J. LUNA ZAGORAC

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EDUCATION

Yale University, New Haven, CT *August 2016 - Present*
Ph.D. anticipated in August, 2022

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

Old Rochester Regional High School, Mattapoisett, MA *August 2011 - June 2012*
Foreign Exchange Student

Prva beogradska gimnazija, Belgrade, Serbia *September 2008 - June 2011*
Vuk Stefanović-Karadžić Honors High School Student

RESEARCH EXPERIENCE

UltraLight Dark Matter Simulations and Observational Constraints January 2019 - Present
Professor Nikhil Padmanabhan & Professor Richard Easther *Yale University*

Current project supported by NASA's FINESST grant involving developing the ChapelUltra pseudo-spectral solver, using it to simulate UltraLight Dark Matter, and comparing with data to assess candidate feasibility.

Gravitational Signatures of Primordial Black Holes September 2017 - March 2019
Professor Nikhil Padmanabhan & Professor Richard Easther *Yale University*

Modeled primordial black hole creation mechanisms in the early universe, constrained their 2-body interactions and dynamics, and calculated resultant gravitational wave spectra from mergers for allowed parameter space. Publication in JCAP.

Particle Mesh Code for Bi- and Power Spectra January 2017 - August 2017
Professor Nikhil Padmanabhan *Yale University*

Wrote particle mesh code to calculate the power spectrum and bispectrum from GADGET-2 simulation data in C++. Tested the code by generating a Gaussian random field to run through the code and compared results with analytically calculated power spectra and bispectra for the Gaussian case.

Data Reduction for SMARTS Consortium at Yale November 2016 - May 2017
Professor Charles Bailyn *Yale University*

Reduced a backlog of AGN spectra collected by the Yale SMARTS Consortium using Yale's software pipeline. Prepared data for online publication for use by collaborators.

Supermassive WIMP Production in the Early Universe August 2015 - May 2016
Professor Patrick Crotty *Colgate University*

Wrote senior honors thesis under the title: "Constraining WIMPzilla Production in the Inflationary Phase of the Early Universe." Wrote an equation solver in Python, using Numpy and Scipy for analysis and Matplotlib for visualizations. Varied coefficients describing shape of sigmoid inflaton field and calculated resulting DM abundances with assumed particle mass. Presented preliminary results at Syracuse University Undergraduate Research Day.

Volunteer Archaeologist at South Asasif Conservation Project June - July 2015
Dr. Elena Pischikova *Luxor, Egypt*

Supervised team of workers doing excavation; organized, labeled, and stored finds, and documented site progress daily. Used dumpy-level photography and measurements to produce accurate technical drawings of the site. Wrote up extensive field reports for the site director.

Observations and Analysis of 2014 Flare of Blazar 3C454.3 June 2014 - August 2014
Professor Thomas Balonek *Colgate University*

Observed AGN at Foggy Bottom Observatory at Colgate University on a 16-inch, Newtonian-Cassegrain telescope. Reduced all data using UNIX, IRAF, and Pascal-based software, with analysis focusing on 3C454.3 and its historic flare that summer. Compared our optical data with Yale SMARTS data of the same object to find excellent agreement, as well as radio data from the Submillimeter Array. No correlation between radio and optical flares was found.

TEACHING EXPERIENCE

PHYS442 - Introduction to Nuclear and Particle Physics January 2020 - May 2020
Teaching Fellow *Charles Baltay*

· Weekly office hours, grading homework sets, proctoring exams

PHYS410 - Classical Mechanics August 2019 - December 2019
Teaching Fellow *Charles Baltay*

· Weekly office hours, weekly study hall, grading homework sets, proctoring exams

Yale Bootcamp on Physics Fundamentals June 2019 - August 2019
Classical Mechanics Instructor *Rona Ramos*

· Co-developed a curriculum for 20 hours of Classical Mechanics instruction
· Met weekly with faculty supervisor to polish lectures and example problems
· Lectured for 10 hours of the Bootcamp
· Developed a Mathematica tutorial for incoming students

ASTR343 - Gravity, Astrophysics, and Cosmology January 2019 - May 2019
Teaching Fellow *Laura Newburgh*

· Weekly office hours, grading homework sets, proctoring exams

PHYS170/171 - University Physics for the Life Sciences August 2017 - May 2018
Head Teaching Fellow *Simon Mochrie, Rona Ramos, Daisuke Nagai*

