

Education

University of Washington	Seattle, WA
– Ph.D. Physics	2020
Dissertation: <i>Precision Mechanical Rotation Sensors for Terrestrial Gravitational Wave Observatories</i>	
– M.S. Physics	2017
Elective Coursework: quantum computing, machine learning, high performance computing, data analysis, seismology	
Humboldt State University	Arcata, CA
– B.S. Physics	2015
College of the Redwoods	Eureka, CA
– A.A. Science	2013
– A.A Science Exploration	2013

Research Experience

University of Washington	Seattle, WA
Center for Experimental Nuclear Physics and Astrophysics (CENPA)	
Eöt-Wash Experimental Gravity Group	
– Research Scientist	2025–Present
– Senior Postdoctoral Scholar	2020 – 2024
– Research Assistant	2017 – 2020
– Laboratory Technician	2015 – 2016
California Institute of Technology	Pasadena, CA
LIGO Laboratory	
– Visiting Researcher	2023
Stanford University	Stanford, CA
Ginzton Laboratory	
– Visiting Postdoctoral Scholar	2022
LIGO	Livingston, LA
Livingston Observatory	
– LIGO Scientific Collaboration Fellow	2018
Humboldt State University	Arcata, CA
Gravity Lab	
– Undergraduate Researcher	2013 – 2015

Teaching Experience

Humboldt State University	Arcata, CA
Department of Physics & Astronomy	
– Lecturer	2021
– Instructional Student Assistant	2013 – 2015
University of Washington	Seattle, WA
Department of Physics	
– Directed Reading Instructor	2019
– Teaching Assistant	2016

Academic Service

Lead Organizer – Gravitational Wave Astronomy Northwest, LIGO Hanford, 2024

Organizing Committee – Testing Gravity, Vancouver, BC, 2025, 2027

Reviewer – Physical Review D, Journal of Undergraduate Reports in Physics, Nature, American Journal of Physics

Non-Academic Experience

Scuba Diver – PADI Open Water Diver + Dry Suit Certification, comfortable diving in low temperature and low visibility conditions

Hazmat Removal – Assisted in the removal and disposal of 3.5 tons of oxidized depleted uranium from decommissioned experiment

Outdoorsman – Avid hiker, paddleboarder, climber, and archer. Experienced in bushcraft, foraging, and navigating rugged terrain

Research Interests

Gravitational wave astronomy: Compact binary coalescence, Stochastic gravitational wave background, Measurements of Hubble's constant, Black hole populations, Neutron star equation of state

Tests of Gravity: Tests of the inverse square law, Equivalence principle verification, Searches for ultra-light dark matter, Gravitational wave tests of General Relativity

Instrumentation: Torsion balances, Beam balances, Precision angle sensing, Interferometric angle sensing, Gravitational calibration, Seismic isolation

Seismology/Seismic Noise Sources: Rotational seismology, Seismometer tilt contamination, Atmospheric-ground tilt coupling, Newtonian-noise subtraction, Elasto-gravity observation

Selected Publications

Full list (scholar.google.com/citations?user=mj-lj64AAAAJ)

Gravitational Wave Astronomy:

GWTC-4.0: constraints on the cosmic expansion rate and modified gravitational-wave propagation, AG Abac et. al. – The Astrophysical Journal Letters, 2026

GW230814: Investigation of a loud gravitational-wave signal observed with a single detector, AG Abac et. al. – The Astrophysical Journal Letters, 2026

GW240925 and GW250207: Astrophysical Calibration of Gravitational-wave Detectors, AG Abac et. al. – Physical Review Letters, 2026

Black hole spectroscopy and tests of general relativity with GW250114, AG Abac et. al. – Physical Review Letters, 2025

GW231123: A Binary Black Hole Merger with Total Mass 190–265 $M_{\odot}$, AG Abac et. al. – The Astrophysical Journal Letters, 2025

GW241011 and GW241110: Exploring binary formation and fundamental physics with asymmetric, high-spin black hole coalescences, AG Abac et. al. – The Astrophysical Journal Letters, 2025

