

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

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 $g - 2$

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

Quantum and Classical Effects of Axion Dark Matter

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

How (Not) to Probe the Axion-Electron Coupling

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

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

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

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

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

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

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 	
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)

Online discussion

- Wrote 1,000 [answers](#) on StackExchange for all fields of physics (3 million total views)
- Moderated Reddit’s r/Physics, the internet’s most active physics forum (1 million views per week)

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](#)