Carl Edward Fields, Jr.

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EDUCATION

MICHIGAN STATE UNIVERSITY
PH.D., ASTRONOMY & ASTROPHYSICS
College of Natural Sciences
May 2021 | East Lansing, MI

CERTIFICATE IN COLLEGE TEACHING
College of Natural Sciences
May 2020 | East Lansing, MI

CERTIFICATE IN HIGH PERFORMANCE COMPUTING
College of Natural Sciences
December 2018 | East Lansing, MI

ARIZONA STATE UNIVERSITY
B.S., PHYSICS, W/ HONORS
College of Liberal Arts and Sciences
May 2016 | Tempe, AZ

B.S., ASTROPHYSICS, W/ HONORS
School of Earth and Space Exploration
May 2016 | Tempe, AZ

TECHNICAL SKILLS

Languages/Programming Models
`FORTRAN` • Python • `C++` •Kokkos

Software/Numerical Instruments
`MESA` • `MAESTRO` • `FLASH` • `phoebus`

ADVISORS

Graduate Advisor
Sean Couch
Michigan State University

Undergraduate/Thesis Advisor
Frank Timmes
Arizona State University

ADVISEES

RESEARCH
Previous:
Emma Brann, B.S. Physics, 2021, MSU

MENTORING
Previous:
Emma Brann, B.S. Physics, 2021, MSU
Bilal Jones, Ph. D Physics, 2021 MSU
Tom-Erik H., Ph. D Physics, 2021 MSU
Tyler Cox, B.S. Astrophysics, 2019, ASU

RESEARCH INTERESTS

Stellar Hydrodynamics, Core-Collapse Supenovae, Stellar Nucleosynthesis, Gravitational Waves, High-Performance Computing, and Radiation Hydrodynamics.

CURRENT/RECENT APPOINTMENTS

2022 - Present	Early Career Member-at-Large, Executive Committee, DAP-APS
2021 - Present	RPF Distinguished Postdoctoral Fellow, CCS-2, LANL
2016 - 2021	Graduate Research Fellow, National Science Foundation
2015 - 2021	Lead Developer, `MESA-Web` - `mesa-web.asu.edu`
Summer 2019	Graduate Writing Coach/Facilitator, SROP, MSU
2017 - 2019	Data Science Fellow, LSST Corporation
2016 - 2019	Predoctoral Fellow, Nat'l Academies/FORD Foundation

PUBLICATIONS SUMMARY

Summary: 19 publications: 13 refereed, 1 submitted, 2 in prep.
Citations: 784; h-index: 11; i_{10}-index: 12; i_{100}-index: 2 (**Google Scholar Link**)

RECENT FUNDING, AWARDS, DISTINCTIONS

2022 **SPOT Award, Los Alamos National Lab**
for outstanding performance and lasting contribution . . .

2021 **Institutional Computing Award (2 Years), Los Alamos National Lab**
12M SU, *STARS: Simulating Turbulence in Advanced and Rotating Stars*

2021 **RPF Distinguished Postdoctoral Fellow, Los Alamos National Lab**
extraordinary ability in scientific research . . .

2021 **Forbes 30 Under 30, Science**

2020 **Dr. Pliny A. and Margaret H. Price Prize, Ohio State University**
research excellence and exceptional promise

2020 **Edward A. Bouchet Graduate Honor Society, Michigan State University**
exemplify the five core values of the society

2019 **Beth Brown Memorial Prize, National Society of Black Physicists/AAS**
best graduate oral presentation

2017 **Data Science Fellowship, LSST Corporation**

2016 **Predoctoral Fellowship, FORD Foundation/NASEM**
promise that you show for future achievement as a scholar . . .

2016 **Graduate Research Fellowship, NSF**
demonstrated potential to contribute to . . .

2016 **Academic Achievement Graduate Assistantship, MSU**
demonstrated promotion of understanding among persons . . .

2015 **ASU/NASA Space Grant Undergraduate Fellowship**

2015 **Carl A. Rouse Fellowship, National Society of Black Physicists/Caltech**
in support of research in gravitational-wave science

2015 **LIGO Summer Undergraduate Research Fellowship, Caltech**
project entitled, *Testing The Strong-Field Dynamics of General Relativity* . . .

