

Wright Laboratory
Yale University
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CLARKE A. HARDY

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EDUCATION

Stanford University, Stanford, CA
Ph.D. in Physics 2025

Queen's University, Kingston, Canada
M.Sc. in Physics 2019
B.A.Sc. in Engineering Physics 2018

RESEARCH EXPERIENCE

Postdoctoral Associate, Search for Sterile Neutrinos with SIMPLE
Yale University Sep 2025 – Present

Graduate Research Assistant, Optically-Levitated Microspheres Lab
Stanford University Jul 2023 – Sep 2025

- Developed techniques for in-situ noise & background witnessing to improve sensitivity
- Built analysis framework to test for modifications to Newtonian gravity at short distances

Graduate Research Assistant, nEXO Neutrinoless Double Beta Decay Search
Stanford University Jun 2020 – Sep 2025

- Designed, constructed, & characterized a new xenon purifier to mitigate radon backgrounds
- Developed light collection efficiency calibration scheme using an internal ^{127}Xe source
- Built, maintained, & operated two test platforms for nEXO R&D at Stanford

Graduate Research Assistant, LZ Dark Matter Search
SLAC National Accelerator Laboratory Sep 2019 – Jun 2020

- Modelled sensitivity of the LZ detector to leptophilic dark matter

Graduate Research Assistant, PICO Dark Matter Search
Queen's University & SNOLAB May 2018 – Sep 2019

- Modelled sensitivity of PICO-40L to $\text{CE}\nu\text{NS}$ and annual modulations in a DM signal
- Assisted with commissioning of the PICO-40L detector at SNOLAB
- Improved PICO-40L image quality by designing, fabricating, & installing a new retroreflector

Undergraduate Research Assistant, PICO Dark Matter Search
Queen's University May 2017 – May 2018

- Performed ray tracing simulations & reflectivity tests for PICO-40L retroreflector design

Undergraduate Research Assistant, NEWS-G Dark Matter Search
Queen's University May 2016 – Aug 2016

- Developed & tested new calibration schemes using UV laser & external sources
- Designed & implemented slow controls readout electronics & software

HONORS & AWARDS

NSERC Postgraduate Scholarship – Doctoral
National Sciences and Engineering Research Council of Canada 2020

*** Alexander Graham Bell Canada Graduate Scholarship – Doctoral**
National Sciences and Engineering Research Council of Canada 2020

*** Clarendon Scholarship**

University of Oxford

2019

Queen's CAP Prize Examination Award

Queen's University

2019

R. Samuel McLaughlin Fellowship

Queen's University

2018

First Place, particle physics category

Canadian Undergraduate Physics Conference

2017

Ontario Professional Engineers Foundation Scholarship

Queen's University

2015

Principal's Scholarship

Queen's University

2014

* declined award

WORKSHOPS

Tri-Institute School on Elementary Particles (TRISEP)

Perimeter Institute for Theoretical Physics

June 2023

- Workshop spanning two weeks with sessions from invited researchers on the Standard Model, BSM physics, dark sector theory, amplitude techniques, EFT methods for gravity, gravitational wave theory, gravitational wave experiments, collider experiments, particle astrophysics observations, cosmology, and axions

TEACHING EXPERIENCE

Co-Instructor, *PHY 154: Physics I with Lab*, Mount Tamalpais College

Fall 2024

Co-Instructor, *Summer Science Circle*, Mount Tamalpais College

Summer 2023

Lead Instructor, *PHY 154: Physics I with Lab*, Mount Tamalpais College

Fall 2022

Co-Instructor, *MTH 220: Precalculus I*, Mount Tamalpais College

Spring 2022

Teaching Assistant, *PH 41: Mechanics*, Stanford

Winter 2022

Teaching Assistant, *PH 25: Modern Physics*, Stanford

Spring 2020

Teaching Assistant, *PH 23: Electricity, Magnetism, & Optics*, Stanford

Winter 2020

Teaching Assistant, *APSC 111: Mechanics*, Queen's

Fall 2018

SERVICE & OUTREACH

Volunteer Mentor

nEXO Collaboration Mentorship Program

2024 – Present

Volunteer Faculty

Mount Tamalpais College

2022 – Present

- Served on faculty at a college for the incarcerated population at San Quentin State Prison
- Developed & taught multiple courses in physics & math

