Council (CA$64,000)
2020 - 24	Dunlap Fellowship (CA$364,091)

2017 - 20	Oskar Klein Centre Fellowship (SEK 1,318,800)
2014 - 17	UK Science & Technology Facilities Council (STFC) PhD studentship (£68,770)
2013	University of Oxford Commendation for Practical Work in Physics
2010 - 14	University of Oxford Bursary for climate change specialism (£4000)
2010 - 14	University of Oxford Scholar for first class examination results (£1400)

Computing awards

| 2024 - 25 | *Lyman-alpha forest simulations of atomic dark matter*, Compute Canada (Canada national supercomputing facility), 2.6M CPU-hours, co-I |
| 2019 - 20 | *Constraining inflation & neutrino masses with the Dark Energy Spectroscopic Instrument*, DiRAC (UK STFC supercomputing facility), 4.5M CPU-hours, co-I |

Supervision and mentoring

PhD students as primary supervisor

| 2025 - | Joshua Darne, Imperial College London |

PhD student project supervision

2024 - 25	Calvin Preston, University of Cambridge, 1 journal paper
2023 - 24	Harrison Winch, University of Toronto, 1 journal paper; *Next: Asst. Prof., UToronto*
2020 - 22	Alex Laguë, University of Toronto, 1 journal paper; *Next: Postdoc, UPenn*
2017 - 21	Christian Pedersen, UCL, 1 journal paper; *Next: Postdoc, New York University*

Undergraduate students as primary supervisor
[1] = astronomy theory project, [2] = Milky Way simulation project, [3] = machine learning project

2025 - 26	[3] Cindy Deng & Agnes Luo, *Multi-component internal linear combination*
2025	[3] Matthew Howarth, *Skyclean: a Python package for CMB component separation*
2024	[3] Zhaoqi (Max) Wang, *Neural net-enhanced wavelet CMB component separation*
2023 - 24	[1] Alexander Spencer London, *Galaxy voids as new probes of dark matter signatures*
	[2,3] Peter Ma, *SBI for stellar stream dark matter constraints*, 1 journal paper
2023	[3] Ian Chow, *Using ML to understand the robustness of cosmological inference* Winner, UToronto Astronomy Summer Undergraduate Research competition
2022 - 23	[2] Julian Meunier, *Modelling the nature of dark matter in stellar stream simulations*
2022	[2] Ruth Huang, *Simulating stellar streams in non-cold dark matter cosmologies*
	[1] Alexander Spencer London, *Modelling axion dark matter in cosmic void clustering* Honourable mention, Richards Award for Excellence in Undergraduate Research
	[3] Anran Xu, *Neural network emulators of axion Einstein-Boltzmann solvers*
2021 - 22	[1] Zara Zaman, *Searching for axion dark matter in cosmic voids*
2021	[3] Utkarsh Mali, *Machine learning visible counterparts to gravitational-wave events* Winner, UToronto Astronomy Summer Undergraduate Research competition
	[1] TonyLouis Fondzenyuy Verberi, *A clear view of the primordial Universe* Winner, National Society of Black Physicists (US & Canada) undergraduate prize

Teaching

Lecturer

| 2021 - 24 | *Cosmology*, Summer Undergraduate Research Program, UToronto/CITA |

Guest lectures, *active learning activity: think, pair, share; Poll Everywhere polling*

Epoch of reionisation, postgraduate course, UToronto
Guest lecture, *active learning activity: collaborative cloud computing exercise*

Introduction to research, 4th year undergraduate course, UToronto
Guest lecture, *developed syllabus, flexible curricula using pre-recorded elements*

Cosmic microwave background, 3rd year undergraduate course, UToronto
Guest lecture, *active learning activity: reflective discussion*

Teaching assistant
2016 - 17	*Advanced physical cosmology,* 4th year undergraduate course, UCL
	Teaching assistant, *delivered three seminars, coursework assessment*
2015 - 16	*Environmental physics*, 2nd year undergraduate course, UCL
	Teaching assistant, *coursework assessment*
2014 - 17	University College London Observatory, multiple undergraduate courses
	Supervisor, *teaching telescope operation, data reduction, data analysis*

