

GABRIEL CASABONA

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Northwestern University Alum ◊ DOE CSGF Alum

RESEARCH INTERESTS

- General relativity, relativistic hydrodynamics, cosmology, turbulence, population synthesis, GRB progenitors
- Compact binary stellar object mergers, white dwarfs, neutron stars, black holes, type Ia supernovae, LISA

EDUCATION

Northwestern University	Jun 2024
M.S. in Physics	
DOE CSGF Fellow	Sep 2019 - Aug 2023
University of Massachusetts Dartmouth	May 2019
M.S. in Physics	
Research Assistant	Jul 2018 - May 2019
Teaching Assistant	Sep 2017 - May 2019
Florida International University	May 2017
B.S. in Physics	
Resident Assistant	Jun 2015 - May 2017
Tutor	Sep 2016 - May 2017

RESEARCH EXPERIENCE

Los Alamos National Laboratory	Jul 2022 - Oct 2022
<ul style="list-style-type: none">• Conducted research with Oleg Korobkin on developing a model to describe the general relativistic solid dynamics of the crust of neutron stars during binary mergers. The computational model will be used to make improvements on the lab-based code SPARTA.• Collaborated and published with Roseanne Marie Cheng and Nicole Lloyd-Ronning on the analysis of binary systems consisting of stellar mass black holes and main sequence stars as GRB progenitors, using the population synthesis code COSMIC.	
Northwestern University	Nov 2019 - Jun 2024
<ul style="list-style-type: none">• Lead research with Shane Larson to develop a new mathematical model to describe a fully general relativistic fluid model for a neutron-degenerate Fermi gas, based on Israel-Stewart hydrodynamics, for neutron stars.	
University of Massachusetts Dartmouth	Oct 2017 - May 2019
<ul style="list-style-type: none">• Worked with Robert Fisher to analyze the role of turbulence in the detonation of carbon and helium in electron-degenerate matter. The FLASH4 code was used to solve the hydrodynamics and nuclear burning, motivated by the double-degenerate channel of type Ia supernovae.	

PUBLICATIONS

G. Casabona and **R. Fisher**, "Turbulently-Driven Detonation Initiation in Electron-Degenerate Matter with Helium," *The Astrophysical Journal Letters*, 962, L31, 2024.

L. Kenoly, *et al.*, "Understanding Binary Systems—a Comparison between COSMIC and MESA," *Research Notes of the AAS*, 7, 167, 2023.

R. Fisher, **P. Mozumdar**, **G. Casabona**, "Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter," *The Astrophysical Journal*, 876, 64, 2019.

PROGRAMMING

Computer Languages	Python, Fortran, C, MATLAB, \LaTeX
Parallel Processing	OpenMP, MPI, CUDA
HPC Techniques	Scientific Computing, Data Analysis, Visualization, Parallel I/O
Tools	UNIX Commands, vi, Bash

PRESENTATIONS

Casabona, G (Jan 2021). *Detonation Initiation in Type Ia Supernovae*.
237th Meeting of the AAS. Virtual

Casabona, G (Mar 2019). *Detonation Initiation in Type Ia Supernovae*.
APS March 2019. Boston, Massachusetts

Casabona, G (Jan 2019). *Detonation Initiation in Type Ia Supernovae*.
233rd Meeting of the AAS. Seattle, Washington

Casabona, G (Nov 2018). *Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter*.
APS Bridge/NMC Conference 2018. Stanford University

Casabona, G (Nov 2018). *Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter*.
APS New England 2018. University of Massachusetts Dartmouth

Casabona, G (Jul 2018). *Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter*.
IHPCSS. Technical University of Ostrava, Czech Republic

Casabona, G (Apr 2018). *Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter*.
APS April 2018. Columbus, Ohio

CONFERENCES & WORKSHOPS

SC22: The International Conference for High Performance Computing, Networking, Storage, and Analysis.
(Nov 2022). Dallas, Texas

SC19: The International Conference for High Performance Computing, Networking, Storage, and Analysis.
(Nov 2019). Denver, Colorado

NuGrid/JINA/ChETEC School: Software Tools for Simulations in Nuclear Astrophysics.
(Sep 2018). University of Hull, United Kingdom

Neutron Star Mergers for Non-Experts: GW 170817 in the Multi-Messenger Astronomy and FRIB Eras.
(May 2018). Michigan State University

OUTREACH

CAMBA Learning to Work Internship Program

- Casabona, G & Nephew, A. (Dec 2021). *Professional Development Basics*. Brooklyn Bridge Academy. Brooklyn, New York

Physics Honors Society ($\Sigma\Pi\Sigma$)

- Casabona, G & Tumeo, B., *et al.* (Aug 2016). *Minority and Women in S.T.E.M. Outreach*. Women in S.T.E.M. Living Learning Community, Florida International University

It's On Us/ Sexual Assault Awareness

- Casabona, G., & Nephew, A. (Jul 2016). *Let's Talk About Sex*. Office of Residential Life, Florida International University

TEACHING EXPERIENCE

Department of Physics

Teaching Assistant

Sep 2017 - May 2019

UMass Dartmouth

- Instructed students on conducting experiments related to introductory Newtonian Mechanics
- Advised on the improvements to the experiments, including installation of updated equipment and curriculum
- Facilitated the understanding and development of problem-solving techniques related to physics

STEM Learning Lab

Tutor

Sep 2017 - Dec 2017

UMass Dartmouth

- Facilitated the understanding in the following subjects:
Introductory Physics, General Chemistry I-II, Quantum Mechanics, Thermodynamics, Classical Mechanics, Electrodynamics, Algebra, Pre-Calculus, Trigonometry, Calculus, Differential Equations

ARC Learning Center

Tutor

Sep 2016 - May 2017

FIU

- Facilitated the understanding in the following subjects:
Introductory Physics, General Chemistry, Quantum Mechanics, Thermodynamics, Classical Mechanics, Electrodynamics, Algebra, Pre-Calculus, Trigonometry, Calculus, Differential Equations

ORGANIZATION MEMBERSHIPS

Society of Physics Students

Physics Honors Society ($\Sigma\Pi\Sigma$)

American Astronomical Society

APS Bridge Program