

Batia Friedman-Shaw

Education

- 2023 – Now **Perimeter Institute/University of Waterloo**, Waterloo, ON, Canada
Ph.D. Candidate, Advisors: *Dr. Katherine Mack and Dr. Matthew C. Johnson*
Research: Cosmology
- 2022 – 2023 **Perimeter Institute/University of Waterloo, PSI Program**, Waterloo, ON, Canada
M.Sc., Advisor: *Professor Robert C. Myers*
Research: Quantum Gravity
- 2018 – 2022 **Brown University**, Providence, RI, United States
Sc. B., Advisor: *Professor Stephon Alexander*
Research: Cosmology, Machine Learning

Research & Projects

- 2026 – Now **Galaxy Survey Systematics Research**, Advisors: *Dr. Matthew C. Johnson, Dr. Katherine J. Mack*, Extracting an empirical map of galaxy bias.
- 2024 – 2026 **Theoretical Dark Energy Research**, Advisors: *Dr. Matthew C. Johnson, Dr. Katherine J. Mack*, Examining consequences of sub-horizon scale vacuum decay bubbles on local observables.
- 2023 – 2024 **Data Driven Dark Energy Research**, Advisor: *Professor Will Percival*, Tested validity of Baryon Acoustic Oscillation (BAO) analyses in the Dark Energy Spectroscopic Instrument (DESI) Survey.
- 2023 – 2024 **Galaxy Survey Analysis Research**, Advisor: *Professor Niayesh Afshordi*, Examining how gravitationally influenced galaxy velocities affect galaxy target selection and subsequent cosmological observables.
- 2022 – 2023 **Quantum Gravity Research**, Advisor: *Professor Robert C. Myers*, Explored scattering around holographic black holes.
- 2022 **Physics Hackathon Creation**, Project Leader: *Professor Richard Gaitskell*, Creating a coding competition to expose Brown University physics majors to machine learning methods.
- 2021 – 2022 **Theoretical Dark Energy Research**, Advisor: *Professor Stephon Alexander*, Examining whether a newly proposed model of dark matter and dark energy fits with well-established cosmology.
- 2020 – 2021 **Physics and Machine Learning Project**, Advisor: *Professor Stephon Alexander*, Developed a primer on machine learning to help researchers apply ML in all fields of physical science.
- 2021 – 2022 **Quantum Field Theory Renormalization Research**, Advisor: *Professor Jeremy Kahn*, Explored the use of analytic continuation to define specific renormalization methods more rigorously.

2019 – 2020 **Quantum Chemistry Computational Research**, Advisor: Professor Brenda Rubenstein, Developed software used to determine Hamiltonians and their approximate associated energy for arbitrary 2D Ising models.

Papers

Dark Energy Bubble as Dynamical Dark Energy: Properties and CMB Constraints

By Batia Friedman-Shaw, Matthew C. Johnson, Katherine J. Mack

arXiv:2607.18376 [astro-ph.CO]

Prepared for Submission to JCAP

Doppler Bias: Impact of Peculiar Velocities on Color Selection and the Large Scale Structure of Galaxy Surveys

By Batia Friedman-Shaw, Alex Krolewski, Matteo Foglieni, Niayesh Afshordi

arXiv:2410.04705 [astro-ph.CO]

JCAP 03 (2025) 059

Holographic Scattering and Non-Minimal RT Surfaces

By Jacqueline Caminiti, Batia Friedman-Shaw, Alex May, Robert C. Myers, Olga Papadoulaki
authorship is listed alphabetically

arXiv:2404.15400 [hep-th]

JHEP 10 (2024) 119

The Physics of Machine Learning: An Intuitive Introduction for the Physical Scientist

By Stephon Alexander, Sarah Bawabe, Batia Friedman-Shaw, Michael Toomey

authorship is listed alphabetically

arXiv:2112.00851 [cond-mat.dis-nn]

Teaching

Fall 2026 **Grader**, *Phys 490*, Introduction to String Theory and T-duality, University of Waterloo.

Fall 2026 **Graduate Teaching Assistant**, Quantum Theory, Perimeter Institute.

Spring 2026 **Certificate**, *Fundamentals of University Teaching*, Centre for Teaching Excellence, University of Waterloo.

Winter 2026 **Graduate Teaching Assistant**, Cosmology, Perimeter Institute.

Winter 2026 **Grader**, *Phys 490*, Introduction to String Theory and T-duality, University of Waterloo.

Fall 2025 **Graduate Teaching Assistant**, Statistical Physics, Perimeter Institute.

Fall 2025 **Graduate Teaching Assistant**, Quantum Theory, Perimeter Institute.

Spring 2025 **Instructor**, Student-Organized Graduate Cosmology Course, Perimeter Institute.