NATIONAL/INTERNATIONAL SERVICE

2022 - 2024 ***Early Career Member-at-Large, Executive Committee,***, DAP-APS
2021 - ***Scientific Reviewer***, LANL: Exploratory Research, LDRD, NASA: ATP, TCAN.
2019 - 2021 ***Organizing Committee/Lecturer - Stellar Modelling for Nuclear Astrophysics Workshop***, JINA-CEE/LSU
2018 - 2019 ***Local Organizing Committee - JINA Frontiers 2019 Meeting***, Joint Institute for Nuclear Astrophysics, MSU
2017 - ***Scientific Referee***, The American Astronomical Society Journals; Astronomy & Astrophysics
2017 ***Teaching Assistant for Prof. Leslie Rogers***, 2017 `MESA` Summer School, UCSB
2016 ***Teaching Assistant for Prof. Jim Fuller***, 2016 `MESA` Summer School, UCSB

TEACHING

GUEST LECTURER | LSSTC Data Science Fellowship Program - Session 15

Center for Astrophysics, Harvard University | July 2022, Cambridge, MA
Led lectures and lesson plans on *Graphics Processing Units* and *Parallel Computing in Python* as part of Session 15 of the LSSTC Data Science Fellowship Program hosted at the CfA.

LECTURER | Stellar Modeling for Nuclear Astrophysics Conference

Department of Astronomy, Louisiana State University University | June 2022, Baton Rouge, LA
Led lectures and lesson plans on various topics leveraging `MESA` for nuclear reaction rate studies in stellar models.

GRADUATE TEACHING ASSISTANT | Visualizing Scientific Datasets

Department of CMSE, Michigan State University | Sping 2020, East Lansing, MI
Teaching assistant for course focused on various aspects of learning the language and techniques of contructing visualizations for use in science. Led class of ∼40 in in guest lesson on *Volumetric Visualizations*.

INSTRUCTIONAL/LABORATORY AIDE | General Physics Laboratory I/II

Department of Physics, Arizona State University | August 2014 - May 2015, Phoenix, AZ
Provided overview of material being covered in lecture component of course to over 80 students. Led students through experiements in kinematics, optics, thermodynamics, and electricity & magnetism.

PUBLIC OUTREACH

SPACETIME PROGRAM, THE PLANETARY SOCIETY | SpaceTime Expert

January 2018 – May 2020
The SpaceTime program is a program designed to connect experts in astronomy with classrooms across all accross the country. SpaceTime experts lead discussions about their research and allow a space for students to directly ask questions they otherwise would not have the opportunity to ask.

SUMMER RESEARCH OPPORTUNITIES PROGRAM (SROP), MSU | Writing Coach/Facilitator

Summer 2019
The goal of SROP is to increase the number of underrepresented students who pursue graduate study and research careers. This position gave me the opportunity to mentor students that came from a similar ethnic/socioeconomic background as myself. I met with the students on a weekly basis and provided feedback on preparing documents such as personal statements, CVs, and research proposals.

WOMAN AND MINORITIES IN PHYSICS SCIENCES (WAMPS), MSU | Mentor

August 2017 – May 2019 | East Lansing, MI
WaMPS is a graduate student group at Michigan State University. Our purpose is to promote diversity in the physical sciences by encouraging women and minorities to pursue the field. We also work to support women and minorities who are already members of the physical science community.

THE SUNDIAL PROJECT, ASU | Mentor

August 2014 – May 2016 | Tempe, AZ
Sundial is an organization that seeks to foster a diverse community of undergraduates, graduates, post-docs, and faculty with interest in the physical sciences.

WESTERN SCHOOL OF SCIENCE & TECHNOLOGY | Instructional Fellow/AVID Tutor

June 2014 – May 2016 | Phoenix, AZ
Western Tech. is a new charter school in Phoenix designed to help promote interest in science and technology in those whom come from low income families or are dealing with other socioeconomic factors. My volunteer service here allows me to inspire young minds to pursue higher education as a role model assisting in the teaching process with the primary instructor.

