J. LUNA ZAGORAC

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Postdoctoral Fellow ⋄ Perimeter Institute ⋄ Waterloo, ON N2L 2Y5

PROFILE

I'm a cosmologist through and through: passionate not just about what our silly little Universe is up to, but also the ways we as humans interact with and understand it. I love to work in radically interdisciplinary ways, from marrying quantum-inspired techniques and numerical simulations of wave dark matter to developing a Python package to map ancient Egyptian star data from hieroglyphs to virtual skies. I'm always keen to share my work & interests through scicomm, teaching, and mentoring.

EMPLOYMENT

Perimeter Institute for Theoretical Physics, Waterloo, ON *Sep 2022 - Aug 2025*
Postdoctoral Fellow

EDUCATION

Yale University, New Haven, CT *Aug 2016 - May 2022*
Ph.D. in Physics

Colgate University, Hamilton, NY *Aug 2012 - May 2016*
B.A. with Honors in Astronomy/Physics & Anthropology

SKILLS AND QUALIFICATIONS

Programming Languages	Python, C/C++, MATLAB, Chapel, Pascal
Python Packages	Jupyter, MatPlotlib, Numba, NumPy, SciPy, PyFFTW, AstroPy
Software & Tools	LaTeX, Excel, Mathematica, ImageJ
Communication skills	Science & grant writing, outreach, public speaking, data visualization
Certifications	Yale Poorvu Center Certificate for Public Communication, Certificate of College Teaching Preparation
Languages	English & Serbian (native) French, Italian & Arabic (limited proficiency) Latin & Middle/Late Egyptian (intermediate)

HONORS & AWARDS

Future Investigator in NASA Earth and Space Science and Technology *May 2020*
NASA Grant for \$90*k funding two years of doctoral work and independent investigations of ULDM.*

Leigh Page Award for Excellence in Graduate Student Teaching *Nov 2021*
Award for \$500 which recognizes broad and valuable contributions to physics education at Yale, science communication, and work fostering a welcoming learning environment for students.

Loyde and William C. G. Ortel Fellowship in Physics *Nov 2020*
Awarded to an outstanding student pursuing a Ph.D. in Physics.

Franke Science & Humanities Interdisciplinary Research Award *Sep 2019*
Yale Fellowship for \$3000 funding two years of interdisciplinary work on Egyptian constellations.

Colgate Physics and Astronomy Department Founders Award *Apr 2016*
Awarded periodically to a senior who has demonstrated four years of outstanding progress and development of their understanding of physics or astronomy.

Sigma Pi Sigma Physics Honors Society *Apr 2016*
Honorary membership to Sigma Pi Sigma Honors Society.

Alumni Memorial Scholar at Colgate University *Aug 2012*
Scholars are selected at the time of admission to Colgate for their dedication and interest in scholarship and have the opportunity to apply for grants totaling up to \$5,000 to fund independent research.

PUBLICATIONS

7. Polzin et al. (including **Zagorac**). "Astronomy as a Field: A Guide for Aspiring Astrophysicists." *arXiv: 2312.04041, submitted to BAAS.*

6. Robles, **Zagorac**, and Padmanabhan. "Scalar Field Dark Matter: Impact of Supernovae-driven blowouts in the central densities of dwarf galaxies." *arXiv: 2308.14691, submitted to MNRAS.*

5. Gosenca, Eberhardt, Wang, Eggemeier, Kendall, **Zagorac**, and Easther. "Multifield Ultralight Dark Matter." *Physical Review D 107.8 (2023): 083014.*

4. **Zagorac**, Kendall, Padmanabhan, and Easther. "Soliton Formation and the Core-Halo Mass Relation for Synthetic ULDM Halos: An Eigenstate Perspective." *Physical Review D 107.8 (2023): 083513.*

3. **Zagorac**, Sands, Padmanabhan, and Easther. "Schrödinger-Poisson Solitons: Perturbation Theory." *Physical Review D 105.10 (2022): 103506.*

2. Padmanabhan, Ronaghan, **Zagorac**, and Easther. "Simulating Ultralight Dark Matter with Chapel: An Experience Report." (2019). *2020 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)*

1. **Zagorac**, Easther, and Padmanabhan. "GUT-scale primordial black holes: mergers and gravitational waves." *Journal of Cosmology and Astroparticle Physics 2019.06 (2019): 052.*

