Chelsea E. Harris

curriculum vitae

Michigan State University, Biomedical-Physical Sciences Building
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Nationality: U.S. Citizen
Conozco español de nivel B2 (intermedio).

current position

Research Specialist, Physics and Astronomy Department, Michigan State University (MSU)

- Co-PI NSF grant #2107070 "Constraining Type Ia Supernova Progenitors via their Environments" ($595k, with AGEP supplement; co-PI L. Chomiuk)
- Hydrodynamic and radiation transport simulations of supernova interaction with circumstellar material; interpretation of radio, X-ray, optical, and UV datasets.

education

2018 **PhD Astronomy & Astrophysics with a Designated Emphasis in Computational and Data Science and Engineering**, UC Berkeley. Dissertation: "One Shell, Two Shell, Red Shell, Blue Shell: Numerical Modeling to Characterize the Circumstellar Environments of Type I Supernovae". Committee: D. Kasen (Chair), P. Nugent, A. Filippenko, P.-O. Persson

2013 MA in Astrophysics, UC Berkeley

2012 BS in Physics, UC Santa Barbara (College of Creative Studies, Regents' Scholar)

appointments held

08/23- *Research Specialist*, MSU, group of Laura Chomiuk.

06/20-07/23 *Research Associate*, MSU, group of Laura Chomiuk.

09/18-05/20 *Research Associate*, MSU, group of Sean Couch

06/18-08/18 *Interim Postdoctoral Researcher*, Lawrence Berkeley National Laboratory, group of Peter Nugent

areas of research in supernova astrophysics

Primary focus: Determining the progenitors of supernovae through computer simulations of ejecta interaction with the circumstellar medium.
Specializations: Type Ia supernovae, circumstellar environments, shocks, numerical hydrodynamics, radiation transport, synthetic observations, comparison to observations.
Related interests: extragalactic transients, stellar evolution, close binary stars, stellar mass loss/transfer, nucleosynthesis, cosmology, galaxy evolution, multi-messenger astronomy.

methods

PROGRAMMING AND SIMULATION DATA

2019 Argonne Training Program on Extreme-Scale Computing (Argonne National Laboratory, U.S. Department of Energy, National Nuclear Security Administration, Exascale Computing Project)

Primary languages: Python, C, C++, PostgreSQL. **Secondary language:** Fortran 90.
Codes: `FLASH` (multiscale, multiphysics simulations), `Sedona` (Monte Carlo radiation transport and hydrodynamic solver), `RT1D` (hydrodynamics), `SNEC` (radiation hydrodynamics), `SYNAPPS` (supernova spectrum modeling), `Superfit` (supernova spectrum matching).

GROUND AND SPACE TELESCOPE DATA

Zwicky Transient Facility, *Swift* UVOT, Jansky Very Large Array, *Hubble Space Telescope* WFC3, Arcminute Microkelvin Imager; supernova optical spectra and photometry

research mentoring as primary advisor

The Michigan State University (MSU) Drew program and the National Astronomy Consortium both serve undergraduates from underrepresented backgrounds.

2022 Miranda Pikus, MSU undergraduate (Physics Astronomy Research Experience for Drew Scholars). Obtaining late-time fluxes of Type Ia supernovae in the *Swift* UVOT archives to limit the rate of late-time interaction.

2020, 2021 Jacqueline Hernandez, Texas Christian University undergraduate (MSU REU student, National Astronomy Consortium). Creating light-curves of Zwicky Transient Facility Type Ia supernovae to search for interaction with circumstellar material at late-times.

2019 Brandon McIntyre, MSU undergraduate, Drew Scholars program. Creating a grid of Red Super-Giant explosion models for use in Type IIP supernova microlensing simulations (`FLASH` code).

