ALEXANDER C. JENKINS

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ABOUT ME

I'm a theoretical physicist, working at the interface between *cosmology*, *astrophysics*, *high-energy physics*, and *quantum matter*. My research looks at new ways of probing the fundamental laws of Nature, whether that's using *gravitational waves* as powerful new astronomical messengers, or using cutting-edge *quantum technologies* to simulate the early Universe.

EMPLOYMENT

Postdoctoral Research Fellow — *University College London* *2021–2024*

Leading an international, interdisciplinary project to study false vacuum decay with quantum analogue experiments and numerical lattice simulations, as part of the QSimFP Consortium
Collaborating with Profs Hiranya Peiris and Andrew Pontzen | Member of the Cosmoparticle Initiative

EDUCATION

PhD in Theoretical Physics — *King's College London* *2017–2021*

Funded by competitive faculty scholarship | Theoretical Particle Physics and Cosmology Group
Thesis: *'Cosmology and fundamental physics in the era of gravitational-wave astronomy'*
Nominated for four thesis prizes | Honorable Mention in the GWIC-Braccini Thesis Prize competition
Supervised by Prof Mairi Sakellariadou | Examined by Profs Stephen Fairhurst and David Wands

MSci in Astrophysics (Part III) — *University of Cambridge* *2016–2017*

1st class | Ranked 5th in cohort | Elected a Bateman Scholar of Trinity Hall for 'excellent' exam results
Research project: *'Understanding the outcomes of planet-planet scattering'* (Distinction)
Supervised by Dr Roman Rafikov

Leonid Grishchuk Internship Program — *Cardiff University* *Summer 2016*

Competitive, funded summer research internship in the Gravitational Physics Group
Project: *'Constraining the scalar polarisation content of gravitational waves'*
Supervised by Prof Patrick Sutton and Dr Francesco Pannarale

MA in Natural Sciences (Astrophysics) — *University of Cambridge* *2013–2016*

1st class | Elected a Scholar of Trinity Hall

AWARDS AND ACHIEVEMENTS

- Winner, Buchalter Cosmology Prize (2nd Prize) | UCL press release *2023*
  International award recognising *'ground-breaking theoretical, observational, or experimental work in cosmology that has the potential to produce a breakthrough advance in our understanding'*
- Honorable Mention in the GWIC-Braccini Thesis Prize competition *2022*
- Best Student Talk Prize at BritGrav 21, sponsored by IoP Publishing *2021*
  Corresponding paper published in *Classical and Quantum Gravity* as an invited submission
- King's Education Award for 'extraordinary contributions' to teaching *2020*
- 'Rising Star' nominee, King's Education Awards (only PhD student nominee in Physics) *2019*
- Bateman Scholar of Trinity Hall (Cambridge), recognising 'excellent' exam results *2017*

GRANTS AND FUNDING SECURED

- UKRI Quantum Technologies for Fundamental Physics Additional Research Grant *2023*
  6-month funding extension — £68,800
- UCL Astrophysics Group Small Grant (to support a seminar series I organise) — £1,000 *2022*
- IoP Research Student Conference Fund — £300 *2019*

RESPONSIBILITIES

- Lead organiser, UCL Cosmology/Extragalactic Seminars *2022–present*
  Developed an ambitious program of in-person talks with speakers from across the UK and abroad, from what had previously been an online-only event due to COVID-19; secured and managed small grant (£1,000) for speaker expenses and group lunches to encourage student participation
- Co-organiser, London Cosmology Discussion Meetings (LCDM) *2018–2021*
  Coordinated between five institutions to organise meetings at the Royal Astronomical Society on *'Dark Matter in Cosmology'*, *'Neutrinos in Cosmology'*, and *'Cosmological Probes of New Physics'*
- Organiser, TPPC Journal Club *2021*
- Organiser, TPPC Gravity Meetings *2018–2020*
  Initiated a regular series of meetings with internal and external speakers on gravitational physics
- Referee for NSF Research Grant *2022*
- Referee for ERC Consolidator Grant in Universe Sciences *2019*
- Referee for 22 articles in *Nature Astronomy*, *Physical Review Letters (PRL)*, *2020–present*
  Physical Review D (PRD), *Journal of Cosmology and Astroparticle Physics (JCAP)*, *European Physical Journal C (EPJC)*, *The Astronomical Journal*, and *Universe*
- Student representative, KCL Physics Department Research Committee *2019–2021*