GW250114: Testing Hawking's area law and the Kerr nature of black holes, AG Abac et. al. – Physical Review Letters, 2025

Observation of Gravitational Waves from the Coalescence of a 2.5–4.5 $M_{\odot}$ Compact Object and a Neutron Star, AG Abac et. al. – The Astrophysical Journal Letters, 2024

GWTC-3: Compact binary coalescences observed by LIGO and Virgo during the second part of the third observing run, R Abbott et. al. – Physical Review X, 2023

Constraints on the cosmic expansion history from GWTC-3, R Abbott, et. al – The Astrophysical Journal, 2023

Observation of gravitational waves from two neutron star–black hole coalescences, R Abbott, et. al. – The Astrophysical journal, 2021

GWTC-2: Compact binary coalescences observed by LIGO and Virgo during the first half of the third observing run, R Abbott et. al. – Physical Review X, 2021

A gravitational-wave measurement of the Hubble constant following the second observing run of advanced LIGO and Virgo, BP Abbott et. al. – The Astrophysical Journal, 2021

Limits on the stochastic gravitational wave background and prospects for single-source detection with GRACE Follow-On, M.P. Ross, C.A. Hagedorn, E.A. Shaw, A.L. Lockwood, B.M. Iritani, J.G. Lee, K. Venkateswara, J.H. Gundlach – Physical Review D, 2020

Gravitational-wave constraints on the equatorial ellipticity of millisecond pulsars, R Abbott, et.al – The Astrophysical Journal Letters, 2020

GW190521: A Binary Black Hole Merger with a Total Mass of 150 $M_{\odot}$, R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– Physical Review Letters, 2020

GW190814: gravitational waves from the coalescence of a 23 solar mass black hole with a 2.6 solar mass compact object, R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– The Astrophysical Journal Letters, 2020

GW190412: Observation of a binary–black–hole coalescence with asymmetric masses, R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– Physical Review D, 2020

GW190425: Observation of a compact binary coalescence with total mass~ 3.4 $M_{\odot}$, R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– The Astrophysical Journal Letters, 2020

GWTC-1: a gravitational-wave transient catalog of compact binary mergers observed by LIGO and Virgo during the first and second observing runs, B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– Physical Review X, 2019

GW170608: Observation of a 19 solar-mass binary black hole coalescence, B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– Physical Review X, 2017

A gravitational-wave standard siren measurement of the Hubble constant, B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– Nature, 2017

GW170817: observation of gravitational waves from a binary neutron star inspiral, B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– Physical Review Letters, 2017

Multi-messenger Observations of a Binary Neutron Star Merger, B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– The Astrophysical Journal Letters, 2020

GW170104: observation of a 50-solar-mass binary black hole coalescence at redshift 0.2, B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– Physical Review Letters, 2017

Tests of Gravity:

Probing for non-gravitational long-range dark matter interactions, MP Ross, EA Shaw, C Gettings, SK Apple, IA Paulson, JH Gundlach – 2025

A Search for Ultra-Light Vector Dark Matter with a Rotating Torsion Balance, MP Ross, EA Shaw, C Gettings, SK Apple, IA Paulson, JH Gundlach – 2025

An Improved Torsion Balance Test of the Equivalence Principle Towards the Sun, MP Ross, EA Shaw, C Gettings, SK Apple, IA Paulson, JH Gundlach – 2025

Impact of cavities on the detection of quadratically coupled ultra-light dark matter, Clare Burrage, Angus Macdonald, Michael P. Ross, Gray Rybka, Elisa Todarello – 2025

Test of the Equivalence Principle for Superconductors, M.P. Ross, S.M. Fleischer, I.A. Paulson, P. Lamb, B.M. Iritani, E.G. Adelberger, C.A. Hagedorn, K. Venkateswara, C. Gettings, E.A. Shaw, S.K.Apple, and J.H. Gundlach – Physical Review D, 2025

