

Keir K. Rogers

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Research interests: theoretical & observational cosmology, dark matter, fundamental physics, statistical methods, machine learning, emulators, cosmological simulations

Research employment

- | | |
|----------------------------|---|
| Oct 2020 – present | <i>Dunlap Fellow</i>
Dunlap Institute, University of Toronto, Canada |
| Oct 2017 – Oct 2020 | <i>Oskar Klein Centre Fellow</i>
Oskar Klein Centre, Stockholm University, Sweden |
| Jul 2013 – Sep 2013 | <i>Research intern</i>
STFC Rutherford Appleton Laboratory, Oxfordshire, UK |

Education

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

Awards

Professional & academic awards

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|-----------|---|
| 2021 | Student funding, Summer Undergraduate Research Program (CA\$5000) |
| 2020 - 23 | Dunlap Fellowship (CA\$272,830) |
| 2018 | Travel funding, CASPEN exchange network (SEK 9000) |
| 2014 - 17 | Travel funding, Royal Astronomical Society, UCL graduate school (£1500) |
| 2014 - 17 | UK Science & Technology Facilities Council 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 (£1400) |

Computing award

- | | |
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| 2019 - 20 | <i>Constraining inflation & neutrino masses with the Dark Energy Spectroscopic Instrument, DiRAC (UK STFC supercomputing facility), 4.5M CPU-hours, co-I</i> |
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Supervision and mentoring

- 2021 - 22 Zara Zaman, *Searching for axion dark matter in cosmic voids*
4th year undergraduate research project, University of Toronto (co-supervised)
- 2021 Utkarsh Mali, *Machine learning the visible counterparts to gravitational-wave events: kilonovae*
Undergraduate internship, University of Toronto
Winner, Summer Undergraduate Research Program poster competition
- 2021 TonyLouis Fondzenyuy Verberi, *A clear view of the primordial Universe*
Undergraduate internship, Aurora Borealis Fellow, University of Toronto

Teaching

- 2021 *Epoch of reionisation*
Postgraduate astronomy course, University of Toronto
Guest lecture (developed syllabus, active learning activity: collaborative cloud computing exercise, devised problem set)
- 2021 *Introduction to research*
4th year undergraduate astronomy course, University of Toronto
Guest lecture (developed syllabus, flexible curricula)
- 2021 *Introduction to astrophysics*
3rd year undergraduate astronomy course, University of Toronto
Guest lecture (developed syllabus, active learning activity: interactive discussion)
- 2021 *Cosmology*
Summer Undergraduate Research Program, University of Toronto/CITA
Lecturer (developed syllabus, active learning activity: think, pair, share)
- 2016 - 17 *Advanced physical cosmology*
4th year undergraduate physics & astronomy course, University College London
Teaching assistant (3 seminars, coursework assessment)
- 2015 - 16 *Environmental physics*
2nd year undergraduate physics & astronomy course, University College London
Teaching assistant (coursework assessment)
- 2014 - 17 University College London Observatory
Multiple undergraduate physics & astronomy courses, University College London
Supervisor (teaching telescope operation, data reduction, data analysis)

Professional service

Leadership and organisation

- 2021 - Anti-racism meeting organisation and presenting committee, U of T Astronomy/CITA
Weekly meeting, alternating between action and learning activities

- 2020 - Summer Undergraduate Research Program committee, U of T Astronomy/CITA Programme (forty students) with research internship, professional development course, lectures, networking programme
Lead, oral presentation mini-conference, poster competition, end-of-program reports
- 2019 - 20 Organiser, Cosmology & Gravity meetings, Oskar Klein Centre
Fortnightly meeting, hosting external speakers, journal club
- 2015 - 17 Organiser, cosmology graduate seminars, University College London
Monthly meeting, hosting internal speakers

Referee

- 2019 - Referee, DiRAC (UK STFC supercomputing facility) grants
- 2017 - Referee, Physical Review Letters, Physical Review D, Astrophysical Journal, Monthly Notices of the Royal Astronomical Society

Professional association

- 2014 - Fellow of the Royal Astronomical Society

Press and public engagement

- 2021 News article on OKC website: [Dark matter is not “fuzzy”](#)
- 2018 Blog post on group website:
earlyuniverse.org/a-clear-view-of-the-primordial-universe
- 2014 - Outreach events, e.g., UCL Your Universe festival, astronomy open days
- 2010 - Public talks on research & cosmology, e.g., UCL Diploma Club

Programming skills

Languages: Python, C++/C, Fortran, R, Matlab, Mathematica, HTML, SQL, LaTeX

Packages: GADGET, CAMB/CLASS, CosmoMC, TensorFlow 2

High performance (CPU/GPU) computing: OpenMP, MPI, CUDA

Conference and seminar presentations

53 cosmology / astrophysics / high-energy physics / data science / statistics seminars and conference talks since 2015.