RECENT PRESENTATIONS (INVITED)

MICHIGAN STATE UNIVERSITY
JINA-CEE Frontiers Junior Workship Talk + Panel | May 2023
Next-Generation Simulations of The Remarkable Deaths of Massive Stars

UNIVERSITY OF MICHIGAN
Astronomy Colloquium | April 2023
Next-Generation Simulations of The Remarkable Deaths of Massive Stars

CENTER FOR ASTROPHYSICS | HARVARD & SMITHSONIAN
Institute for Theory and Computation Colloquium | April 2023
Next-Generation Simulations of The Remarkable Deaths of Massive Stars

CARNEGIE OBSERVATORIES
Astronomy Colloquium | March 2022
Next-Generation Simulations of The Remarkable Deaths of Massive Stars

STOCKHOLM UNIVERSITY, THE OSKAR KLEIN CENTRE
Astronomy Colloquium | February 2022
Next-Generation Simulations of The Remarkable Deaths of Massive Stars

UNIVERSITY OF CALIFORNIA (SAN DIEGO), DEPARTMENT OF PHYSICS
Astronomy Seminar | January 2022
Next-Generation Simulations of The Remarkable Deaths of Massive Stars

KAVLI INSTITUTE FOR THEORETICAL PHYSICS, PROBES OF TRANSPORT IN STELLAR INTERIORS
Invited Talk | November 2021
Next-Generation Simulations of Massive Stars and Their Explosions

UNIVERSITY OF TEXAS, AUSTIN, DEPARTMENT OF ASTRONOMY
Colloquium | October 2021
Next-Generation Simulations of Massive Stars and Their Explosions

NASA, GODDARD SPACE FLIGHT CENTER
ASD Colloquium | April 2021
Multidimensional Progenitor Models For Core-collapse Supernovae

HARVARD UNIVERSITY, CENTER FOR ASTROPHYSICS
GCSP Seminar | November 2020
Multidimensional Progenitor Models For Core-collapse Supernovae

CALIFORNIA INSTITUTE FOR TECHNOLOGY, DEPARTMENT OF ASTRONOMY
Astronomy Tea Talk | November 2020
Multidimensional Progenitor Models For Core-collapse Supernovae

UNIVERSITY OF MASSACHUSETTS (DARTMOUTH), DEPARTMENT OF PHYSICS
Physics Colloquium | October 2020
Multidimensional Progenitor Models For Core-collapse Supernovae

UNIVERSITY OF CALIFORNIA (BERKELEY), DEPARTMENT OF ASTRONOMY
Astro Lunch Seminar | October 2020
Multidimensional Progenitor Models For Core-collapse Supernovae

OHIO STATE UNIVERSITY, CENTER FOR COSMOLOGY AND ASTROPARTICLE PHYSICS
Price Prize Seminar | September 2020
Multidimensional Progenitor Models For Core-collapse Supernovae

HARVARD UNIVERSITY, THE BANNEKER INSTITUTE
Oral Presentation | July 2019 - Cambridge, Massachusetts
On Getting to grad school, star stuff, and beyond

UNIVERSITY OF TOKYO, KAVLI INSTITUTE FOR PHYSICS & MATHEMATICS OF THE UNIVERSE
Seminar | January 2019 - Kashiwa, Japan
The Progenitors of Core-Collapse Supernovae

RECENT PRESENTATIONS (CONTRIBUTED, PUBLIC)

THE ROYAL ASTRONOMICAL SOCIETY OF CANADA TORONTO CENTRE
Speaker's Night (Public) | April 2022
The Remarkable Death of Massive Star

CONFERENCE OF THE NATIONAL SOCIETY OF BLACK PHYSICIST
Oral Presentation | November 2019 - Providence, Rhode Island
The Progenitors of Core-Collapse Supernovae

LOS ALAMOS NATIONAL LABORATORY, CENTER FOR THEORETICAL ASTROPHYSICS
Astro Seminar | July 2018 - Los Alamos, NM, USA
The Progenitors of Core-Collapse Supernovae

CONFERENCE OF FORD FELLOWS
Student Presenter | (Postponed May 2018) - San Juan, PR
Multi-Dimensional Simulations of Massive Stars

JINA-CEE FRONTIERS IN NUCLEAR ASTROPHYSICS
Student Presenter | February 2017 - East Lansing, MI
On Variations of Pre-Supernova Model Properties

NATIONAL SOCIETY OF BLACK PHYSICISTS FALL WORKSHOP
Student Presenter | October 2016 - Fermilab
On Variations of Pre-Supernova Model Properties

AGEP MICHIGAN ALLIANCE 2016 FALL CONFERENCE
Student Presenter | October 2016 - East Lansing, MI
On Variations of Pre-Supernova Model Properties

CONFERENCE OF FORD FELLOWS
Student Presenter | September 2016 - East Lansing, MI
On Variations of Pre-Supernova Model Properties

