

Employment and Education

UC Berkeley / Lawrence Berkeley National Lab

Postdoctoral Researcher

from 2024

Stanford University

PhD in Physics (advisor: Natalia Toro)

2024

Oxford University (New College)

MSc in Mathematical and Theoretical Physics with distinction

2019

Cambridge University (St. John's College)

MASt in Mathematics with distinction

2018

Massachusetts Institute of Technology

BS in Physics and Mathematics

2017

Publications

Most of these works have alphabetical author lists; exceptions are indicated by underlining.

2511.07514 Quantum Calculations of the Cavity Shift in Electron Magnetic Moment Measurements
F. Day, R. Harnik, Y. Kahn, S. Pavaskar, K. Zhou

2510.05198 Intrinsically Quantum Effects of Axion Dark Matter are Undetectable
Y. Bao, D. Y. Cheong, N. Rodd, J. Takach, L.-T. Wang, K. Zhou

2507.07173 A Prototype Hybrid Mode Cavity for Heterodyne Axion Detection
Z. Li, K. Zhou, M. Oriunno, A. Berlin, S. Calatroni, R. T. D'Agnolo,
S. A. R. Ellis, P. Schuster, S. Tantawi, N. Toro

2504.02927 Determining Spin-Dependent Light Dark Matter Rates from Neutron Scattering
A. Berlin, A. J. Millar, T. Trickie, K. Zhou, Phys. Rev. D 112, 035021 (2025)

2502.01725 Ponderomotive Effects of Ultralight Dark Matter
K. Zhou, JHEP 05, 134 (2025)

2312.11601 Physical Signatures of Fermion-Coupled Axion Dark Matter
A. Berlin, A. J. Millar, T. Trickie, K. Zhou, JHEP 05, 314 (2024)

2303.04816 Interactions of Particles with “Continuous Spin” Fields
P. Schuster, N. Toro, K. Zhou, JHEP 04, 010 (2023)

2209.12901 Discovering QCD-Coupled Axion Dark Matter with Polarization Haloscopes
A. Berlin, K. Zhou, Phys. Rev. D 108, 035038 (2023)

- 2112.02104** Probing Invisible Vector Meson Decays with the NA64 and LDMX Experiments
P. Schuster, N. Toro, K. Zhou, Phys. Rev. D 105, 035036 (2022)
- 2106.09033** Stellar Shocks From Dark Matter Asteroid Impacts
A. Das, S. A. R. Ellis, P. Schuster, K. Zhou, Phys. Rev. Lett. 128, 021101 (2022)
- 2007.15656** Heterodyne Broadband Detection of Axion Dark Matter
A. Berlin, R. T. D'Agnolo, S. A. R. Ellis, K. Zhou, Phys. Rev. D 104, L111701 (2021)
- 1912.11048** Axion Dark Matter Detection by Superconducting Resonant Frequency Conversion
A. Berlin, R. T. D'Agnolo, S. A. R. Ellis, C. Nantista, J. Neilson, P. Schuster, S. Tantawi, N. Toro, K. Zhou, JHEP 07, 088 (2020)
- 1704.06266** Casimir Meets Poisson: Improved Quark/Gluon Discrimination with Counting Observables
C. Frye, A. Larkoski, J. Thaler, K. Zhou, JHEP 09, 083 (2017)
- 1704.05456** Generalized Fragmentation Functions for Fractal Jet Observables
B. Elder, M. Procura, J. Thaler, W. Walewijn, K. Zhou, JHEP 06, 085 (2017)
- 1703.04722** Minimum Energetic Cost to Maintain a Target Nonequilibrium State
J. Horowitz, K. Zhou, J. England, Phys. Rev. E 95, 042102 (2017)

Community White Papers and Collaborations

- 2509.26574** Probing the Critical Point of AI Reasoning: a Frontier Physics Research Benchmark
Contributed a scaffolded and fully solved example research problem
- 2501.14249** Humanity's Last Exam
Contributed tricky physics problems to help benchmark AI, interviewed in *New York Times*
- 2203.14923** Axion Dark Matter
Contributed writing for a subsection, and editing for all sections
- 2203.12714** Searches for New Particles, Dark Matter, and Gravitational Waves with SRF Cavities
Contributed writing and feedback
- 2203.08192** Current Status and Future Prospects for the Light Dark Matter eXperiment
Contributed theoretical projections for experimental sensitivity, and figures

Other Works

- [Physics Olympiad Handouts](#)
Proto-textbook with 1,000 tricky solved problems, used by students in dozens of countries
- 2411.08283** The surprising subtlety of electrostatic field lines
K. Zhou and T. Brauner, Am. J. Phys. 93, 234–240 (2025)
- 2203.15821** Comment on “Poynting vector controversy in axion modified electrodynamics”

Fellowships and Awards

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|---|-------------|
| NSF Graduate Research Fellowship | 2017 – 2022 |
| Marshall Scholarship | 2017 – 2019 |
| Demuth Prize, New College | 2019 |
| Dirac Prize, St. John's College | 2018 |
| Finalist, Hertz Fellowship | 2017 |
| Joel Matthew Orloff Award for Outstanding Research, MIT | 2017 |
| Honorable Mention, Putnam Mathematical Competition | 2016, 2017 |
| Gold Medal, International Physics Olympiad | 2012, 2013 |
| Winner, USA Junior Mathematical Olympiad | 2011 |

Seminars

The Cavity Shift of Electron $g - 2$

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| UC Davis QMAP Particle/Cosmology Seminar | 11/25 |
| Fudan University Seminar | 7/25 |