Invited

Cosmic probes of dark matter physics

- 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

Searching for dark matter in the Lyman-alpha forest

- 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

Bayesian emulator optimisation for cosmological simulations

- Apr 2019 Institute for Computational Science, Zurich University, Switzerland

Bayesian optimisation & Gaussian process emulators

- Sep 2018 Stockholm Data Science Forum, Sweden

Cosmology from the Lyman-alpha forest

- Feb 2018 Department of Physics, Stockholm University, Sweden
- Dec 2017 Oskar Klein Centre for Cosmoparticle Physics, Stockholm University, Sweden

Contributed

Cosmic probes of dark matter physics

- Dec 2021 AstroDark-2021 conference, University of Tokyo, Japan

Searching for dark matter in the Lyman-alpha forest

- Nov 2021 Astropinformatics 2021 conference, Caltech, Pasadena, USA
- Oct 2021 Snowmass mini-symposium for wave-like dark matter
- Aug 2021 COSMO-21 conference, University of Illinois, USA
- Jul 2021 Cosmology from Home 2021 conference
- Jun 2021 16th Patras Workshop on Axions, WIMPs and WISPs, INFN Trieste, Italy
- May 2021 Canadian Astronomical Society (CASCA) 2021 Annual General Meeting
- Apr 2021 Perimeter Institute for Theoretical Physics, Canada
- Feb 2021 Department of Astronomy and Astrophysics, University of Toronto, Canada
- Nov 2020 Center for Computational Astrophysics, Flatiron Institute, New York City, USA
- Sep 2020 Cosmology from Home 2020 conference
- Dec 2019 CoSyne: cosmological synergies conference, IAP, Paris, France

Fundamental physics from the Lyman-alpha forest

- Oct 2019 Department of Physics and Astronomy, UC Riverside, USA
- Sep 2019 Berkeley Cosmology Group, UC Berkeley, USA
- Sep 2019 Kavli Institute for Particle Astrophysics & Cosmology, Stanford University, USA
- Sep 2019 Center for Astrophysics, Harvard University, Cambridge, USA
- Sep 2019 Kavli Institute, Massachusetts Institute of Technology, Cambridge, USA
- Aug 2019 Understanding cosmological observations workshop, Benasque, Spain

Bayesian emulator optimisation for cosmological simulations

- Jul 2019 Institut de Ciències del Cosmos, University of Barcelona, Spain
- Jun 2019 Artificial intelligence methods in cosmology workshop, Ascona, Switzerland
- Jun 2019 Institute for Astronomy, University of Edinburgh, UK
- May 2019 School of Physics and Astronomy, University of Nottingham, UK
- May 2019 Department of Physics, Imperial College London, UK
- May 2019 DAMTP, University of Cambridge, UK
- Dec 2018 Dark Energy Spectroscopic Instrument Lyman-alpha forest working group telecon

Damped Lyman-alpha absorbers & the Lyman-alpha forest

- Sep 2018 IGM2018 conference, University of Tokyo, Japan
- Aug 2018 Center for Computational Astrophysics, Flatiron Institute, New York City, USA

Feb 2018 Dark Energy Spectroscopic Instrument Lyman-alpha forest working group telecon

Spin-SILC: cosmic microwave background polarisation component separation with spin wavelets

Dec 2016 Department of Physics, Harvard University, USA
Dec 2016 Center of Cosmology and Particle Physics, New York University, USA
Dec 2016 Department of Astronomy, Columbia University, USA
Dec 2016 Center for Computational Astrophysics, Flatiron Institute, New York City, USA
Dec 2016 Department of Astrophysical Sciences, Princeton University, USA
Nov 2016 Oskar Klein Centre for Cosmoparticle Physics, Stockholm University, Sweden
Oct 2016 London Cosmology Meeting, Royal Astronomical Society, UK
Aug 2016 Perimeter Institute for Theoretical Physics, Canada
Aug 2016 Canadian Institute for Theoretical Astrophysics, Canada
May 2016 ADA8/COSMO21 conference, Chania, Greece
Apr 2016 Cosmology after Planck, Ecole de Physique des Houches, France

SILC: cosmic microwave background component separation with directional wavelets

Jan 2016 Statistical methods in cosmology workshop, UC Berkeley, USA
Dec 2015 Mullard Space Science Laboratory, University College London, UK
Dec 2015 London Cosmology Meeting, Royal Astronomical Society, UK

Referees

Prof. Hiranya Peiris
University College London
Department of Physics & Astronomy
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Prof. George Efstathiou
University of Cambridge
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Prof. Renée Hložek
University of Toronto
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Prof. Cora Dvorkin
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