

Orion S. Ning

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📖 ACADEMIC POSITIONS

PhD Student, Theoretical Physics

2022 –

*University of California, Berkeley, and Lawrence Berkeley National Laboratory
NSF Graduate Research Fellow*

🏛️ EDUCATION

University of California, Berkeley

Berkeley, CA

Ph.D. Physics, Advisor: Benjamin R. Safdi

2022 –

The University of California, Berkeley

Berkeley, CA

B.A. Physics (Highest Honors), Mathematics (High Honors)

2022

M.A. Physics

2024

⚙️ CURRENT RESEARCH INTERESTS

Dark Matter Phenomenology and Indirect Detection, Axions/ALPs, Gravitational Waves, Astroparticle Physics, Gamma-Ray Astronomy, Computational Methods, Quantum Field Theory

📖 PUBLICATIONS

[INSPIRE](#) | 

1. **Ning, O.**, Safdi, B.R., & Welch, C. (2026). No Evidence for Superradiant Axions in LIGO-Virgo-KAGRA GWTC-5 Binary Black Hole Spins. [arXiv:2607.01317](#).
2. Ellis, S. A. R., **Ning, O.**, Rodd, N. L., & Schütte-Engel, J. (2026). Crowdsourcing Gravitational Waves from Superradiant Axions. [arXiv:2603.15734](#).
3. De Marchi, A. G., **Ning, O.**, & Xiao, T. (2026). Blazar Constraints on Axions through New Spectral Modulation Searches in 1ES 1959+650 & B2 1811+31. [arXiv:2603.13480](#).
4. **Ning, O.**, Raman, K., & Safdi, B. R. (2025). Cosmological Neutron Stars Produce Diffuse Axion X-Ray Signatures. [arXiv:2512.15849](#).
5. **Ning, O.**, Ray, A., & Safdi, B. R. (2025). Axion lines from nuclear de-excitations in galactic stellar populations. *Phys.Rev.D* 113 (2026) 3, 035010 [arXiv:2509.03569](#).
6. **Ning, O.**, & Safdi, B. R. (2025). Probing the Axion-Electron Coupling with NuSTAR Observations of Galaxies. *Phys.Rev.D* 113 (2026) 1, 015021 [arXiv:2503.09682](#).
7. **Ning, O.**, Dessert, C., Hong, V., & Safdi, B. R. (2024). Search for Axions from Magnetic White Dwarfs with Chandra. *Phys.Rev.D* 111 (2025) 10, 103002 [arXiv:2411.05041](#).
8. **Ning, O.**, & Safdi, B. R. (2024). Leading Axion-Photon Sensitivity with NuSTAR Observations of M82 and M87. *Phys.Rev.Lett.* 134 (2025) 17, 171003 **Editor's Suggestion**, [arXiv:2404.14476](#).
9. Dessert, C., **Ning, O.**, Rodd, N. L., & Safdi, B. R. (2023). Resurrecting Hitomi for Decaying Dark Matter and Forecasting Leading Sensitivity for XRISM. *Phys.Rev.Lett.* 132 (2024) 21, 211002 [arXiv:2305.17160](#).
10. Mu2e-II Collaboration (including **Ning, O.**) (2022). Mu2e-II: Muon to electron conversion with PIP-II. *In Snowmass 2021*. [arXiv:2203.07569](#).
11. Garcia-Quintero, C., Ishak, M., & **Ning, O.** (2020). Current constraints on deviations from General Relativity using binning in redshift and scale. *JCAP*, 12, 018. [arXiv:2010.12519](#).

