EZRA SEBASTIAN BROOKER

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EDUCATION

Florida State University *Exp Jul 2021*
Ph.D. in Computational Science
Doctoral Thesis: *In progress*
Advisor: Tomasz Plewa

Florida State University *Exp Dec 2020*
M.Sc., Computational Science
Master's Project: *Multidimensional Studies of Detonation Ignition in Turbulent Stellar Plasmas*
Advisor: Tomasz Plewa

Florida State University *May 2015*
B.Sc., Physics & Astrophysics
Undergraduate Thesis: *Magnetic Field Angles in Collapsing Molecular Clouds*
Advisor: David Collins

RESEARCH

Florida State University *2019 - Present*
Doctoral Candidate Research

Supervisor: Tomasz Plewa
Detonability of white dwarf plasma in search of a viable mechanism for the deflagration-to-detonation transition in Type Ia supernova explosions. Created a database of 2D and 3D turbulent combustion models using a turbulently mixed box simulations of white dwarf plasma with stellar burning physics implemented using a fork of the FLASH hydrocode. Developed spatio-temporal cross correlation procedure and module for LAVAflow data analysis package.

Los Alamos National Laboratory - New Mexico Consortium *2018 - Present*
Graduate Research Assistant

Supervisors: Chris Fryer and Chris Mauney
Studied the nucleation, growth, and destruction of dust grains in the outflows of core-collapse supernovae and the dependence of dust formation on the supernova explosion energy. I implemented additional gas-phase chemistry reactions into a cosmic dust formation Python code and adapted for use in high performance computing environments.

Florida State University *2018 - 2019*
Graduate Research

Supervisor: Tomasz Plewa
Studied the supernova remnant in an attempt to identify observable characteristics that could be used to understand the

core-collapse supernova explosion mechanism and properties of the progenitor star. Worked on a 1D preliminary model evolve explosion out to very late times towards the young supernova remnant phase. This work was done within a fork of the FLASH hydrocode.

Florida State University *2013 - 2015*
Undergraduate Research

Supervisor: David Collins
Studied magnetic field angles of proto-stellar cores relative to the mean magnetic field of large-scale simulations of collapsing globular molecular clouds. Developed analysis Python scripts to look for potential trends between magnetic fields of star-forming cores and the global magnetic field. Research reported in an undergraduate thesis for Honors in the Major graduation distinction.

EMPLOYMENT

Florida State University *Aug 2017 - Present*
Graduate Teaching Assistant

Computational Methods for Discrete Problems
Introduction to Scientific Computing in Fortran (Instructor of Record)
Applied Computational Science I
Continuous Algorithms for Science Applications
Computational Thinking
Elementary Oceanography

New Mexico Consortium *May 2020 - Aug 2020*
Graduate Research Assistant

Los Alamos National Laboratory *May 2019 - Aug 2019*
Graduate Research Assistant

Florida State University *Aug 2014 - May 2015*
Undergraduate Learning Assistant

Studio Physics B: Electricity, Magnetism, Optics

WORKSHOPS

Los Alamos National Laboratory *Jun 2018 - Aug 2018*
Computational Physics Summer Student Workshop

Summer program sponsored by LANL with seminars in scientific computing, verification and validation, fluid/solid mechanics, and HPC, coupled with a team-based summer research project. My partner and I worked on simulations of cosmic dust formation in core collapse-supernovae outflows with Chris Fryer and Chris Mauney as LANL mentors.

PUBLICATIONS

"SN Ia DDT Explosions Powered by the Zeldovich Reactivity Gradient Mechanism" **Ezra Brooker**, Tomasz Plewa, Daniel Fenn, Arxiv 2008.05010, accepted by *Monthly Notices of the Royal Astronomical Society*

"Dependence of Dust Formation on the Supernova Explosion" **Ezra Brooker**, Sarah Stangl, Christopher Mauney, Christopher Fryer, In Preparation

PRESENTATIONS

Contributed Talks

"Detonability of White Dwarf Plasma: Models at Low Densities", Atlanta, GA, *17th International Workshop on the Physics of Compressible Turbulent Mixing*, **Ezra Brooker**, Daniel Fenn, Tomasz Plewa, delayed/TBA

"Detonability of white dwarf plasma: Turbulence models at transition densities", Virtual, *236th Meeting of the American Astronomical Society*, **Ezra Brooker**, Tomasz Plewa, June 03, 2020

