

# Michael P. Ross

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## RESEARCH EXPERTISE

- Precision inertial rotation sensing
- Laboratory tests of gravity
- Gravitational-wave astronomy
- Gravitational force simulation
- Linear and interferometric optics
- Active seismic isolation
- Rotational seismology
- Precision force sensing
- Torsion balance apparatuses
- Cryogenic engineering

## EDUCATION

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|------|---|-------------|
| 2020 | University of Washington  | Seattle, WA |
|      | Ph.D. Physics   |             |
|      | <i>Precision Mechanical Rotation Sensors for Terrestrial Gravitational Wave Observatories</i> |             |
| 2017 | M.S. Physics  |             |
| 2015 | Humboldt State University   | Arcata, CA  |
|      | B.S. Physics  |             |
| 2013 | College of the Redwoods   | Eureka, CA  |
|      | A.A. Science, A.A. Science Exploration  |             |

## RESEARCH EXPERIENCE

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|------------------|--|
| 6/2020 – Present | <b><i>Postdoctoral Scholar</i></b><br>University of Washington, Seattle, Washington  |
|                  | <ul style="list-style-type: none"><li>· Developed an absolute gravitational calibration system for the LIGO gravitational wave observatories</li><li>· Mentored undergraduate students on research projects ranging from data analysis to seismic isolation systems</li><li>· Conducted a cryogenic torsion balance experiment which tested the equivalence principle for superconductors.</li></ul> |
| 1/2017 – 6/2020  | <b><i>Research Assistant</i></b><br>University of Washington, Seattle, Washington  |
|                  | <ul style="list-style-type: none"><li>· Developed precision inertial rotation sensors for use on the in-vacuum seismic isolation platforms of the LIGO gravitational wave observatories</li><li>· Deployed ground rotation sensors for feed-forward control of the LIGO seismic isolation systems</li></ul>  |

- Constructed an interferometrically-readout torsion balance as a pathfinder experiment into low-frequency gravitational wave detector technologies
- Worked on machine learning algorithms to detect gravitational wave transients in data from the LIGO observatories
- Improved a cryogenic torsion balance experiment which tested the equivalence principle for superconductors
- Assisted in the decommissioning of 3.5 tons of depleted uranium
- Author on all LIGO scientific collaboration papers since 2017
- 8 short author list papers

2/2018 – 5/2018

***LSC Fellow***

LIGO Livingston Observatory, Livingston, Louisiana

- Built four precision ground rotation sensors and implemented the sensors in the observatory's seismic isolation system to correct for the contamination of seismometer signals due to wind-driven tilts

8/2015 – 9/2016

***Laboratory Technician***

University of Washington, Seattle, Washington

- Developed precision rotation sensors for use in the LIGO seismic isolation systems
- Contributed to the development of a cryogenic torsion balance built to circumvent thermal noise which limits many torsion balance experiments

9/2013 – 5/2015

***Undergraduate Researcher***

Humboldt State University, Arcata, California

- Assisted in the construction of a torsion balance experiment aimed at testing the behavior of gravity at short-ranges
- Developed prototype interferometric readout for torsion balance experiments
- 3 published papers

**TEACHING  
EXPERIENCE**

5/2019 – 12/2019

***Directed Reading Instructor***

University of Washington, Seattle, Washington

- Taught a one-on-one reading course for undergraduates that covered the basics of gravitational wave theory and contemporary subjects in gravitational wave astronomy

9/2016 – 12/2016

***Teaching Assistance***

University of Washington, Seattle, Washington

- Taught an algebra-based heat and electromagnetism lab and an introductory level calculus-based mechanics tutorial

- Assisted in exam grading for the introductory mechanics course
- Tutored in an open lab study center

9/2013 – 5/2015

***Instructional Student Assistant***

Humboldt State University, Arcata, California

- Graded homework for a non-calculus based electromagnetism and modern physics course

8/2011 – 5/2013

***Peer Tutor***

College of the Redwoods, Eureka, California

- Tutored students in an open lab that were enrolled in courses ranging from basic arithmetic to multivariable calculus

**NON-ACADEMIC  
EXPERIENCE**

12/2016 – 2/2020

***Independent Software Developer***

- Developed an Android app that displays data from personal weather stations  
Google Play: [https://play.google.com/store/apps/details?id=net.mpross.pwspaid&hl=en\\_US](https://play.google.com/store/apps/details?id=net.mpross.pwspaid&hl=en_US)

