

# Brandon Lynn Barker

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## EDUCATION

### MICHIGAN STATE UNIVERSITY

#### PH.D., ASTRONOMY AND ASTROPHYSICS

College of Natural Sciences

Exp. 2025 | East Lansing, MI

Advisor: Sean Couch

### UNIVERSITY OF TENNESSEE

#### B.S., PHYSICS, WITH HONORS

Secondary Major in Mathematics

Minor in Astronomy

Magna Cum Laude

College of Arts and Sciences

May 2019 | Knoxville, TN

Advisors: Anthony Mezzacappa and Eirik

Endeve

## TECHNICAL SKILLS

### LANGUAGES

Python • FORTRAN • C/C++

LaTeX • Linux

### SOFTWARE

FLASH • thornado • git/svn

• yt • LaPack

## LANGUAGES

Intermediate Proficiency in Japanese

## PUBLICATIONS

- “**thornado**-hydro: Generalizing discontinuous galerkin methods for a nuclear equation of state for supernova hydrodynamics.” **B. Barker**, E. Endeve, A. Mezzacappa. 2019. (in prep).
- “Equation of State Dependence of the Observable Properties of Turbulence-aided Neutrino-driven Core-collapse Supernovae.” M. Warren, **B. Barker**, T. Cooper, S. Couch, J. Ranta, M. Pajkos, E. O’Connor. 2019. (in prep).
- “**thornado**-hydro: towards discontinuous galerkin methods for supernova hydrodynamics.” E. Endeve, J. Buffaloe, S. Dunham, N. Roberts, K. Andrew, **B. Barker**, D. Pochik, J. Pulsinelli, A. Mezzacappa. 2018. (in review).

## RECENT AWARDS

- 2019 Michigan State University Enrichment Fellowship
- 2019 FORD Foundation Fredoctoral Fellowship Honorable Mention
- 2019 Chancellor’s Undergraduate Researcher of the Year, UTK
- 2018 Barry Goldwater Scholarship Honorable Mention
- 2018 Society of Physics Students National Organization Leadership Award
- 2018 Chancellor’s Citation Award, UTK  
for Extraordinary Academic Achievement
- 2018 Chancellor’s Citation Award, UTK  
for Extraordinary Professional Promise
- 2018 James W. McConnell Award for Academic Excellence, UTK  
from the Department of Physics and Astronomy
- 2018 Office of Research and Engagement Silver Award, UTK  
for the Exhibition of Undergraduate Research and Creative Achievement
- 2018 Arts and Sciences Award, UTK  
for the Exhibition of Undergraduate Research and Creative Achievement
- 2018 Cooper D. Schmitt Memorial Scholarship, UTK  
from the Department of Mathematics for academic merit
- 2018 Katherine M. Frierson Memorial Scholarship, UTK  
for outstanding academic achievement
- 2018 Inducted into Sigma Pi Sigma Physics Honor Society
- 2017 Katherine M. Frierson Memorial Scholarship, UTK
- 2017 Dr. Glenn R. and Elise I. Young Scholarship, UTK  
Department of Mathematics for academic merit
- 2017 Cooper D. Schmitt Memorial Scholarship, UTK  
Department of Mathematics for academic merit
- 2017 Outstanding Undergraduate Researcher, UTK  
Department of Physics and Astronomy
- 2016 Robert W. Lide Citation, UTK  
Department of Physics and Astronomy for contributions to physics labs

## PREVIOUS RESEARCH EXPERIENCE

### **ADVANCED COMPUTATIONAL RESEARCH EXPERIENCE FOR STUDENTS | SUMMER UNDERGRADUATE RESEARCH FELLOW**

May 2018 – August 2018 | East Lansing, MI

Worked under **Sean Couch** and **MacKenzie Warren** exploring the sensitivity of core-collapse supernovae to variations in input nuclear physics.

### **ISTITUTO NAZIONALE DI FISICA NUCLEARE (INFN) | SUMMER UNDERGRADUATE RESEARCH FELLOW**

June 2017 – August 2017 | Pisa, Italy

Received a competitive scholarship under the DOE-INFN Student Exchange Program to work under **Barbara Patricelli**.