Seminar Talks

"Detonation Ignition in Turbulent Stellar Plasmas", LANL, *LA Astro Seminar Series*, **Ezra Brooker**, September 25, 2020

"Detonation Ignition in Turbulent Stellar Plasmas", FSU, *Dept of Scientific Computing Colloquium*, **Ezra Brooker**, September 23, 2020

"Parallelization and Vectorization of nuDust", LANL-NMC, *HPC-SI-USRC Intern Showcase*, **Ezra Brooker** and Sarah Stangl, August 12, 2020

"Dust Nucleation in CCSN", LANL, *LA Astro Seminar Series*, **Ezra Brooker** and Sarah Stangl, July 24, 2020

"Nucleation, Growth, and Destruction of Dust Grains in Different CCSNe Configurations", LANL, *LA Astro Seminar Series*, **Ezra Brooker** and Sarah Stangl, July 25, 2019

Posters

"Detonability of white dwarf plasma: Turbulence models at low densities", FSU, *Dept of Scientific Computing 2020 Computational Xposition*, **Ezra Brooker**, Daniel Fenn, Tomasz Plewa, April 13-15, 2020

"The inverse problem: Connecting Core-Collapse Supernova Observations to the Explosion", FSU, *Dept of Scientific Computing 2019 Computational Xposition*, **Ezra Brooker**, Timothy Handy, Tomasz Plewa, April 19, 2019

"Dust Formation in Supernova Explosions", LANL, *Computational Physics Summer Student Workshop Poster Session*, **Ezra Brooker**, Sarah Stangl, Chris Fryer, Chris Mauney, August 13, 2018

"Magnetic Field Angles in Collapsing Molecular Clouds", FSU, *Dept of Physics Undergraduate Research Poster Session*, **Ezra Brooker**, David Collins, April 16, 2015

Non-technical Talks

"Type Ia Supernovae and Turbulent Combustion", FSU, *CPE-FoCS Accessible Science Lecture Series*, **Ezra Brooker**, February 17, 2020

"Undergrad to Grad, Exploding Stars, and National Labs", FSU, *Dept of Scientific Computing Informational Talk for Undergraduates*, **Ezra Brooker**, October 04, 2019

HONORS AND AWARDS

DoD SMART Scholarship Semi-Finalist *2020*

DoD SMART Scholarship Semi-Finalist *2019*

Honors in the Major for completion of an undergraduate thesis, *2015*
Florida State University

3rd Place Lanutti Prize for Undergraduate Research, *2015*
Dept. of Physics, Florida State University

EXTRACURRICULAR

Graduate Student Liaison *2019-Present*

Fellowship of Computational Scientists

Nascent, SGA-compliant organization for undergraduate and graduate computational STEM students at Florida State University. Organization goals include fostering an all-inclusive and productive environment in inter-disciplinary computational science. My role is to help involve graduate students in working with and mentoring undergraduates on a level beyond the traditional teaching assistant, in communicating graduate research work, and participation in social events to improve inter-department social cohesion.

Curriculum Design Team Lead *2019-Present*

Create With Code! Summer Camp Program

A one week programming summer camp for Leon County, FL, high school students. Program is designed to introduce students to the concepts of data visualization, machine learning, robotics using Python and game design using the Unity engine. Students will explore FSU's Research Computing Center, the Geophysical Fluid Dynamics Institute, and the Center for Intelligent Systems, Control, and Robotics Facility. The program goal is to expose students to computation-based STEM fields, with special emphasis on students who may not otherwise have this opportunity. My role is leading curriculum design for the data analysis and visualization portion of the summer camp.

Organizer *Spring 2020*

Accessible Science Lecture Series

Undergraduate and graduate research lecture series organized by the Fellowship of Computational Scientists in conjunction with the Center for Participant Education. Talks are designed to be accessible to anyone, no STEM field training required. I helped recruit undergraduate and graduate student speakers and organize the lecture schedule.

Volunteer *Feb 1, 2020*

Math Fun Day

Dept. of Math, Florida State University, mathematics education outreach event geared towards elementary and middle school age children. Helped run the computer-algebra room for children ages 4 and above. Guided students through programming challenges involving mathematical ideas about polygonal perimeter calculations in the Scratch programming environment.

TECHNICAL STRENGTHS

Modeling and Analysis	FLASH, MESA, VisIt, yt
Programming Languages	Proficient: Fortran 90/95 and newer, Python, LaTeX
	Familiar: C/C++, Matlab, Bash, HTML5
Operating Systems	Windows, MacOS, CentOS