· Organizing other teaching fellows, staffing weekly help sessions and office hours, holding review sessions on material before midterms and finals, grading weekly homework, proctoring and grading the midterm and final exams

PHYS165/166 - General Physics Laboratory August 2016 - May 2017
Teaching Fellow *Sean Barrett, Bonnie Flemming*

· Preparing weekly labs, weekly lab monitoring, grading lab reports, proctoring & grading the final exam

SKILLS AND QUALIFICATIONS

Programming Languages	Python, C/C++, MATLAB, Chapel, Pascal
Python Packages	Jupyter, Matplotlib, Numpy, Scipy, PyFFTW
Software & Tools	LaTeX, Excel, Mathematica
Languages	English & Serbian (native)
	French & Italian (proficient), Arabic (conversational)
	Latin & Middle/Late Egyptian (intermediate)

HONORS & AWARDS

Future Investigator in NASA Earth and Space Science and Technology (FINESST)	*May 2020*
Franke Program in Science & The Humanities Interdisciplinary Research Award	*September 2019*
3 Minute Thesis Competition Finalist	*April 2019*
Graduated Magna Cum Laude with Honors in Astronomy/Physics	*May 2016*
Colgate Physics and Astronomy Department Founders Award	*April 2016*
Sigma Pi Sigma Physics Honors Society	*April 2016*
Dean's List	*August 2012 - May 2016*
Alumni Memorial Scholar at Colgate University	*August 2012 - May 2016*

SERVICE & LEADERSHIP

Physics Climate and Diversity Committee Member	*Spring 2018 - Present*
Panel Chair for Equity in the Job Search Symposium at Yale	*February 2019*
McDougal Graduate Student Life Fellow at Yale	*August 2018 - May 2019*

OUTREACH

Astronomy on Tap Presenter: *Cosmic Archaeology*	*August 2019*
Activity Leader, Girls Science Investigations	*September 2016 - Present*
Ativity Leader, CT Students Exploring Engineering Day	*Spring 2018*
Volunteer, Girl Scouts Day of Engineering	*Fall 2018*
Volunteer, Cyborgs and Highschoolers	*Spring 2019*
Astrobites Contributing Author	*December 2019 - Present*

PROFESSIONAL ASSOCIATIONS

American Astronomical Society
American Physical Society
American Research Center in Egypt

PUBLICATIONS

Padmanabhan, Ronaghan, **Zagorac**, and Easther. "Simulating Ultralight Dark Matter with Chapel : An Experience Report." *In preparation.*

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

Balonek, Weaver, Didio, Jenks, Morris, Stahlin, **Zagorac**, Chapman, D'Auteuil, Karnes, Reding. The Optical Variability of the Blazar 3C 454.3. Over Three Decades from the Colgate University Foggy Bottom Observatory. In American Astronomical Society Meeting Abstracts 229 2017 Jan (Vol. 229).

Balonek, Weaver, Didio, Jenks, Morris, **Zagorac**, D'Auteuil, Karnes, Reding, Rose, Rilinger. The 2013-2015 Optical Outburst and Historic Light Curve of the Blazar 3C 454.3. In American Astronomical Society Meeting Abstracts 227 2016 Jan (Vol. 227).

PRESENTATIONS

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

Invited Talk: Center for Computational Astrophysics May 2020
Parametrizing UltraLight Cold Dark Matter Haloes Through Binary Soliton Core Mergers *Flatiron Institute*

Talk: Weak Interaction Discussion Group at Yale May 2020
Parametrizing UltraLight Cold Dark Matter Haloes Through Binary Soliton Core Mergers *Yale University*

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

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

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

Publication & Presentation: Colgate University Honors Thesis Defense April 2016
Saving Tokyo: Constraining WIMPzilla Production in the Early Universe *Colgate University*

Presentation: Syracuse University Undergraduate Research Day December 2015
Constraining WIMPzilla Production in the Early Universe *Syracuse University*

Publication & Presentation: Keck Northeastern Astronomy Consortium November 2014
The Optical and Radio Variability of the Blazar 3C 454.3 *Swarthmore College*

Presentation: Colgate Physics & Astronomy Welcome Seminar September 2014
The Variability of Blazar 3C 454.3 *Colgate University*