INVITED SEMINARS

* = Virtual

Canadian Institute for Theoretical Astrophysics	Oct 2023
University of Southern California	Sep 2023
Jet Propulsion Laboratory	Sep 2023
Colgate University	Apr 2022
Stockholm University*	Jan 2022
Perimeter Institute*	Dec 2021
Stony Brook University*	Nov 2021
University College London*	Oct 2021
Carnegie Observatories*	Oct 2021
University of Hawaii Institute of Astronomy*	Oct 2021
Northwestern University CIERA*	Oct 2021
Newcastle University*	Sep 2021
Center for Computational Astrophysics*	May 2020

CONTRIBUTED PRESENTATIONS

† = Invited Speaker

Egyptian Cultural Heritage Now — Nov 2023
Using Python to Investigate Stellar Data from Ramesside Star Clocks — *Cairo, Egypt*

APS April Meeting — Apr 2023
Ultralight Dark Matter Dynamics in the Language of Eigenstates — *Minneapolis, MN*

Testing Gravity 2023 — Jan 2023
UltraLight Dark Matter Dynamics in the Language of Eigenstates — *Simon Fraser University*

240th Meeting of the American Astronomical Society — Jun 2022
A Light in the Dark: UltraLight Dark Matter Phenomenology in Simulations — *Virtual*

Chapel Implementers and Users Workshop — Jun 2022
UltraLight Dark Matter in Simulations: A Chapel-Powered Eigenstate Perspective — *Virtual*

236th Meeting of the American Astronomical Society Jun 2020
Parametrizing UltraLight Dark Matter Haloes Through Binary Soliton Core Mergers *Virtual*

235th Meeting of the American Astronomical Society Jan 2020
A Light in the Dark: Ultra Light Dark Matter in Theory and Simulation *Hawaii Convention Center*

American Research Center in Egypt Annual Meeting Apr 2021
In Search of Lost Time: An Astronomical View of Ancient Egyptian Star Clocks *Virtual*

Aspen Winter Conference, A Rainbow of Dark Sectors Mar 2021
UltraLight Dark Matter & Its Eigenstates *Virtual*

†**Connecticut Digital Humanities** Feb 2021
In Search of Lost Time: An Astronomical View of Ancient Egyptian Star Clocks *Virtual*

Great Lakes Cosmology Workshop Aug 2019
Pseudo-Spectral Solvers for Fuzzy Dark Matter *Rochester Institute of Technology*

Tri-Institute Summer School on Elementary Particles Jul 2018
Gravitational Wave Spectrum of Ultralight Primordial Black Holes *Perimeter Institute*

POPULAR SCIENCE PRESENTATIONS

† = Invited Speaker

†**iTelescope Webinar** Dec 2023
What we Can't See in the Universe (and Why it Might Be Fuzzy) *Virtual*

Astronomy on Tap Kitchener-Waterloo Dec 2023
A Bestiary of Dark Matter Candidates *Kitchener, ON*

†**Canadian Undergraduate Physics Conference** Oct 2023
Panelist on *Change Your Basis: From Expert to Public* *University of Waterloo*

†**Royal Astronomical Society of Canada Mississauga Centre Speaker Night** Oct 2023
What we Can't See in the Universe (and Why it Might Be Fuzzy) *Mississauga, ON*

†**SciComm Collider** Apr 2023
A Bestiary of Dark Matter Candidates *Perimeter Insitute*

†**David Dunlap Observatory Speaker's Night** Dec 2022
What we Can't See in the Universe (and Why it Might Be Fuzzy) *Virtual*

Bay Area Science Festival "Astro Coffee" Oct 2020
Cosmic Archaeology, or: How Do We Know the Things We Know? *Virtual*

Ask a Scientist Webinar May 2020
Dark Matter *Virtual*

Astronomy on Tap New Haven May 2020
Cosmic Archaeology, or: How Do We Know the Things We Know? *New Haven, CT*

Yale 3 Minute Thesis Competition Finalist Apr 2019
How Small Black Holes Teach Us about the Big Bang *Yale University*

TEACHING EXPERIENCE

Certificate of College Teaching Preparation (CCTP) May 2022
Yale Poorvu Center for Teaching and Learning

A record of participation in teaching activities and reflections on those experiences. Earning the CCTP, also meets requirements for the Center for Integration of Research, Teaching and Learning Associate.

Curriculum Development & Lecturing

Tri-Institute Summer School on Elementary Particles (TRISEP) *June 2023*

Lecture on "Axion-Like Particles (and Why We Love Them)."