227TH MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY
Student Presenter | January 2016 - Kissimmee, FL
On The Origin of The Elements: The Spectacular Role of White Dwarfs

FUNDING, AWARDS, DISTINCTIONS

2022 SPOT Award, Los Alamos National Lab
for outstanding performance and lasting contribution . . .

2021 Institutional Computing Grant, Los Alamos National Lab
12M SU, *STARS: Simulating Turbulence in Advanced and Rotating Stars*

2021 RPF Distinguished Postdoctoral Fellow, Los Alamos National Lab
extraordinary ability in scientific research . . .

2020 Forbes 30 Under 30, Science

2020 Dr. Pliny A. and Margaret H. Price Prize, Ohio State University
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2020 Edward A. Bouchet Graduate Honor Society, Michigan State University
exemplify the five core values of the society

2019 Beth Brown Memorial Prize, National Society of Black Physicists/AAS
best graduate oral presentation

2019 Stellar Modelling for Nuclear Astrophysics Workshop, JINA-CEE/NSF
organizing committee

2017 Data Science Fellowship, LSST Collaboration

2016 Graduate Research Fellowship, National Science Foundation
demonstrated potential to contribute to . . .

2016 Predoctoral Fellowship, FORD Foundation/Nat'l Academies of Science, Engineering, and Medicine
promise that you show for future achievement as a scholar . . .

2016 Academic Achievement Graduate Assistantship, Michigan State University
demonstrated promotion of understanding among persons . . .

2016 Chambliss Astronomy Achievement Award (Hon. Ment.), American Astronomical Society
undergraduate poster presentation

2015 Space Grant Undergraduate Fellowship, National Aeronautical and Space Administration
academic achievement, research experience

2015 Carl A. Rouse Fellowship, National Society of Black Physicists/Caltech
in support of research in gravitational-wave science

2015 LIGO Summer Undergraduate Research Fellowship, California Institute of Technology
research experience, academic achievements

2015 APIASF/Coca-Cola Scholarship, Asian & Pacific Islander American Scholarship Foundation
academic achievement, outstanding community service and financial need
selected out of nearly 9,000 applicants from over 48 countries

2015 Undergraduate Summer Enrichment Award, Arizona State University, College of Liberal Arts & Sciences
for proposal titled, *On The Evolution of The Elements*

2015 Norm Perrill Origins Project Undergraduate Scholar, Arizona State University Origins Project
academic achievement, origins based research

2015 AAS Beth Brown Memorial Prize, National Society of Black Physicists/American Astronomical Society
best undergraduate poster presentation

2014 APIASF/Wells Fargo Scholarship, Asian & Pacific Islander American Scholarship Foundation
academic achievement, outstanding community service and financial need
selected out of 7,000 applicants from over 41 countries

SELECTED PRESS

2020 ***MSU astrophysics doctoral student Carl Fields named one of Forbes' 30 Under 30 for science***
Lansing State Journal, Newspaper

2020 ***Black voices in physics: Carl Fields***
Physics Today, Interview (Journal)

2020 ***2020 Price Prize Winners Announced***
Center for Cosmology and AstroParticle Physics, OSU

2017 ***Study of the Evolution of Stars and Stellar Explosions***
Institute for Cyber Enabled Research, MSU, Interview

2016 ***Determination is the key***, ASU Now, Interview
highlight of my graduate research fellowships + general Q/A about my time at ASU.

2015 ***A Cutting-Edge Research Tool***, The UC Santa Barbara Current., Interview
brief discussion about the MESA stellar evolution code and how it is used in my research.

2015 ***Up and Down The Ladder***, ASU EdX: Introduction to Solar Systems & Astronomy, Video Presentation
guest dialogue with Prof. Timmes on atomic structure of matter, phase transitions, and energy
as part of the lecture series for ASU's 111x course, the largest college-credit astronomy course in the world.

2015 ***Google Hangout for JINA CEE***, National Science Foundation, Video Presentation
brief discussion about my current research and my role as an undergraduate JINA-CEE.

2014 ***The Evolution of Carbon Burning Flames Inside Super-Asymptotic Giant Branch Stars***, ΣΞ (Sigma Xi), Interview
brief discussion about my current research and long term goals.

REFEREED PUBLICATIONS

1ST AUTHOR PUBLICATIONS

8. *Multi-dimensional GRMHD Core-Collapse Supernova Explosion Models Enabled with* ***phoebus***,
C. E. Fields, J. Dolence, J. Miller, L. Roberts, and B. Ryan, 2023, in prep.

