Brandon Lynn Barker

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EDUCATION

MICHIGAN STATE UNIVERSITY

PH.D., ASTRONOMY AND ASTROPHYSICS
College of Natural Sciences
Exp. 2024 | 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: Eirik Endeve and Anthony Mezzacappa

TECHNICAL SKILLS

LANGUAGES

Python • `FORTRAN` • C/C++
LaTeX • Linux

SOFTWARE

`FLASH` • `thornado` • git/svn
• yt • LaPack

LANGUAGES

Intermediate Proficiency in Japanese

PUBLICATIONS

- "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. 2020. (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. 2019, Journal of Physics: Conference Series, 1225, 012014.
- "`thornado`-hydro: Generalizing discontinuous galerkin methods for a nuclear equation of state for supernova hydrodynamics." **B. Barker**, E. Endeve, A. Mezzacappa. 2019. (in prep).

RECENT AWARDS

2019 **NSF Graduate Research Fellowship**
2019 **Michigan State University Enrichment Fellowship**
2019 **FORD Foundation Fredoctoral Fellowship Honorable Mention**
2019 **Outstanding Presentation Award, APS April**
2019 **Chancellor's Undergraduate Researcher of the Year, UTK**
2018 **Barry Goldwater Scholarship Honorable Mention**
2018 **Society of Physics Students (SPS) National Organization Leadership Award**
2018 **SPS Outstanding Undergraduate Research Award Honorable Mention**
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 with **Sean Couch** and **MacKenzie Warren** exploring the sensitivity of core-collapse supernovae to variations in input nuclear physics.

INSTITUTO 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 with **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 with **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 with **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 with **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 undergradaute 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

235TH MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY

Student Presenter | January 2020 - Honolulu, HI
``Constraining the Core Structure of Core-Collapse Supernovae''

SIAM SOUTH EASTERN ATLANTIC SECTION MEETING

Student Presenter | September 2019 - Knoxville, TN
``Application of the Discontinuous Galerkin Method to Supernova Hydrodynamics in thornado''

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''

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''

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 15$M_\odot$ Progenitor CHIMERA Data''

UNDERGRADUATE RESEARCH SYMPOSIUM
Student Presenter | April 2016 - Knoxville, TN
``A Singular Value Decomposition of 15$M_\odot$ Progenitor CHIMERA Data''

SOUTHEAST SECTION OF THE AMERICAN PHYSICAL SOCIETY ANNUAL MEETING
Student Presenter | November 2015 - Mobile, AL
``A Singular Value Decomposition of 15$M_\odot$ Progenitor CHIMERA Entropy Data''

PRESS

ASK A SCIENTIST: HOW BIG IS A QUASAR Brandon Barker and Scott Satinover
Scicomm article in UTK's campus newpaper adressing a submitted question about the size of quasars as part of Ask A Scientist's column.

BRIDGING THE SYNAPSE: BLUE LIGHT Anu Kumar and Madeline MacArthur, Guest: Brandon Barker
Appeared in an episode of *Bridging The Synapse* to discuss the physics of light.

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.