The Yale Summer Program in Astrophysics *Jul 2022*

Lecture on "Comparing Cosmologies: the History of the Cosmos from Pyramids to Space Telescopes."

Yale Institute of Sacred Music *Mar 2021*

Lecture in graduate-level religion class on "Cosmogonies, Cosmologies, & Time"

Yale Bootcamp on Physics Fundamentals *Summer 2019 - 2021*

Co-developed a curriculum for 20 hours of Classical Mechanics instruction, met weekly with staff supervisor to polish lectures and example problems. Delivered 10 hours of lecture at the Bootcamp. Developed a Mathematica tutorial for incoming graduate students. Re-vamped the curriculum and moved it online for Summer 2020 and Summer 2021.

Teaching Fellow Positions

S&DS176 - YData: Humanities Data Mining	*Spring 2022*
PHYS/ASTR600 - Cosmology	*Fall 2020*
PHYS442 - Introduction to Nuclear and Elementary Particle Physics	*Spring 2020*
PHYS410 - Classical Mechanics	*Fall 2019*
ASTR343 - Gravity, Astrophysics, and Cosmology	*Spring 2019*
PHYS170/171 - University Physics for the Life Sciences	*Fall 2017 - Spring 2018*
PHYS165/166 - General Physics Laboratory	*Fall 2016 - Spring 2017*

SCIENCE COMMUNICATION

Public Communication Certificate Oct 2021
Yale Poorvu Center for Teaching and Learning

Certification in public communication through extensive preparation for the 3MT Competition. Areas: Text, Speech, and Visual Design; Feedback and Revision; Peer and Interdisciplinary Collaboration.

Outreach Volunteering

Volunteer, Dark Matter Night at Perimeter Institute	*Oct 2022*
Astronomy Ambassador, American Astronomical Society	*Jan 2020 - Present*
Volunteer, Yale Pathways to Science	*Fall 2018 - Spring 2019*
Activity Leader, CT Students Exploring Engineering Day	*Spring 2018*
Activity Leader, Girls Science Investigations	*Sep 2016 - Mar 2020*

Writing

Astrobites Media Intern at AAS238	*Jun 2021*
Astrobites Contributing Author (>15 articles and interviews)	*Dec 2019 - Dec 2021*
ComSciCon at the American Institute of Physics Participant	*Sep 2019*

SERVICE & LEADERSHIP

Committee Work

Perimeter Institute Anti-Racism Working Group Member — *Sep 2022 - Present*
Astrobites Diversity, Equity, and Inclusion Committee Member — *Mar 2020 - Dec 2021*
Physics Climate and Diversity Committee Member — *Jan 2018 - May 2020*

Conference & Seminar Organization

Co-organizer: Black in Physics Week at Yale Event Series — 2020
Volunteer: Conference for Undergraduate Women in Physics — 2019-2020
Co-organizer: Equity in the Job Search Symposium — 2018-2019

University Positions

Yale Digital Humanities Lab Consultant — *Sep 2020 - May 2022*
McDougal Graduate Student Life Fellow at Yale — *Aug 2018 - May 2019*
Graduate Affiliate, Pauli Murray College at Yale — *Fall 2017 - Spring 2022*

MENTORSHIP

Perimeter Institute PSI Winter School Masters Research Project — 2023
Dynamical Heating in Early Fuzzy Galaxies — *with Prof. Katie Mack*

Cole Coughlin (Ph.D. at PI starting 2023)
Anna Knörr (Ph.D at Harvard starting 2024)

Perimeter Institute Postoc-PhD Mentoring

Alice Chen, Samantha Hergott — 2023-2024
Maxence Corman, Ramiro Cayuso — 2022-2023

Yale Undergraduate Researchers Supervised

Claire Recamier (Researcher at Los Alamos National Lab starting 2023): — *Jun 2021 - May 2023*
Stellar Streams in UltraLight Dark Matter Halos

Isabel Sands (Ph.D. at Caltech starting 2021): — *Jan 2020 - Jun 2021*
Constructing a Binary Soliton Merger Library
Linear Approximations to UltraLight Dark Matter Stationary States

Formalized Mentoring Activities

SU(5) Group Mentor — *Fall 2020*
Científico Latino Graduate Student Mentoring Initiative (GSMI) Mentor — *Fall 2019*
Women in Science at Yale (WISAY) Mentor — *2016-2019*