Investigated possible joint detection rates for gravitational wave signals from binary neutron star mergers and short gamma ray bursts.

### **JOINT INSTITUTE FOR COMPUTATIONAL SCIENCES, ORNL | UNDERGRADUATE RESEARCHER**

August 2016 – Present | Knoxville, TN

Developed algorithms for supernova hydrodynamics utilizing discontinuous Galerkin methods under **Eirik Endeve** and **Anthony Mezzacappa**.

### **JOINT INSTITUTE FOR ADVANCED MATERIALS, ORNL | RESEARCH ASSISTANT**

May 2016 – August 2016 | Knoxville, TN

Developed a vacuum suitcase for use in the lab, and helped commission an X-ray photoelectron spectrometer under **Norman Mannella** and **Paolo Vilmercati**.

### **JOINT INSTITUTE FOR COMPUTATIONAL SCIENCES, ORNL | UNDERGRADUATE RESEARCHER**

May 2015 – May 2016 | Knoxville, TN

Studied the impact of turbulent flows on the evolution of the supernova explosion under **Anthony Mezzacappa** and **Eirik Endeve**.

## OUTREACH

### **ANNOOR ACADEMY SCIENCE CLUB | COORDINATOR**

August 2018 - December 2018

Created lesson plans and assisted with demonstrations for an after school science club at Annoor Academy, a private Islamic school in Knoxville.

### **LEGO ROBOTICS LEAGUE, INSKIP ELEMENTARY | ACTIVITY LEADER**

August 2018 - December 2018

Assist with an after school LEGO robotics club at Inskip Elementary, a local community school.

### **SATURDAY SCIENCE CLUB | ACTIVITY LEADER**

August 2018 - December 2018

Pond Gap Elementary School, a Title I community school in Knoxville, is visited monthly on Saturdays, and volunteers conduct science experiments and demonstrations with grade-school students with lesson plans written by volunteers.

## LEADERSHIP

### **GOLDWATER SCHOLARS' COMMUNITY COUNCIL | MEMBER**

2019

Organize programming and events for Goldwater Scholars. Help to foster a community among Scholars.

### **DEAN'S STUDENT ADVISORY COUNCIL | MEMBER**

August 2018 - May 2019

Representative for the Department of Physics and Astronomy. Advise Dean of the College of Arts and Sciences on issues of student concern.

### **UNDERGRADUATE RESEARCH STUDENTS' ASSOCIATION | EXECUTIVE BOARD MEMBER**

January 2018 - May 2019

Organize an annual undergraduate research symposium and promote undergraduate research across campus.

### **PHYSICS JOURNAL CLUB | Co-FOUNDER**

January 2017 - May 2019

Weekly meetings with faculty advisor to discuss a paper in physics or astronomy.

### **PURSUIT - THE JOURNAL OF UNDERGRADUATE RESEARCH | RESEARCH EDITOR FOR THE SCIENCES AND ENGINEERING**

August 2016 - May 2019

Pursuit is a university wide, cross-discipline undergraduate research journal at UTK. Delegate submissions to referees and communicate with authors. Led a team of reviewers.

## **SOCIETY OF PHYSICS STUDENTS** | EXECUTIVE OFFICER

August 2014 - May 2019

Host numerous public outreach activities at local schools and other areas. Organize panels, trips to conferences, and host an undergraduate conference roughly once every other academic year.

## PRESENTATIONS

### **APS APRIL MEETING**

STUDENT PRESENTER | APRIL 2019 - DENVER, CO

"Equation of State Dependence of the Observable Properties of Turbulence-aided Neutrino-driven Core-collapse Supernovae"

### **UNDERGRADUATE RESEARCH SYMPOSIUM**

STUDENT PRESENTER | APRIL 2019 - KNOXVILLE, TN

"Equation of State Dependence of the Observable Properties of Turbulence-aided Neutrino-driven Core-collapse Supernovae"

### **EXHIBITION OF UNDERGRADUATE RESEARCH AND CREATIVE ACHIEVEMENT**

STUDENT PRESENTER | APRIL 2019 - KNOXVILLE, TN

"Equation of State Dependence of the Observable Properties of Turbulence-aided Neutrino-driven Core-collapse Supernovae"