McDonald Institute Ambassador

Arthur B. McDonald Canadian Astroparticle Physics Research Institute

2018 – 2019

- Hosted school groups & gave tours of the McDonald Institute Visitor Center
- Assisted with regular outreach events within the community

CONFERENCES & TALKS

1. * “In search of Majorana neutrinos and micron-scale interactions,” Nuclear Particle Astrophysics (NPA) Seminar, Yale University, New Haven, CT, April 2025
 2. “Searching for new physics at the micron scale with optically levitated microspheres,” APS April Meeting, Sacramento, CA, April 2024
 3. † “Optimizing energy reconstruction for nEXO”, Topics in Astroparticle and Underground Physics (TAUP) 2023, Vienna, Austria, September 2023
 4. † “Searching for Neutrinoless Double Beta Decay with nEXO”, TRISEP 2023, Waterloo, Canada, June 2023
 5. * “In Search of No Neutrinos: the nEXO Experiment and Detector Calibration”, Two Sigma PhD Symposium, New York, NY, June 2023
 6. “Development of a ^{127}Xe calibration source for nEXO,” APS April Meeting, New York City, NY, April 2022
 7. “Development of a high-purity zirconium purifier for nEXO,” APS Division of Nuclear Physics Fall Meeting (virtual), MIT, October 2021
 8. “Lightmap reconstruction in nEXO with an internal xenon 127 source,” Light Detection In Noble Elements (virtual), UC San Diego, September 2021
 9. “New Outreach Initiatives in Canada with the McDonald Institute,” European Physical Society High Energy Physics Conference, Ghent, Belgium, July 2019
 10. “Searching for Dark Matter with PICO-40L,” European Physical Society High Energy Physics Conference, Ghent, Belgium, July 2019
 11. “Determining the Physics Reach of the PICO Bubble Chamber Dark Matter Detectors,” Canadian Association of Physicists Congress, Burnaby, Canada, June 2019
 12. “Improving the Optics of the PICO Bubble Chamber Dark Matter Detector,” Winter Nuclear & Particle Physics Conference, Mont Tremblant, Canada, January 2018
 13. “Improving the Optics and Fiducial Volume of the PICO-40L Dark Matter Detector,” Canadian Undergraduate Physics Conference, Ottawa, Canada, October 2017
- * invited talk
† poster presentation

PUBLICATIONS

1. Z. Li [*et al.*, including **C. A. Hardy**], “Characterization of CRYO ASIC for charge readout in the nEXO experiment,” submitted to JINST (2025) [arXiv:2512.11116]
2. * Evan Angelico [*et al.*, including **Clarke A. Hardy** as corresponding author] “A flexible test facility for liquid xenon detector development,” JINST 20, P11005 (2025) [arXiv:2508.05853]
3. G. Richardson [*et al.*, including **C. A. Hardy**] “Sensitivity of nEXO to ^{136}Xe charged-current interactions: Background-free searches for solar neutrinos and fermionic dark matter,” Phys. Rev. D 112, 103010 (2025) [arXiv:2506.22586]
4. * A. B. M. R. Sazzad, **C. A. Hardy** *et al.*, “Predicting the single-site and multi-site event discrimination power of dual-phase time projection chambers,” submitted to JINST (2025) [arXiv:2510.02258]
5. T. J. Roosendaal [*et al.*, including **C. A. Hardy**] “Ultra-pure Nickel for Structural Components of Low-Radioactivity Instruments,” submitted to NIM A (2025) [arXiv:2508.08230]
6. A. Anker [*et al.*, including **C. A. Hardy**] “Ultra-sensitive radon assay using an electrostatic chamber in a recirculating system,” Nucl. Instrum. Methods Phys. Res. A 1081, 170876 (2026) [arXiv:2504.15464]