7. *3D Hydrodynamic Simulations of Rotating Massive Stars Reveal Unique Convective Burning Shell Configurations*,
C. E. Fields, 2023, ApJ, in prep.

6. ***MESA-Web****: A cloud resource for stellar evolution in astronomy curriculum*
C. E. Fields, Richard H. D. Townsend, A.L. Dotter, Michael Zingale and F.X. Timmes, 2023, AEJ, under review.

5. *The Three-Dimensional Collapse of a Rapidly Rotating 16* $M_\odot$ *Star*
C. E. Fields, 2022 ApJL, **924**, L15

4. *Three-dimensional Hydrodynamic Simulations of Convective Nuclear Burning in Massive Stars Near Iron Core Collapse*
C. E. Fields & S. M. Couch, 2021, ApJ, 2021 ApJ, **921**, 28

3. *On The Development of Multidimensional Progenitor Models For Core-collapse Supernovae*
C. E. Fields & S. M. Couch, 2020, ApJ, 2020 ApJ, **901**, 33

2. *The Impact of Nuclear Reaction Rate Uncertainties On The Evolution of Core-Collapse Supernova Progenitors*
C. E. Fields, R. Farmer, I. Petermann, S. M. Couch, & F. X. Timmes, 2018 ApJS, **867**, 30

1. *Properties of Carbon-Oxygen White Dwarfs From Monte Carlo Stellar Models*
C. E. Fields, R. Farmer, I. Petermann, C. Iliadis, & F. X. Timmes, ApJ, 823, **46**, 2016

CO-AUTHOR PUBLICATIONS

8. *Testing White Dwarf Age Estimates using Wide Double White Dwarf Binaries from Gaia EDR3*
Heintz, Tyler and 87other co-authors including **C. E. Fields**, ApJ, **934**, 148 (2022).

7. *On the Impact of* ^{22}*Ne on the Pulsation Periods of Carbon-Oxygen White Dwarfs with Helium-dominated Atmospheres*
Chidester, Morgan and 8 other co-authors including **C. E. Fields**, ApJ, **910**, 24 (2021).

6. *Evolutionary roads leading to low effective spins, high black hole masses, and O1/O2 rates for LIGO/Virgo binary black holes*
K. Belczynski, J. Klencki, & **C. E. Fields** et al., A&A, 636, A104 (2020).

5. *Understanding the Engines and Progenitors of Gamma-Ray Bursts*
C. L. Fryer and 7 other co-authors including **C. E. Fields**, Eur. Phys. J. A (2019) 55: 132.

4. *The Impact of White Dwarf Luminosity Profiles on Oscillation Frequencies*
F. X. Timmes, Richard H. D. Townsend, Evan B. Bauer, Anne Thoul, **C. E. Fields** & William M. Wolf, 2018 ApJL, **234**, 19.

3. *The* $^{12}C(\alpha,\gamma)^{16}O$ *Reaction and Its Implications for Stellar Helium Burning*
R. J. deBoer and 12 other co-authors including **C. E. Fields**, Rev. Mod. Phys. **89**, 035007 (2017).

2. *On Variations Of Pre-Supernova Model Properties*
R. Farmer, **C. E. Fields**, I. Petermann, L. Dessart, M. Cantiello, B. Paxton, & F. X. Timmes, ApJS, 2016, **227**, 22.

1. *On Carbon Burning in Super Asymptotic Giant Branch Stars*
R. Farmer, **C. E. Fields**, & F. X. Timmes, ApJ, 807, **184**, 2015.

NON-REFEREED PUBLICATIONS/ABSTRACTS

3. *Catching Element Formation In The Act ; The Case for a New MeV Gamma-Ray Mission: Radionuclide Astronomy in the 2020s*
   C. L. Fryer, F. X. Timmes, A. L. Hungerford, A. Couture, and many other authors including **C. E. Fields**, Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 2 (2019).

2. `starkiller-astro/Microphysics`: common astrophysical microphysics routines with interfaces for the different AMReX codes
   the StarKiller Microphysics Development Team; including **C. E. Fields**, 10.5281/zenodo.2620545.

1. *On The Origin of The Elements: The Spectacular Role of White Dwarfs*, **C. E. Fields**, R. Farmer, I. Petermann, & F. X. Timmes, 227th Meeting of the AAS, Abstract #144.01.