Professional service and membership

Collaboration and professional association
2025 -	Euclid collaboration: dark matter, weak lensing, Milky Way
2023 -	Rubin Observatory, Dark Energy Science Collaboration, Dark Matter working group
	PI, collaboration project to prepare for dark matter studies with galaxy survey data
	Co-I, stellar streams sub-working group: simulations, models, machine learning
2023 -	Simons Observatory collaboration: dark matter emulator, GPU likelihood
2022 -	Atacama Cosmology Telescope collaboration: PI, DR6 dark matter paper
2014 -	Fellow of the Royal Astronomical Society

Leadership and organisation
2025 - 26	***Invited white paper co-lead author on dark matter limits from small scales***
	Reviews of Modern Physics
2025	***Invited white paper contribution on ultra-light dark matter***
	COSMIC WISPers in the dark universe, European Union COST Action CA21106
2025	Organiser, Cosmodonuts theoretical cosmology meetings, Imperial College London
2024	***Conference organising committee***, *Defining simulation frontiers for DM discovery*
	50 invited attendees, leading scientific rationale, programme, fundraising, logistics
2022 - 24	***Community climate committee***, UToronto Astronomy
	Leading equality, diversity and inclusion actions, student - advisor code of conduct
	Lead, 2023 and 2024 UToronto Astronomy community climate surveys
2021 - 22	***Anti-racism meeting committee***, UToronto Astronomy/CITA
	Weekly meeting, alternating between action and learning activities
2020 - 22	***Summer Undergraduate Research Program 2021 & 2022 committees***, UToronto
	Programme (forty students) with research internship and professional development
	Lead, oral presentation mini-conference, poster competition, end-of-program reports

2020 - 22	**Snowmass 2021**, US particle physics community planning exercise
	Lead author, *Astrophysical probes of dark matter*, *Ultralight dark matter* white paper
	Co-author, *Axion dark matter* & *CMB-S4 dark matter* white papers
	Lead author, *Cosmic probes of ultralight dark matter* letter of interest (LOI)
2019 - 20	Organiser, Cosmology & Gravity group meetings, Stockholm University
	Fortnightly meeting, hosting external speakers, journal club
2015 - 17	Organiser, cosmology graduate seminars, University College London

Referee and review panels

2025 - 28	UKRI STFC Ernest Rutherford Fellowship panel
2025	PhD examiner, Calum Gordon, Institut de Física d'Altes Energies
	Referee, Swiss National Science Foundation Starting Grants
2023	Invited grant review panelist, US Department of Energy HEP Cosmic Frontier
	Invited grant review panelist, US National Science Foundation Astronomy panel
2019 -	Referee, DiRAC (UK STFC supercomputing facility) grants
2017 -	Referee, PRL, PRD, ApJ, JCAP, MNRAS, Astrophysics & Space Science, Open Journal of Astrophysics

Press and public engagement

2025	Speakers for Schools, science and artificial intelligence programme
	I'm a Scientist, Get me out of here!, online outreach with school students in the UK
	Invited public talk on cosmological tensions at The Arts Club, London
2023	News article on JCAP article: New link between dark matter & clumpiness
	Science press: *e.g.*, New Scientist (front page), MSN news,
	Popular Mechanics (interview), The Globe & Mail (interview),
	Universe Today (YouTube interview)
2023	Invited public talk on dark matter at the Royal Astronomical Society of Canada
2022 - 24	Skype a Scientist, online outreach with remote school students across USA/Canada
2021	News article on Phys. Rev. Lett. article: Dark matter is not "fuzzy"
2018	Invited blog post on the cosmic microwave background: The Primordial Universe
2014 -	Outreach events, *e.g.*, UCL Your Universe festival, astronomy open days

Conference and seminar presentations

> 100 invited & contributed cosmology / physics / data science seminars and talks since 2015.