AFFILIATIONS

Scientific collaborations

- Quantum Simulators for Fundamental Physics (QSimFP) Consortium *2021–present*
- LISA Consortium *2018–present*
- Einstein Telescope (ET) Observational Science Board *2021–present*
- LIGO Scientific Collaboration *2016–2021*

Professional bodies

- Member, Institute of Physics (MInstP) *2018–present*
- Fellow, Royal Astronomical Society (FRAS) *2020–present*
- Junior Member, European Astronomical Society *2020–present*

SELECTED PUBLICATIONS

Citation statistics as of 11 October 2023 (data from INSPIRE-HEP):

Lead-author only	15 papers, 436 citations, h-index = 10
Non-LIGO only	26 papers, 1,424 citations, h-index = 18
All publications	102 papers, 22,699 citations, h-index = 53

Lead-author papers (author list is ordered alphabetically in some cases)

L1. **ACJ**, J. Braden, H. V. Peiris, A. Pontzen, M. C. Johnson, and S. Weinfurtner, *From the tabletop to the Big Bang: Analogue vacuum decay from vacuum initial conditions* (2023), arXiv:2307.02549 [cond-mat.quant-gas]

L2. A. K.-W. Chung, **ACJ**, J. D. Romano, and M. Sakellariadou, *Targeted search for the kinematic dipole of the gravitational-wave background* (2022), Phys. Rev. D **106**, 082005, arXiv:2208.01330 [gr-qc]

L3. M. R. Mosbech, **ACJ**, S. Bose, C. Boehm, M. Sakellariadou, and Y. Y. Y. Wong, *Gravitational-wave event rates as a new probe for dark matter microphysics* (2022), Phys. Rev. D **108**, 043512, arXiv:2207.14126 [astro-ph.CO]
Co-lead author with Markus Mosbech; I developed the core idea and led $\sim 50\%$ of the analysis
Featured in a Royal Astronomical Society press release at the 2023 National Astronomy Meeting

L4. **ACJ**, *Cosmology and Fundamental Physics in the Era of Gravitational-Wave Astronomy* (2022, PhD thesis), arXiv:2202.05105 [gr-qc]

L5. D. Blas and **ACJ**, *Bridging the μHz gap in the gravitational-wave landscape with binary resonance* (2022), Phys. Rev. Lett. **128**, 101103, arXiv:2107.04601 [astro-ph.CO]
Awarded a Buchalter Cosmology Prize (2nd Prize), recognising 'potential for remarkable impact'
Altmetric attention score of 397, in the top 0.3% of all publications ever tracked by Altmetric
Featured in the *Daily Express*, *Physics* magazine, *Big Think*, *SYFY wire*, and 40+ other outlets

L6. D. Blas and **ACJ**, *Detecting stochastic gravitational waves with binary resonance* (2022), Phys. Rev. D **105**, 064021, arXiv:2107.04063 [gr-qc]

L7. **ACJ** and M. Sakellariadou, *Nonlinear gravitational-wave memory from cusps and kinks on cosmic strings* (2021), Class. Quant. Grav. **38**, 165004, arXiv:2102.12487 [gr-qc]
Invited submission to CQG as winner of the Best Student Talk Prize at BritGrav 21

L8. **ACJ** and M. Sakellariadou, *Primordial black holes from cusp collapse on cosmic strings* (2020), arXiv:2006.16249 [astro-ph.CO]

L9. **ACJ**, J. D. Romano, and M. Sakellariadou, *Estimating the angular power spectrum of the gravitational-wave background in the presence of shot noise* (2019), Phys. Rev. D **100**, 083501, arXiv:1907.06642 [astro-ph.CO]