Quantum and Classical Effects of Axion Dark Matter

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| UC Berkeley "4D" Seminar | 10/25 |
| Tsung-Dao Lee Institute Seminar | 7/25 |

How (Not) to Probe the Axion-Electron Coupling

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| Peking University Seminar | 7/25 |
| UC Davis "Xperiment" Seminar | 5/25 |
| University of Chicago Particle Theory Seminar | 4/25 |
| UC Berkeley "4D" Seminar | 8/24 |
| Flatiron Institute, Particle Astrophysics and Cosmology Meeting Around NYC | 4/24 |
| University of Geneva High Energy Particle Physics Seminar | 3/24 |
| HEP/Astro Results Forum | 3/24 |
| SLAC Theory Seminar | 11/23 |

Electromagnetism and Gravity with Continuous Spin

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| Tsinghua University Seminar | 7/25 |
| UIUC High Energy Physics Seminar | 10/24 |
| Hunting Invisibles (HIDDeN) Virtual Institute Seminar | 11/23 |
| Caltech High Energy Physics Seminar | 10/23 |
| UC Santa Cruz SCIPP Seminar | 10/23 |
| University of Maryland EPT Seminar | 9/23 |
| ICTP HECAP Seminar | 7/23 |
| CERN BSM Forum | 6/23 |
| UC Davis QMAP Particle/Cosmology Seminar | 4/23 |
| UC Berkeley "4D" Seminar | 4/23 |
| Stanford Phenomenology Seminar | 2/23 |
| Perimeter Institute Theory Seminar | 10/22 |

Discovering the QCD Axion with Polarization Haloscopes

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| Fermilab Theory Seminar | 4/23 |
| TRIUMF Theory Seminar | 10/22 |
| University of Victoria Theory Seminar | 10/22 |

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| Flashes in the Dark: New Searches for Axions and Macroscopic Dark Matter | | |
| Johns Hopkins Theory Seminar | | 9/22 |
| Searching for Ultraheavy and Ultralight Dark Matter | | |
| SLAC Theory Seminar | | 3/22 |
| Heterodyne Detection of Axion Dark Matter | | |
| Virtual Axion Institute | | 8/20 |

Conferences and Workshops

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| The Superconducting Heterodyne Approach to Axion Detection | | |
| Axions in Stockholm 2025 | | 7/25 |
| Berkeley Axion Workshop 2025 (invited) | | 5/25 |
| Spin-Dependent Dark Matter Rates from Neutron Scattering | | |
| Phenomenology 2025 Symposium | | 5/25 |
| Physical Signatures of Fermion-Coupled Axion Dark Matter | | |
| Phenomenology 2024 Symposium | | 5/24 |
| Discovering the QCD Axion with Polarization Haloscopes | | |
| 18th Patras Workshop on Axions, WIMPs and WISPs | | 7/23 |
| Phenomenology 2023 Symposium | | 5/23 |
| Probing Dark Sectors With Invisible Vector Meson Decays | | |
| Phenomenology 2022 Symposium | | 5/22 |
| APS April Meeting 2022 | | 4/22 |
| ILC Workshop on Potential Experiments (ILCX2021) | | 10/21 |
| Stellar Shocks From Dark Asteroids | | |
| 24th International Conference on Particle Physics and Cosmology (COSMO'21) | | 8/21 |
| APS Division of Particles & Fields Meeting (DPF21) | | 7/21 |
| Phenomenology 2021 Symposium | | 5/21 |

Proposals

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| An SRF Cavity for Dark Matter Axion Detection | 2022 – 2024 |
| <ul style="list-style-type: none"> • SLAC LDRD grant, with principal investigator Zenghai Li • Participated in design discussions, writing and editing of proposal and final publication | |

Outreach and Service

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| U.S. Physics Olympiad | 2015 – 2024 |
| <ul style="list-style-type: none"> • Wrote and edited the largest physics competition in the United States (6,000 participants) • Taught classes on problem solving and lab skills to finalists at annual training camps • Managed the theoretical training of the U.S. traveling team from 2021 to 2024 | |
| Physics StackExchange | 2014 – 2020 |

- Wrote 1,000 [answers](#) for questions on all fields of physics, with 3 million total views

Press coverage 2022

- Participated in several interviews for “Stellar Shocks From Dark Matter Asteroid Impacts”
(Altmetric score of 200+, in top 1% of Physical Review Letters)

National Science Bowl 2023 – 2024

- Wrote and edited physics questions for the U.S. Department of Energy’s flagship middle school and high school outreach event (~10,000 participants)

Department service

- Co-organized the Berkeley “Axion Works” seminar Fall 2025
- Co-organized the Berkeley/LBNL particle theory seminar Spring+Fall 2025
- Served as student representative for the physics department’s Graduate Studies Committee 2023
- Participated on various panels for undergraduates and incoming graduate students 2020

Local outreach

- Mentored a local undergraduate research intern Summer 2024
- Judged research presentations for the US Invitational Young Physicists Tournament 2023
- Taught high school students at “Splash” events at MIT, Oxford, and Stanford 2013 – 2019

Peer review

- Refereed research papers for *JHEP*, *JCAP*, *Phys. Rev. D*, *Phys. Rev. Lett.*, and *Nature Communications*
- Refereed pedagogical papers and books for *Am. J. Phys.*, *Cambridge University Press*, and *World Scientific*

Teaching and Education

Physics 230: Graduate Quantum Mechanics I 2024

Physics 120: Intermediate Electricity and Magnetism I 2023

Physics 330: Quantum Field Theory I 2022

- Ran weekly sections and office hours; helped write, edit, solve, and grade [new problem sets](#)