

J. LUNA ZAGORAC

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Physics PhD Candidate ◊ Yale University ◊ New Haven, CT 06511

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EDUCATION

Yale University, New Haven, CT

Ph.D. anticipated in August, 2022

August 2016 - Present

Colgate University, Hamilton, NY

B.A. with Honors in Astronomy/Physics & Anthropology

August 2012 - May 2016

Old Rochester Regional High School, Mattapoisett, MA

Foreign Exchange Student

August 2011 - June 2012

Prva beogradska gimnazija, Belgrade, Serbia

Vuk Stefanović-Karadžić Honors High School Student

September 2008 - June 2011

RESEARCH EXPERIENCE

Pseudo-Spectral Solvers for Ultra Light Dark Matter

Professor Nikhil Padmanabhan & Professor Richard Easther

January 2019 - Present

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 preparation.

Gravitational Signatures of Primordial Black Holes

Professor Nikhil Padmanabhan & Professor Richard Easther

September 2017 - March 2019

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

Professor Nikhil Padmanabhan

January 2017 - August 2017

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

Professor Charles Bailyn

November 2016 - May 2017

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

Professor Patrick Crotty

August 2015 - May 2016

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

Franke Program in Science & The Humanities Interdisciplinary Research Award	<i>September 2019</i>
3 Minute Thesis Competition Finalist	<i>April 2019</i>
Graduated Magna Cum Laude with Honors in Astronomy/Physics	<i>May 2016</i>
Colgate Physics and Astronomy Department Founders Award	<i>April 2016</i>
Sigma Pi Sigma Physics Honors Society	<i>April 2016</i>
Dean's List	<i>August 2012 - May 2016</i>
Alumni Memorial Scholar at Colgate University	<i>August 2012 - May 2016</i>

SERVICE & LEADERSHIP

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

OUTREACH

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

PROFESSIONAL ASSOCIATIONS

American Astronomical Society
American Physical Society
American Research Center in Egypt

PUBLICATIONS

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

Zagorac, Easter, 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, Rilingier. 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

- 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