**SELECTED  
PUBLICATIONS**

- 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, Virgo Collaboration). The Astrophysical Journal Letters 896 (2), L44. 2020.
- *GW190412: Observation of a Binary-Black-Hole Coalescence with Asymmetric Masses*. BP Abbott et.al. (LIGO Scientific Collaboration, Virgo Collaboration). Submitted to Physical Review D. 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, C. Mow-Lowry, S. Cooper, J. Warner, B. Lantz, J.S. Kissel, H. Radkins, T.J. Shaffer, R. Mittleman, A. Pele, J.H. Gundlach. Classical and Quantum Gravity. 2020.
- *Observation of a potential future sensitivity limitation from ground motion at LIGO Hanford* Authors. 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.
- *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.
- *GW190425: Observation of a Compact Binary Coalescence with Total Mass  $\sim 3.4 M_{\odot}$* . BP Abbott et.al. (LIGO Scientific Collaboration, 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.* BP Abbott et.al. (LIGO Scientific Collaboration, Virgo Collaboration). Physical Review X. 2019
- *Implications of dedicated seismometer measurements on Newtonian-noise cancellation for Advanced LIGO.* MW 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.* M.P. Ross, K. Venkateswara, C.A. Hagedorn, J.H. Gundlach, J.S. Kissel, J. Warner, H. Radkins, T.J. Shaffer, M.W. Coughlin, P. Bodin. Seismological Research Letters. 2018.
- *GW170817: Measurements of neutron star radii and equation of state.* B.P. Abbott et. al. (LIGO Scientific Collaboration, Virgo Collaboration). Physical Review Letters. 2018.
- *Multi-messenger Observations of a Binary Neutron Star Merger.* B.P. Abbott et. al. (LIGO Scientific Collaboration, Virgo Collaboration). The Astrophysical Journal Letters. 2017.
- *A gravitational-wave standard siren measurement of the Hubble constant.* LIGO Scientific Collaboration, Virgo Collaboration, 1M2H Collaboration, Dark Energy Camera GW-EM Collaboration, DES Collaboration, DLT40 Collaboration, Las Cumbres Observatory Collaboration, VINROUGE Collaboration, MASTER Collaboration. Nature. 2017.
- *GW170104: observation of a 50-solar-mass binary black hole coalescence at redshift 0.2.* B.P. Abbott et. al. (LIGO Scientific Collaboration, Virgo Collaboration). Physical Review Letters. 2017.
- *Experimental Progress Towards Testing the Behavior of Gravity at the 20-micron Distance Scale.* M.P. Ross, J.S. Johnson, I.S. Guerrero, H.F. Leopardi, C.D. Hoyle. Journal of Undergraduate Research and Scholarly. 2018.
- *Tests of Short-Range Gravity with a Novel Parallel-Plate Torsion Pendulum.* M.P. Ross. National Conference on Undergraduate Research Proceedings. 2015.
- *Experimental Progress on Tests of Gravity at 20 microns.* C. Cardenas, A.C. Harter, M.P. Ross. National Conference on Undergraduate Research Proceedings. 2014.

## PRESENTATIONS

- *Compact-BRS Update.* M.P. Ross. LIGO/Virgo collaboration meeting, Warsaw, Poland. 2019.
- *Development and deployment of beam rotation sensors for the LIGO seismic isolation system.* M.P. Ross. Gravitational Wave Astronomy Northwest Meeting, LIGO Hanford Observatory. 2019.
- *Development and deployment of beam rotation sensors for the LIGO seismic isolation system.* M.P. Ross. Applied Physics Lab Seminar, University of Washington. 2019.
- *Development and deployment of beam rotation sensors for the LIGO seismic isolation system.* M.P. Ross. 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.* M.P. Ross. LIGO/Virgo collaboration meeting, Sonoma State University. 2018.
- *Tests of Short-range Gravity with a Novel Parallel Plate Torsion Pendulum.* M.P. Ross. National Conference on Undergraduate Research, Eastern Washington University. 2015.
- *Experimental Progress on Tests of Gravity at 20 microns with a Parallel-Plate Torsion Pendulum.* M.P. Ross. 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.