Invited talks

Aug 2026	Invisibles26 workshop, A Coruña, Spain
Feb 2026	Scuola Internazionale Superiore di Studi Avanzati (SISSA), Trieste, Italy
Nov 2025	Axions in Japan conference, University of Tokyo, Japan (**invited plenary**)
Oct 2025	Spec-S5 dark matter workshop, University of Chicago, USA
Oct 2025	UK High Energy Physics Forum, Abingdon, UK (**invited review**)
Sep 2025	3rd Meeting of COSMIC WISPers, Sofia University, Bulgaria (**invited plenary**)
Jul 2025	Likelihood and theory working group, SO meeting, University of Manchester, UK
Jun 2025	15th Conference on Intersections of Particle & Nuclear Physics, UW Madison, USA
May 2025	Department of Physics, Imperial College London, UK
Mar 2025	Department of Physics, King's College London, UK

Feb 2025	London Cosmology Discussion Meeting, Royal Astronomical Society, UK
Feb 2025	School of Physics and Astronomy, University of Nottingham, UK
Sep 2024	Department of Physics, Boston University, USA
Jul 2024	IoA 50th anniversary conference, University of Cambridge, UK (**highlight talk**)
Jul 2024	DM working group, Rubin DESC collaboration meeting, ETH Zurich, Switzerland
May 2024	CCAPP, Ohio State University, Columbus, USA
Apr 2024	Department of Physics, University of Texas, Austin, USA
Mar 2024	Department of Physics, Adelphi University, Garden City, New York, USA
Feb 2024	Centre de physique des particules de Marseille (CPPM), France
Feb 2024	Laboratoire d'astrophysique de Marseille (LAM), France
Dec 2023	Kavli IPMU, University of Tokyo, Japan
Dec 2023	Cosmology Talks (YouTube interview)
Nov 2023	Multi-probe approach to wavy dark matter workshop, Korea University, Seoul, Korea
Nov 2023	New physics from galaxy clustering workshop, IFPU, SISSA, Trieste, Italy
Oct 2023	Department of Physics & Astronomy, Queen's University, Kingston, Canada
Aug 2023	Rencontres de Vietnam 2023 conference, Quy Nhon, Vietnam (**invited review**)
Jul 2023	DM working group, Rubin DESC collaboration meeting, SLAC, Menlo Park, USA
May 2023	Montpellier Universe and Particles Laboratory, University of Montpellier, France
Feb 2023	Cosmo Talks mini-workshop on ultra-light axions & cosmological tensions
Jan 2023	Kavli Institute for Cosmological Physics, University of Chicago, USA
Jan 2023	Cosmology Talks (YouTube interview)
Oct 2022	Atacama Cosmology Telescope working group telecon
Oct 2022	School of Mathematics, Statistics and Physics, Newcastle University, UK
Sep 2022	Canadian Institute for Theoretical Astrophysics, Toronto, Canada
May 2022	Rencontres de Blois 2022 conference, France (**invited review/plenary**)
Mar 2022	Institute of Theoretical Astrophysics, University of Oslo, Norway
Feb 2022	Max Planck Institute for Astrophysics, Garching, Germany
Nov 2021	Canadian Virtual Astronomy Seminars, Canadian Astronomical Society (CASCA)
Nov 2021	Nature of dark matter on small scales seminar, Yale University, New Haven, USA
Feb 2021	Carnegie Observatories, Pasadena, USA
Nov 2020	Department of Physics and Astronomy, Queen Mary University of London, UK
Nov 2020	Dark Energy Spectroscopic Instrument Lyman-alpha forest working group telecon
Nov 2019	Oskar Klein Centre for Cosmoparticle Physics, Stockholm University, Sweden
Apr 2019	Institute for Computational Science, Zurich University, Switzerland
Sep 2018	Stockholm Data Science Forum, Sweden
Feb 2018	Department of Physics, Stockholm University, Sweden
Dec 2017	Oskar Klein Centre for Cosmoparticle Physics, Stockholm University, Sweden

Referees

Prof. Hiranya Peiris	Prof. George Efstathiou FRS
University of Cambridge	University of Cambridge
Institute of Astronomy	Institute of Astronomy
United Kingdom	United Kingdom
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