L10. **ACJ** and M. Sakellariadou, *Shot noise in the astrophysical gravitational-wave background* (2019), Phys. Rev. D **100**, 063508, arXiv:1902.07719 [astro-ph.CO]

L11. **ACJ**, R. O'Shaughnessy, M. Sakellariadou, and D. Wysocki, *Anisotropies in the astrophysical gravitational-wave background: The impact of black hole distributions* (2019), Phys. Rev. Lett. **122**, 111101, arXiv:1810.13435 [astro-ph.CO]

L12. **ACJ**, A. G. A. Pithis, and M. Sakellariadou, *Can we detect quantum gravity with compact binary inspirals?* (2018), Phys. Rev. D **98**, 104032, arXiv:1809.06275 [gr-qc]

L13. **ACJ**, M. Sakellariadou, T. Regimbau, and E. Slezak, *Anisotropies in the astrophysical gravitational-wave background: Predictions for the detection of compact binaries by LIGO and Virgo* (2018), Phys. Rev. D **98**, 063501, arXiv:1806.01718 [astro-ph.CO]

L14. **ACJ** and M. Sakellariadou, *Anisotropies in the stochastic gravitational-wave background: Formalism and the cosmic string case* (2018), Phys. Rev. D **98**, 063509, arXiv:1802.06046 [astro-ph.CO]
Featured in PRD's 'kaleidoscope' for Sept 2018

Other selected papers (with summary of my main contributions)

O1. M. Branchesi *et al.*, *Science with the Einstein Telescope: a comparison of different designs* (2023), arXiv:2303.15923 [gr-qc]
Contributed to stochastic background sensitivity analysis for different possible configurations

O2. S. Gasparrotto, R. Vicente, D. Blas, **ACJ**, and E. Barausse, *Can gravitational-wave memory help constrain binary black-hole parameters? A LISA case study* (2023), Phys. Rev. D **107**, 124033, arXiv:2301.13228 [gr-qc]
Helped define project and methodologies; informal supervision of PhD student (Silvia Gasparrotto)

O3. P. Auclair *et al.* (LISA Cosmology Working Group), *Cosmology with the Laser Interferometer Space Antenna* (2022), arXiv:2204.05434 [astro-ph.CO] | LISA white paper; contributed to section on cosmic strings, led analysis of related gravitational-wave background anisotropies

O4. A. Renzini, B. Goncharov, **ACJ**, and P. M. Meyers, *Stochastic Gravitational-Wave Backgrounds: Current Detection Efforts and Future Prospects* (2022), Galaxies **10**, 34, arXiv:2202.00178 [gr-qc]
Invited review article; significant contributions to sections on gravitational-wave theory and sources

O5. N. Bartolo *et al.* (LISA Cosmology Working Group), *Probing Anisotropies of the Stochastic Gravitational Wave Background with LISA* (2022), JCAP **11**, 009, arXiv:2201.08782 [astro-ph.CO]
LISA review paper; Coordinator for 'topological defects' section, with further contributions to 'astrophysical sources' section

O6. P. Auclair, J. J. Blanco-Pillado, D. G. Figueroa, **ACJ**, M. Lewicki, M. Sakellariadou, S. Sanidas, L. Sousa, D. A. Steer, J. M. Wachter, and S. Kuroyanagi (LISA Cosmology Working Group), *Probing the gravitational wave background from cosmic strings with LISA* (2019), JCAP **04**, 034, arXiv:1909.00819 [astro-ph.CO] | LISA review paper; significant writing contributions throughout

O7. B. P. Abbott *et al.* (LIGO, Virgo), *Directional limits on persistent gravitational waves using data from Advanced LIGO's first two observing runs* (2019), Phys. Rev. D **100**, 062001, arXiv:1903.08844 [gr-qc] | Led interpretation of observational results in the context of cosmological and astrophysical source models, wrote corresponding section

O8. B. P. Abbott *et al.* (LIGO, Virgo), *Search for the isotropic stochastic background using data from Advanced LIGO's second observing run* (2019), Phys. Rev. D **100**, 061101, arXiv:1903.02886 [gr-qc]
Rapid communication | Led and wrote section on implications for cosmic string models