Ultralight vector dark matter search using data from the KAGRA O3GK run, AG Abac, et. al. – Physical Review D, 2024

Constraints on dark photon dark matter using data from LIGO's and Virgo's third observing run, R Abbott, et. al. – Physical Review D, 2021

A torsion-balance search for ultra low-mass bosonic dark matter, E. A. Shaw, M. P. Ross, C. A. Hagedorn, E. G. Adelberger, J. H. Gundlach – Physical Review D, 2021

Constraints on cosmic strings using data from the third Advanced LIGO–Virgo observing run, R Abbott et. al. – Physical Review Letters, 2021

Tests of general relativity with the binary black hole signals from the LIGO–Virgo catalog GWTC-1, R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– Physical Review D, 2019

Tests of general relativity with GW170817, B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)– Physical Review Letters, 2019

Experimental Progress Towards Testing the Behavior of Gravity at the 20-micron Distance Scale
Authors – M.P. Ross, J.S. Johnson, I.S. Guerrero, H.F. Leopardi, C.D. Hoyle – Journal of Undergraduate Research and Scholarly Excellence, 2018

Tests of Short-Range Gravity with a Novel Parallel-Plate Torsion Pendulum, M.P. Ross – NCUR Proceedings, 2015

Instrumentation:

Improving cosmological reach of a gravitational wave observatory using Deep Loop Shaping, J Buchli et. al. – Science, 2025

LIGO Detector Characterization in the first half of the fourth Observing run, S Soni et. al. – Classical and Quantum Gravity, 2025

Advanced LIGO detector performance in the fourth observing run, E Capote et. al. – Physical Review D, 2025

Squeezing the quantum noise of a gravitational-wave detector below the standard quantum limit, W Jia et. al. – Science, 2024

Broadband quantum enhancement of the LIGO detectors with frequency-dependent squeezing, D. Ganapathy, et. al. – Physical Review X, 2023

A Vacuum-Compatible Cylindrical Inertial Rotation Sensor with Picoradian Sensitivity, M. P. Ross, J. van Dongen, Y. Huang, P. Zhou, Y. Chowdhury, S. K. Apple, C. M. Mow-Lowry, A. L. Mitchell, N. A. Holland, B. Lantz, E. Bonilla, A. Engl, A. Pele, D. Griffith, E. Sanchez, E. A. Shaw, C. Gettings, J. H. Gundlach – Review of Scientific Instruments, 2023

Essentials of Torsion Balances, M. P. Ross – 2023

A Pseudo Plane-wave Gravitational Calibrator for Gravitational Wave Observatories, M. P. Ross, J. H. Gundlach, E. G. Adelberger, C. M. Weller, E. A. Shaw, C. Gettings, J. Kissel, T. Mistry, L. Datrier, E. Daw, M. Hendry – Physical Review D, 2023

A modified Michelson interferometer to measure sub-milliradian changes in angle, C. K. LeDesma, M. P. Ross, B. E. Daly, C. D. Hoyle, and M. M. Mola – AIP Advances, 2022

A cryogenic torsion balance using a liquid-cryogen free, ultra-low vibration cryostat, S. M. Fleischer, M. P. Ross, K. Venkateswara, C. A. Hagedorn, E. A. Shaw, E. Swanson, B. R. Heckel, and J. H. Gundlach – Review of Scientific Instruments, 2022

Point absorber limits to future gravitational-wave detectors, W Jia, et. al. – Physical Review Letters, 2021

Initial Results from the LIGO Newtonian Calibrator, M.P. Ross, T. Mistry, L. Datrier, J. Kissel, K. Venkateswara, C. Weller, K. Kumar, C. Hagedorn, E. Adelberger, J. Lee, E. Shaw, P. Thomas, D. Barker, F. Clara, B. Gateley, T. M. Guidry, E. Daw, M. Hendry, J. Gundlach – Physical Review D, 2021

LIGO detector characterization in the second and third observing runs, D Davis, et. al. – Classical and Quantum Gravity, 2021

