

# ALEXANDER C. JENKINS

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## ABOUT ME

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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

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**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

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

Funded by competitive faculty scholarship | Member of [Theoretical Particle Physics and Cosmology](#)  
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

## OTHER SCIENTIFIC TRAINING

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[International School on Quantum Sensors for Fundamental Physics](#) Sept 2021  
*IPPP, Durham University*

[Kavli-RISE summer school on Gravitational Waves](#) Sept 2019  
*DAMTP, University of Cambridge*

[Workshop on gravitational-wave Bayesian parameter estimation](#) May 2019  
*ICG, University of Portsmouth*

[Les Houches School of Physics, Session CX — Gravitational Waves](#) July 2018  
*École de Physique des Houches, France*

[Scientific Programming with Python](#) May 2018  
*Alan Turing Institute, London*

## AWARDS AND ACHIEVEMENTS

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- 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
- Finalist, [Dutch Mathematical Olympiad](#) (Nederlandse Wiskunde Olympiade) 2012

## RESPONSIBILITIES

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- 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 the pandemic; secured and managed small grant (£1k) 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 20 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

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### 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

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Citation statistics as of 7 July 2023 (data from [INSPIRE-HEP](#)):

<b>Lead-author only</b>	15 papers, 416 citations, $h$ -index = 9
<b>Non-LIGO only</b>	26 papers, 1,258 citations, $h$ -index = 18
<b>All publications</b>	100 papers, 20,952 citations, $h$ -index = 50

**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), [arXiv:2207.14126](#) [astro-ph.CO]  
Co-lead author with Markus Mosbech; I developed the core idea and lead  $\sim 50\%$  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  $\mu\text{Hz}$  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**, M. Sakellariadou, T. Regimbau, E. Slezak, R. O’Shaughnessy, and D. Wysocki, *Response to Cusin et al’s comment on arXiv:1810.13435* (2019), [arXiv:1901.01078](#) [astro-ph.CO]
- L12. **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]
- L13. **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]

- L14. **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]
- L15. **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, lead 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] | Lead 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 | Lead and wrote section on implications for cosmic string models

#### SELECTED TALKS

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- **COSMO23** Sept 2023  
*Instituto de Física Teórica (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*

- **QSimFP 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)*
- **QSimFP Consortium 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*



## SOFTWARE AND NUMERICS

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- 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, L<sup>A</sup>T<sub>E</sub>X (including TikZ), ...

## TEACHING

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### University College London

2021–present

- Lead supervisor of MSc research student, 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)
- 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*, ...
- Co-wrote lecture notes for 3rd-year *General Relativity and Cosmology*

## PUBLIC ENGAGEMENT AND OUTREACH

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- [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  \$\mu\text{Hz}\$  gap in the gravitational-wave landscape with binary resonance](#)' 2022
- Co-organiser, [Astronomy on Tap London](#) 2022–present
- 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 L<sup>A</sup>T<sub>E</sub>X workshops](#) 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*