SELECTED TALKS

Total of 21 invited talks across three continents

- **COSMO23** *Sept 2023*
  Institute for Theoretical Physics (IFT), Madrid
- **Amaldi15** *July 2023*
  Online
- **Cosmology from Home** (Invited expert panellist) *July 2023*
  Online
- **National Astronomy Meeting** (RAS press release) *July 2023*
  Cardiff University
- **Quantum Simulators for Fundamental Physics Workshop** (Invited) *June 2023*
  Perimeter Institute for Theoretical Physics, Waterloo, Canada
- **Astrophysics Seminar** (Invited) *May 2023*
  University of Leicester

- **Cosmology Seminar** (Invited) — *May 2023*
  Beecroft Institute, Oxford
- **Theory Group Seminar** (Invited) — *May 2023*
  Astroparticle and Cosmology Laboratory (APC), Paris
- **Cosmology and Relativity Seminar** (Invited) — *April 2023*
  Queen Mary University of London
- **London Gravity Meeting** (Invited) — *March 2023*
  Royal Society, London
- **UK-QFT XI** — *Jan 2023*
  DAMTP, University of Cambridge
- **'Dark Matters' Workshop** (Invited) — *Nov 2022*
  Université Libre de Bruxelles (ULB)
- **London-Oldenburg Relativity Seminar** (Invited) — *Nov 2022*
  University College London/University of Oldenburg (online)
- **Seminar** (Invited) — *Sept 2022*
  International Centre for Theoretical Physics, Asia-Pacific (online)
- **Quantum Simulators for Fundamental Physics Workshop** (Invited) — *Sept 2022*
  Science Gallery London
- **'Gravitational-Wave Orchestra' Workshop** (Invited) — *Sept 2022*
  Université Catholique de Louvain, Belgium
- **International LISA Symposium XIV** — *July 2022*
  University of Glasgow (online)
- **National Astronomy Meeting** (One of twelve talks selected for parallel session) — *July 2022*
  University of Warwick
- **Circle University Meeting** — *June 2022*
  King's College London
- **Theory Group Seminar** (Invited) — *May 2022*
  Institute of High-Energy Physics (IFAE), Barcelona
- **UKCosmo meeting** (One of seven 'long' talks selected) — *May 2022*
  Newcastle University
- **Quantum Technology Seminar** (Invited) — *May 2022*
  London Centre for Nanotechnology, University College London
- **9th LISA Cosmology Workshop** — *Dec 2021*
  Online
- **Cosmology/Extragalactic Seminar** — *Nov 2021*
  University College London
- **Theory Group Seminar** (Invited) — *Oct 2021*
  Astroparticle and Cosmology Laboratory (APC), Paris
- **European Physical Society Conference on High-Energy Physics** — *July 2021*
  DESY/University of Hamburg (online)
- **Ibarra Group Seminar** (Invited) — *July 2021*
  Technical University of Munich (online)

- **Gravitational Wave Probes of Physics Beyond the Standard Model** (Invited) *July 2021*
  University of Warsaw (online)
- **2nd European Physical Society Conference on Gravitation** *July 2021*
  King's College London (online)
- **BritGrav 21** (Winner of the Best Student Talk Prize) *Apr 2021*
  University College Dublin (online)
- **London Cosmology Discussion Meeting (LCDM)** (Invited) *Dec 2020*
  Royal Astronomical Society, London (online)
- **International LISA Symposium XIII** *Sept 2020*
  Online
- **Theoretical Cosmology Seminar** (Invited) *May 2020*
  Institute of Cosmology and Gravitation (ICG), University of Portsmouth (online)
- **Cosmology Seminar** (Invited) *May 2020*
  Beecroft Institute, University of Oxford (online)
- **London Cosmology Discussion Meeting (LCDM)** *Feb 2020*
  Royal Astronomical Society, London
- **30th Texas Symposium on Relativistic Astrophysics** (IoP travel award) *Dec 2019*
  Institute of Cosmology and Gravitation (ICG), University of Portsmouth
- **Gravitational Wave Probes of Fundamental Physics** (Invited) *Nov 2019*
  EuCAPT workshop, Amsterdam
- **UKCosmo meeting** (One of nine talks selected) *May 2019*
  DAMTP, University of Cambridge
- **14th Iberian Cosmology Meeting (IberiCOS)** *Apr 2019*
  University of the Basque Country, Bilbao
- **1st European Physical Society Conference on Gravitation** *Feb 2019*
  Sapienza University of Rome
- **Seminar** (Invited) *Feb 2019*
  Virtual Institute of Astroparticle Physics (online)
- **Cosmology Coffee Seminar** *Oct 2018*
  Imperial College London
- **UKCosmo meeting** *May 2018*
  Swansea University
- **BritGrav 18** *Apr 2018*
  Institute of Cosmology and Gravitation (ICG), University of Portsmouth