Approaching the motional ground state of a 10-kg object, C Whittle, et. al. – Science, 2021

A Low-Frequency Torsion Pendulum with Interferometric Readout, M.P. Ross, K. Venkateswara, C.A. Hagedorn, C.J. Leupold, P.W.F. Forsyth, J.D. Wegner, E.A. Shaw, J.G. Lee, J.H. Gundlach – Review of Scientific Instruments, 2021

Point absorbers in Advanced LIGO, AF Brooks et. al. – Applied Optics, 2021

Reducing scattered light in LIGO's third observing run, S Soni, et. al. – Classical and Quantum Gravity, 2021

Precision Mechanical Rotation Sensors for Terrestrial Gravitational Wave Observatories, M.P. Ross – University of Washington, 2020

Sensitivity and performance of the Advanced LIGO detectors in the third observing run, A Buikema et. al. – Physical Review D, 2020

Particle swarming of sensor correction filters, J.J. Carter, S.J. Cooper, E. Thrift, J. Briggs, J. Warner, M.P. Ross, C.M. Mow-Lowry – Classical and Quantum Gravity, 2020

Quantum correlations between light and the kilogram-mass mirrors of LIGO, Haocun Yu, L. McCuller, M. Tse, N. Kijbunchoo, L. Barsotti, N. Mavalvala, et. al. (The LIGO Scientific Collaboration Instrument Science Authors) – Nature, 2020

Quantum-Enhanced Advanced LIGO Detectors in the Era of Gravitational-Wave Astronomy, M. Tse et al. (The LIGO Scientific Collaboration Instrument Science Authors) – Physical Review Letters, 2019

Seismology/Seismic Noise Sources:

Searching for the causes of anomalous Advanced LIGO noise, B.K. Berger, et. al. – Applied Physics Letters, 2023

Environmental noise in advanced LIGO detectors, P Nguyen, et. al. – Classical and Quantum Gravity, 2021

Improving the robustness of the advanced LIGO detectors to earthquakes, E Schwartz et. al – Classical and Quantum Gravity, 2020

Towards windproofing LIGO: Reducing the effect of wind-driven floor tilt by using rotation sensors in active seismic isolation, M.P. Ross, K. Venkateswara, J. Warner, C. Mow-Lowry, B. Lantz, J. Kissel, H. Radkins, T. Shaffer, R. Mittleman, S. Cooper, A. Pele, J. Gundlach – Classical and Quantum Gravity, 2020

Observation of a potential future sensitivity limitation from ground motion at LIGO Hanford, J. Harms, E.L. Bonilla, M.W. Coughlin, J. Driggers, S.E. Dwyer, D.J. McManus, M.P. Ross, B.J.J. Slagmolen, K. Venkateswara – Physical Review D, 2020

Implications of dedicated seismometer measurements on Newtonian-noise cancellation for advanced LIGO, M.W. Coughlin, J. Harms, J. Driggers, D.J. McManus, N. Mukund, M.P. Ross, B.J.J. Slagmolen, K. Venkateswara – Physical Review Letters, 2018

Low-Frequency Tilt Seismology with a Precision Ground-Rotation Sensor, MP Ross, K Venkateswara, CA Hagedorn, JH Gundlach, JS Kissel, J Warner, H Radkins, TJ Shaffer, MW Coughlin, P Bodin – Seismological Research Letters, 2018

Presentations

Improving the ISI Performance with Cylindrical Rotation Sensors, LVK Collaboration Meeting, Pisa, Italy. 2026

Torsion Balance Tests of Gravity from the Eöt-Wash Group, Invited Talk: Harvard – SwampLand, 2025

Black Holes, Extra Dimensions, and Antique Instruments, Invited Colloquium: Western Kentucky University, 2025

New Experimental Tests of Gravity from the Eöt-Wash Group, Testing Gravity, Vancouver, BC. 2025

UW Seattle Overview, Gravitational Wave Astronomy Northwest Meeting, LIGO Hanford Observatory. 2024