🗨 SELECTED TALKS AND PRESENTATIONS

- “Galactic Axion Factories: Astrophysical Sources and Signals for Axion Searches,” King’s College London TPPC Seminar, *London, UK, July 2026*
- “Dark Particles and Bright Bursts: Future Stories from the Gamma-Ray Sky with GALAXIS,” Closing In on Thermal Relics with Indirect, Direct, and Collider Searches for Dark Matter Conference (CERN), *Geneva, Switzerland, July 2026*
- “Axion Searches from Black Hole Superradiance,” CERN Theory Cosmo/BSM Coffee, *Geneva, Switzerland, July 2026*
- “Crowdsourcing Gravitational Waves from Superradiance: Black Holes as Extreme Axion Laboratories,” 4th General Meeting of COST Action COSMIC WISPerS CA21106, *Corfu, Greece, June 2026*
- “Dark Particles and Bright Bursts: Future Stories from the Gamma-Ray Sky with GALAXIS,” COST WG3 (WISPerS in Astrophysics) Monthly Meeting, *online, April 2026*
- “Dark Particles and Bright Bursts: Future Stories from the Gamma-Ray Sky with GALAXIS,” LBL Dark Matter Lunch Talk, *Berkeley, CA, April 2026*
- “Galactic Axion Factories: Astrophysical Populations and Signals for Axion Searches,” Stanford KIPAC Seminar, *Stanford, CA, March 2026*
- “Galactic Axion Factories: Stellar Populations and X-Ray Signals for Axion Searches,” SLAC Theory Seminar, *Stanford, CA, October 2025*
- “Dark Particles and Bright Bursts: Future Stories from the Gamma-Ray Sky with GALAXIS,” UC Berkeley Astrophysics Department Lunch Talk, *Berkeley, CA, October 2025*
- “Galactic Axion Factories: Stellar Populations and X-Ray Signals for Axion Searches,” Axions in Stockholm 2025, *Stockholm, Sweden, July 2025*
- “Galactic Axion Factories: Stellar Populations and X-Ray Signals for Axion Searches,” The Strong CP Problem and its Possible Solutions 2025, *Pollica, Italy, June 2025*
- “Galactic Axion Factories: Stellar Populations and X-Ray Signals for Axion Searches,” Berkeley 4D Seminar, *Berkeley, CA, April 2025*
- “Axion-Photon Sensitivity with NuSTAR Observations of M82 and M87,” TeVPA 2024, *Chicago, IL, August 2024*
- “Axion-Photon Sensitivity with NuSTAR Observations of M82 and M87,” DPF-PHENO 2024, *Pittsburgh, PA, May 2024*
- “Resurrecting Hitomi for X-ray Probes of Sterile Neutrino and Axion-Like-Particle Dark Matter with Blank Sky Observations,” PASCOS 2023, *Irvine, CA, June 2023*

✂ COLLABORATION MEMBERSHIP

- COSI, *Dark Matter Working Group* 2025 -
- GALAXIS, *Dark Matter Working Group, Astrophysics Working Group* 2025 -
- Mu2e, *Tracker Working Group* 2019-2022

AWARDS, HONORS, AND FUNDING

- Sushant Singh Rajput Memorial Fellowship in Physics 2025
- Hearts to Humanity Eternal (H2H8) Graduate Research Grant ([site](#)) 2025
- Outstanding Graduate Student Instructor (OGSI) Award ([site](#)) 2023 – 2024
- National Science Foundation Graduate Research Fellowship ([site](#)) 2022 – 2025
- Percy Lionel Davis Award in Mathematics ([site](#)) 2022
- Cal Alumni Association's The Leadership Award and Scholarship ([site](#)) 2021 – 2022, 2018 – 2019
- Astronaut Scholarship Foundation (ASF) Scholar ([site](#)) 2021 – 2022
- UC Berkeley Summer Undergraduate Research Fellowship (SURF) ([site1](#)) ([site2](#)) Summer 2021
- Berkeley Physics Undergraduate Research Scholars Program (BPURS) Funding ([site](#)) ... Fall 2020, Spring 2021
- UC Berkeley Kraft Award for Freshmen ([site](#)) 2018

TEACHING AND TUTORING

Teaching Assistantships (GSI)

- Physics 110B: Classical Electrodynamics Part II (*instructor: Liang Dai*) Fall 2023

Democratic Education at Cal (DeCal) | *Lead Course Facilitator and Teacher* [site](#)

- Astronomy 98: Beginner's Guide to the Universe (*faculty sponsor: Jessica Lu*) Fall 2020 – Spring 2022

Department Peer Tutor and Group Study Facilitator | *Physics Department* [site](#)

- Physics 137A (Quantum Mechanics I) Spring 2022
- Physics 110A (Electromagnetism and Optics I) Fall 2021
- Physics 137B (Quantum Mechanics II) Spring 2021, Fall 2020