TEACHING

University College London *2021–present*

· Lead supervisor of research projects for two masters students: Phoebe Routh (ongoing) and David Moody (distinction, now working in data science)

· Postgraduate Teaching Assistant for 3rd-year *Physical Cosmology*: developed problem sets and delivered problem-solving tutorials

King's College London *2017–2021*
Graduate Teaching Scholar

- Winner of a 2020 King's Education Award, recognising 'extraordinary contributions' to teaching
- 'Rising Star' nominee in the 2019 King's Education Awards (only PhD student nominee in Physics)
- Co-wrote lecture notes for 3rd-year *General Relativity and Cosmology*
- Examples class demonstrator for numerous courses, including 4th-year *Astroparticle Cosmology*, 3rd-year *General Relativity and Cosmology*, 2nd-year *Astrophysics*, 1st-year *Mathematics for Physicists*, ...

SOFTWARE AND NUMERICS

- Lead developer of Fortran lattice field theory code `lattice-fvd` and Python code `gw-resonance`
- Experience with advanced numerical techniques including, e.g., Fourier and Chebyshev pseudospectral methods and symplectic integration
- Extensive experience in Unix environments (Ubuntu/MacOS), including in HPC settings
- Advanced Python user (object-oriented programming; data handling and visualisation; `Jupyter`, `NumPy`, `SciPy`, `h5py`, `Astropy`, `healpy`, `sympy`, ...)
- Other languages and software include Fortran, C++, Mathematica, Git, MATLAB, SageMath, SQL, LaTeX (including Ti*k*Z), ...

PUBLIC ENGAGEMENT AND OUTREACH

- YouTube video interview on 'Early Universe Cosmology in the Lab' *2023*
- Outreach talk for alumni of UCL's 'Introduction to Astronomy' course, aimed at amateur astronomers and members of the public *2023*
- Participated in five interviews for media pieces on my paper *'Bridging the μHz gap in the gravitational-wave landscape with binary resonance'* *2022*
- Team member, `questions@ligo.org` help desk *2020–2021*
  Answered scientific questions submitted to the LIGO Collaboration by members of the public
- Maths and Physics Tutor at Open Tutors London *2017–2020*
  Provided free tutoring for University of London students from under-represented groups
- Speaker and local co-organiser, Pint of Science Festival (cancelled due to COVID-19) *2020*
- Volunteer, KCL Womxn in Physics LaTeXworkshops *2019–2020*
- Helped run an interactive exhibit on Dark Matter at Science Gallery London *2019*
- Local co-organiser, Pint of Science Festival *2018*
- Volunteer, Cambridge Institute of Astronomy Public Open Evenings *2015–2017*
- Member, Trinity Hall Access Team *2015–2017*
- Volunteer, American Physical Society 'Adopt-a-Physicist' program *2016*
- Contributor, Cambridge University Student Union (CUSU) 'Alternative Prospectus' *2016*
- Senior Mentor, CUSU Shadowing Scheme *2014–2016*
- Demonstrator, Cambridge Hands-On Science (CHaOS) *2014–2016*
- Trinity Hall Natural Sciences subject representative *2014–2015*