LIGO-Virgo-Kagra Status Report, Gravitational Wave Astronomy Northwest Meeting, LIGO Hanford Observatory. 2023

University of Washington Eöt-Wash Group Overview, Gravitational Wave Astronomy Northwest Meeting, LIGO Hanford Observatory. 2023

Update on the Cylindrical Rotation Sensor, LVK Collaboration Meeting, Chicago. 2023

Laboratory Tests of Gravity by the Eöt-Wash Group, Invited Talk, Testing Gravity, Vancouver, BC. 2023

Detecting Gravitational Waves on a Shaking Earth, Invited Seminar, Seattle University. 2022

University of Washington Eöt-Wash Group Overview, Gravitational Wave Astronomy Northwest Meeting, LIGO Hanford Observatory. 2022

Rotation Sensor Installation on the Stanford ETF Platform, LVK Collaboration Meeting, Remote. 2022

University of Washington Seattle Group Overview, Gravitational Wave Astronomy Northwest Meeting, Remote. 2021

In-Vacuum Inertial Rotation Sensors, Low-frequency Workshop, Remote. 2021

LIGO NCal Update, LIGO/Virgo collaboration meeting, Remote. 2021

Recent Discoveries in Gravitational Wave Astrophysics, CENPA Seminar, Remote. 2020

LIGO Newtonian Calibrator, LIGO/Virgo collaboration meeting, Remote. 2020

University of Washington LIGO Group Overview, Gravitational Wave Astronomy Northwest Meeting, Remote. 2020

Compact-BRS Update, LIGO/Virgo collaboration meeting, Warsaw, Poland. 2019

Development and deployment of beam rotation sensors for the LIGO seismic isolation system, Gravitational Wave Astronomy Northwest Meeting, LIGO Hanford Observatory. 2019

Development and deployment of beam rotation sensors for the LIGO seismic isolation system, Applied Physics Lab Seminar, University of Washington. 2019

Development and deployment of beam rotation sensors for the LIGO seismic isolation system, SeismoLunch Seminar, University of Washington. 2019

Integration of Beam Rotation Sensors to seismic isolation, A. Pele, M.P. Ross - Low-frequency sensing and control for aLIGO workshop, University of Birmingham, United Kingdom. 2018

Beam Rotation Sensor Update, LIGO/Virgo collaboration meeting, Sonoma State University. 2018

Tests of Short-range Gravity with a Novel Parallel Plate Torsion Pendulum, National Conference on Undergraduate Research, Eastern Washington University. 2015

Experimental Progress on Tests of Gravity at 20 microns with a Parallel-Plate Torsion Pendulum, 31st Pacific Coast Gravity Meeting, University of Oregon. 2015

Experimental Progress on Tests of Gravity at 20 microns. M.P. Ross and C. Cardenas - APS Far West Section Meeting, University of Nevada, Reno. 2014

Grant Writing and Support

Probing Fundamental Physics with Gravitational Experiments, National Science Foundation, PI: Jens Gundlach, Role: Key Personnel / Lead Proposal Writer, 2026. \$400k

Probing Fundamental Physics with Gravitational Experiments, National Science Foundation, PI: Jens Gundlach, Role: Key Personnel / Lead Proposal Writer, 2023. \$1.05M

Sensors for Low-Frequency Improvements in Advanced LIGO, National Science Foundation, PI: Jens Gundlach, Role: Key Personnel / Lead Proposal Writer, 2023. \$330k

Probing Fundamental Physics with Gravitational Experiments, National Science Foundation, PI: Jens Gundlach, Co-PI: Eric Adelberger, Role: Proposal Writer, 2020. \$1.05M

Sensors for Low-Frequency Improvements in Advanced LIGO, National Science Foundation, PI: Jens Gundlach, Co-PI: Eric Adelberger, Role: Proposal Writer, 2020. \$300k

Torsion-Balance Searches for Ultra-Light Dark Matter, National Science Foundation, PI: Jens Gundlach, Co-PI: Eric Adelberger, Role: Proposal Writer, 2020. \$424k