Course Reader/Grader

- Physics 209: Classical Electromagnetism (Graduate Level) (*instructor: Liang Dai*) Fall 2024
- Physics 137A: Quantum Mechanics I (*instructor: Swapan Chatterjee*) Summer 2023
- Physics 110B: Classical Electrodynamics Part II (*instructor: Ehud Altman*) Spring 2022
- Physics 112: Statistical Mechanics/Thermodynamics (*instructors: Michael Zaletel, Ehud Altman*) Fall 2021
- Physics 137A: Quantum Mechanics I (*instructor: Dan Kasen*) Spring 2021
- Physics 77: Introduction to Computational Techniques in Physics (*instructor: Yury Kolomensky*) Fall 2020
- Math 54: Linear Algebra and Differential Equations (*instructor: Rui Wang*) Summer 2020

Pedagogy Theory | *Courses Taken*

- MPS 375: Pedagogy in Math and the Physical Sciences Spring 2023
- Student Learning Center (SLC) Astronomy and Physics Pedagogy Seminar Fall 2021 – Spring 2022

OUTREACH, SERVICE, AND MENTORING

Berkeley Center for Theoretical Physics 4D Seminar

[site](#)

- Organizer Spring 2026

Astronomy on Tap San Francisco

[site](#)

- Speaker, “From Astrophysics to Axions: The Glorious Hunt for Dark Matter” (Dec. 9) Fall 2025

UC Berkeley Compass Lectures

[site](#)

- Speaker, “The Cosmic Game of Hide-and-Seek: Chasing Dark Matter Across the Stars” (Apr. 18) Spring 2025

UC Berkeley Astro Night Public Lecture

[site](#)

- Speaker, “From Astrophysics to Axions: The Glorious Hunt for Dark Matter” (Oct. 3) Fall 2024

Splash at Berkeley | *Administrator and Volunteer Teacher*

[site](#)

- Administrator and Organizer Spring 2024 –
- Class S1663: Cosmic Ghostbusters: Hunting the Universe’s Invisible Beasts (*joint with Hannah Lykes*) Spring 2026
- Class S1570: Good Vibrations: Gravitational Waves and the Hidden Music of Spacetime Fall 2025
- Class S1469: The Usual (Particle) Suspects: Culprits Beyond the Standard Model? Spring 2025
- Class S1241: From Astrophysics to Axions: The Glorious Hunt for Dark Matter Spring 2024, Fall 2024
- Class S919: So Long, and Thanks for All the Spacetime (*joint with Druv Punjabi*) Spring 2022
- Class S838: Alge-cada-bra: The Algebraist’s Answer to Life, the Universe, and Everything (*joint with Ryan Tamura*) Fall 2021
- Rainstorm Virtual Class S732: The Quantum Complex (*joint with Ryan Tamura*) Spring 2021
- Class S772: The Quantum Complex (*joint with Ryan Tamura*) Spring 2021
- Class S667: Relativity and Spacetime Fall 2020

Science Olympiad

- Science Olympiad at Berkeley: Exam Writer, Moderator, Grader – Solar System Spring 2026, [site](#)
- Golden Gate Science Olympiad: Volunteer, Moderator & Grader – Astronomy Spring 2025, [site](#)

UC Berkeley Major Curriculum Committee

- Graduate Representative Fall 2022 – Spring 2023
- Undergraduate Representative Fall 2021 – Spring 2022

MPS Scholars Mentoring Network | *Volunteer Mentor*

[site](#)

- Mentor Fall 2025 –

Berkeley Undergraduate Mathementoring Program (BUMP) | *Volunteer Mentor*

[site](#)

- Mentor Fall 2019 – Fall 2021

Society of Physics Students (SPS) Mentoring Program | *Volunteer Mentor*

[site](#)

- Mentor Fall 2020 – Spring 2022

TECHNICAL SKILLS

Languages and Software: Python, C/C++, ROOT, Linux/Unix, Bash, cluster computing (slurm), Mathematica, L^AT_EX, Git, MESA, NSCool, CAMB/CosmoMC, Geant4, MEGAlib, Arduino, LabVIEW, Microsoft Office Suite

Other: Electronics and Circuitry, Soldering