Winter 2025 **Graduate Teaching Assistant**, *Phys 122*, Waves, Electr., & Mag., University of Waterloo.

Fall 2024 **Graduate Teaching Assistant**, *Phys 121*, Mechanics, University of Waterloo.

Winter 2024 **Graduate Teaching Assistant**, Quantum Field Theory III, Perimeter Institute.

Winter 2024 **Graduate Teaching Assistant**, *Quantum Fields and Strings*, Perimeter Institute.

Fall 2023 **Graduate Teaching Assistant**, *Phys 111*, Physics 1, University of Waterloo.

2019 – 2022 **Hebrew & Religious Studies Teacher**, Temple Beth El, Providence, RI.

Fall 2021 **Grader**, *Math 180*, Multivariable Calculus, Brown University.

Summer 2021 **Teaching Assistant**, *Math 0180*, Multivariable Calculus, Brown University.

Summer 2021 **Grader**, Pre-College Quantum Mechanics, Brown University.

Spring 2021 **Teaching Assistant**, *Phys 0070*, Analytical Mechanics, Brown University.
Fall 2020 **Teaching Assistant**, *Phys 1420*, Quantum B, Brown University.

Honors & Awards

2023-2027 **Graduate Research Studentship**, *University of Waterloo*.
2023-2027 **International Doctoral Student Award**, *University of Waterloo*.
2023-2027 **Perimeter Institute Residency Graduate Scholarship**, *Perimeter Institute*.
2024 **Graduate Research Dissemination Award**, *University of Waterloo*.
2022 **Perimeter Scholars International Award**, *Perimeter Institute*.
2022 **Magna Cum Laude**, *Brown University*, (Highest Distinction at Brown).
2022 **Honors in Physics**, *Brown University Physics Department*.
2022 **Sigma Xi Honors Society**.
2021 **Sigma Pi Sigma Honors Society**, *Brown University Society of Physics Students*.
2019 **UTRA**, *Brown University Teaching and Research Award*.

Presentations

1. *Dark Energy Bubble as Dynamical Dark Energy*, Theory Canada 18, Université de Montréal (2026)
2. *Bursting the Dark Energy Bubble*, Cosmological Frontiers in Fundamental Physics, Perimeter Institute (2026)
3. *Impact of Peculiar Velocities on Color Selection of Emission Line Galaxies*, COSMO-25, Carnegie Mellon University (2025)
4. *Impact of Peculiar Velocities on Color Selection of Emission Line Galaxies*, Relativistic Effects and Novel Observables in Cosmology, University of Geneva (2024)
5. *Testing BAO Fitting on a Range of Cosmologies*, Canadian Astronomical Society (CASCA) Meeting, Toronto (2024)
6. *Doppler Effect in Galaxy Surveys*, Women in Physics Canada Conference, University of Manitoba (2023)
7. *Doppler Effect in Galaxy Surveys*, PSI Winter School Conference, Perimeter Institute (2023)
8. *Identity Theft: The story of how Dark Energy Masqueraded as Matter and Radiation*, Conference for Undergraduate Women in Physics, Brown University (2022)
9. *Identity Theft: The story of how Dark Energy Masqueraded as Matter and Radiation*, Society of Physics Students Chapter Meeting, Brown University (2022)
10. *Identity Theft: The story of how Dark Energy Masqueraded as Matter and Radiation*, Brown Physics Departmental Undergraduate Group 'Scialogue' Presentation, Brown University (2021)
11. *Making Waves: Approximating Solutions to the Hubbard Model Using the Power Method*, Brown Physics Departmental Undergraduate Group 'Scialogue' Presentation, Brown University (2020)
12. *Making Waves: Approximating Solutions to the Hubbard Model Using the Power Method*, Brown University Summer Research Symposium, Brown University (2019)

Organizations & Outreach

2023 – Now **Waterloo Center for Astrophysics (WCA) Outreach**, Partake in organizing Astronomy on Tap, Kitchener Public Library Talks, and Travelling Planetarium Shows.
2023 – Now **Member**, *University of Waterloo Physics Graduate Student Association (GSA)*.
2018 – 2022 **Member**, *Brown Physics Women in Science and Engineering (WiSE) Club*.
2019 **Organizer**, *Brown Physics Departmental Undergraduate Group*.
2018 – 2022 **Member**, *Brown Physics Departmental Undergraduate Group*.
2017 – 2018 **Head Science Tutor**, *Berkeley Preparatory School*.
2015 – 2018 **Science Tutor**, *Berkeley Preparatory School*.

Skills

Computer	Python, Julia, LaTeX, Mathematica, Markdown, HTML, Inkscape, Adobe Illustrator
Personal	Teaching & Lesson Planning, Communication, Creativity, Perseverance, Problem Solving