7. J. Xu [*et al.*, including **C. A. Hardy**] “Electron-ion recombination in composite interactions in liquid xenon,” Phys. Rev. D 112, 012014 (2025) [arXiv:2503.07562]
8. * Gautam Venugopalan, **Clarke A. Hardy et al.**, “Search for new interactions at the micron scale with a vector force sensor,” submitted to Phys. Rev. Lett. (2025) [arXiv:2412.13167]
9. S. Hedges [*et al.*, including **C. A. Hardy**], “Supernova electron-neutrino interactions with xenon in the nEXO detector,” Phys. Rev. D 110, 093002 (2024) [arXiv:2405.19419]
10. M. Yvaine [*et al.*, including **C. A. Hardy**], “Overcoming photobleaching in imaging of single barium atoms in a solid xenon matrix,” Phys. Rev. Research 6, 043193 (2024) [arXiv:2407.00285]
11. R.H.M. Tsang [*et al.*, including **C.A. Hardy**], “An integrated online radioassay data storage and analytics tool for nEXO,” Nucl. Instrum. Methods Phys. Res. A 1055, 168477 (2023) [arXiv:arXiv:2304.06180]
12. B. Acharya [*et al.*, including **C. A. Hardy**], “Fundamental Symmetries, Neutrons, and Neutrinos (FSNN): Whitepaper for the 2023 NSAC Long Range Plan,” (2023) [arXiv:2304.03451]
13. C. Adams [*et al.*, including **C.A. Hardy**], “Neutrinoless Double Beta Decay,” White Paper submitted for the Fundamental Symmetries, Neutrons, and Neutrinos Town Meeting (2022) [arXiv:2212.11099]
14. J. Aalbers [*et al.*, including **C.A. Hardy**], “A Next-Generation Liquid Xenon Observatory for Dark Matter and Neutrino Physics,” J. Phys. G: Nucl. Part. Phys. 50, 013001 (2023) [arXiv:2203.02309]
15. G. Gallina [*et al.*, including **C. A. Hardy**], “Performance of novel VUV-sensitive Silicon Photo-Multipliers for nEXO,” Eur. Phys. J. C 82, 1125 (2022) [arXiv:2209.07765]
16. * B. G. Lenardo, **C. A. Hardy et al.**, “Development of a ^{127}Xe calibration source for nEXO,” JINST 17, P07028 (2022) [arXiv:2201.04681]
17. G Adhikari [*et al.*, including **C A Hardy**], “nEXO: Neutrinoless double beta decay search beyond the 10^{28} year half-life sensitivity,” J. Phys. G: Nucl. Part. Phys. 49, 015104 (2022) [arXiv:2106.16243]
18. * D.S. Akerib [*et al.*, including **C.A. Hardy**], “Projected sensitivities of the LUX-ZEPLIN (LZ) experiment to new physics via low-energy electron recoils,” Phys. Rev. D 104, 092009 (2021) [arXiv:2102.11740]
19. M. Wagenpfeil [*et al.*, including **C. A. Hardy**], “Reflectivity of VUV-sensitive Silicon Photomultipliers in Liquid Xenon,” JINST 16, P08002 (2021) [arXiv:2104.07997]
20. M.G. Aartsen [*et al.*, including **C. Hardy**], “Velocity independent constraints on spin-dependent DM-nucleon interactions from IceCube and PICO,” Eur. Phys. J. C 80, 819 (2020) [arXiv:1907.12509]
21. C. Amole [*et al.*, including **C. Hardy**], “Data-Driven Modelling of Electron Recoil Nucleation in PICO C_3F_8 Bubble Chambers,” Phys. Rev. D 100, 082006 (2019) [arXiv:1905.12522]
22. C. Amole [*et al.*, including **C. Hardy**], “Dark Matter Search Results from the Complete Exposure of the PICO-60 C_3F_8 Bubble Chamber,” Phys. Rev. D 100, 022001 (2019) [arXiv:1902.04031]

* paper for which I was a principal author