### **FIFTH JOINT MEETING OF THE NUCLEAR PHYSICS DIVISIONS OF THE APS AND JPS**

STUDENT PRESENTER | OCTOBER 2018 - WAIKOLOA, HI

"Effects of Input Nuclear Physics on Core Collapse Supernova Simulations"

### **MID-MICHIGAN SYMPOSIUM FOR UNDERGRADUATE RESEARCH EXPERIENCES**

STUDENT PRESENTER | JULY 2018 - EAST LANSING, MI

"Effects of Input Nuclear Physics on Core Collapse Supernova Simulations"

### **EXHIBITION OF UNDERGRADUATE RESEARCH AND CREATIVE ACHIEVEMENT**

STUDENT PRESENTER | APRIL 2018 - KNOXVILLE, TN

"Prospects for High Energy Follow-up Studies of Gravitational Wave Transients"

### **UNDERGRADUATE RESEARCH SYMPOSIUM**

STUDENT PRESENTER | APRIL 2018 - KNOXVILLE, TN

"Prospects for High Energy Follow-up Studies of Gravitational Wave Transients"

### **231ST MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY**

STUDENT PRESENTER | JANUARY 2018 - NATIONAL HARBOR, MD

"High Energy Follow-up Study of Gravitational Wave Transients"

### **EXHIBITION OF UNDERGRADUATE RESEARCH AND CREATIVE ACHIEVEMENT**

STUDENT PRESENTER | APRIL 2017 - KNOXVILLE, TN

"Discontinuous Galerkin Methods in Nuclear Astrophysics Simulations"

### **SIGMA PI SIGMA QUADRENNIAL PHYSICS CONFERENCE**

STUDENT PRESENTER | NOVEMBER 2016 - SAN FRANCISCO, CA

"Discontinuous Galerkin Methods in Nuclear Astrophysics Simulations"

### **EXHIBITION OF UNDERGRADUATE RESEARCH AND CREATIVE ACHIEVEMENT**

STUDENT PRESENTER | APRIL 2016 - KNOXVILLE, TN

"A Singular Value Decomposition of  $15M_{\odot}$  Progenitor CHIMERA Data"

### **UNDERGRADUATE RESEARCH SYMPOSIUM**

STUDENT PRESENTER | APRIL 2016 - KNOXVILLE, TN

"A Singular Value Decomposition of  $15M_{\odot}$  Progenitor CHIMERA Data"

### **SOUTHEAST SECTION OF THE AMERICAN PHYSICAL SOCIETY ANNUAL MEETING**

STUDENT PRESENTER | NOVEMBER 2015 - MOBILE, AL

"A Singular Value Decomposition of  $15M_{\odot}$  Progenitor CHIMERA Entropy Data"

## PRESS

### **ASK A SCIENTIST: HOW BIG IS A QUASAR** Brandon Barker AND SCOTT SATINOVER

Scicomm article in UTK's campus newspaper addressing a submitted question about the size of quasars as part of Ask A Scientist's column.

## WORK EXPERIENCE

### **DEPARTMENT OF PHYSICS AND ASTRONOMY, UTK | UNDERGRADUATE LA**

January 2018 - May 2019

Tutored students in an introductory astronomy class, helped with in-class activities, and graded for the instructor.

### **DEPARTMENT OF MATHEMATICS, UTK | GRADER**

January 2018 - May 2018

Graded written and computer assignments for a numerical algorithms class.

### **DEPARTMENT OF PHYSICS AND ASTRONOMY, UTK | TUTOR**

August 2016 - May 2019

Tutored students in introductory physics and astronomy.

### **DEPARTMENT OF PHYSICS AND ASTRONOMY, UTK | LABORATORY SETUP ASSISTANT**

October 2014 - December 2018

Worked under the Director of Undergraduate Laboratories. Oversaw the setup of all 100-200 level introductory Physics lab sections. Worked with graduate TA's to coordinate setup, lesson plans, and makeup labs.