2018-2019 Cassandra Tang, UC Berkeley undergraduate. Styding the effect of mixing in simulations of the interaction of Type Ia supernovae with double-shell circumstellar structures (`RT1D` code).

grants, honors & awards

2021 Co-PI, National Science Foundation Grant #2107070, "Constraining Type Ia Supernova Progenitors via their Environments" (3 year grant with summer student funding; extended to fund a graduate student)

2019 Howes Scholar Award, Krell Institute (2 awarded; candidates nominated by advisor; for demonstration of "outstanding leadership, character and technical achievement in the field of computational science," in remembrance of Fredrick A. Howes)

2013 Computational Science Graduate Fellowship (CSGF), United States Department of Energy (10 awarded; applicants from fields of science, technology, engineering, and mathematics; open to U.S. only)

2013 Graduate Research Fellowship, National Science Foundation (*declined*; 2,000 awarded; applicants from all fields of research; open to U.S. only.)

2012 Research Award, UCSB Department of Physics (for outstanding effort in laboratory research)

2012 Academic Excellence Award, UC Santa Barbara Department of Physics (for successful completion of the Honors Program)

2012 Physics Highest Academic Honors, UC Santa Barbara Department of Physics (for maintaining a 3.8-4.0 GPA in upper division Physics courses)

2012 Distinction in the Major, UC Santa Barbara Department of Physics (for successful completion of a Senior Honors Thesis)

2011 Honorable Mention, Goldwater Scholarship (275 scholarships awarded, 198 honorable mentions; applicants from fields of mathematics, natural sciences, and engineering; open to U.S. only)

TELESCOPE TIME ALLOCATIONS

2022 Co-I: "A comprehensive search for late-time radio emission from Type Ia-CSM" (VLA/23A-
2022 328). PI Sumit Sarbadhicary. Nine hours. Co-I: "Hunting the evolution and spectrum of the first SN Ia CSM radio detection" (VLA/22A-497). PI Javier Moldon. Three hours.

2022 Co-PI: "Late-Time Observations of Type Ia supernovae to Constrain their Circumstellar Environments" *Swift* fill-in program. Co-PI Peter Brown. 14 targets, 5 ks each.

2020 Co-I: "VLA observations of the youngest SNe Ia as a novel probe of progenitor scenarios" (VLA/20B-355). PI Sumit Sarbadhicary. Six hours.

2019 Co-I: "Characterizing a Nearby Normal Type Ia Supernova with Late-time CSM Interaction" (VLA/19A-451). PI Assaf Horesh. Very Large Array. Two hours.

2018 Co-I: "VLA Data on the Youngest SNe Ia Will Yield Unprecedented Progenitor Constraints" (VLA/18B-162). PI Laura Chomiuk. Very Large Array. Six hours.

2017 Co-I: "Characterizing the First Normal Type Ia Supernova with Late-time CSM Interaction" (VLA/17B-434). PI Assaf Horesh. Very Large Array. Two hours.

2017 Co-I: "NUV Monitoring of a SN Ia with Late-Onset CSM Interaction" (DD-15407). PI Melissa Graham. *Hubble Space Telescope*. One STIS spectrum, conditional three (3) orbits with WFC3/UVIS+275W.

2016 Co-I: "A NUV Imaging Survey for Circumstellar Material in Type Ia Supernovae" (GO-14779). PI Melissa Graham. *Hubble Space Telescope*. Eighty-three (83) Snapshot targets in Cycle 24 with WFC3/UVIS+F275W.

professional publications & presentations

List of Publications

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click here for publications on ADS

REFEREED

2023 **Harris, Chelsea E.**, Sarbadhicary, S. K., Chomiuk, L., and 3 co-authors, "Radio Observations of Six Type Ia Supernovae in their Infancy"; *The Astrophysical Journal*, 952:24

2023 Kool, E. C. and 36 coauthors including Harris, Chelsea E., "A radio-detected type Ia supernova with helium-rich circumstellar material," *Nature*, 617:477

2022 Brethauer, D. and 16 coauthors including Harris, Chelsea E., "Seven Years of Coordinated Chandra-NuSTAR Observations of SN 2014C Unfold the Extreme Mass-Loss History of Its Stellar Progenitor," *The Astrophysical Journal* 939:105

2022 Phillips, M. M. and 21 coauthors including Harris, Chelsea E., "The Absolute Magnitudes of 1991T-like Supernovae," *The Astrophysical Journal* 938:47

2022 Barker, B. L., **Harris, Chelsea E.**, Warren, M. L., and 2 coauthors, "Connecting the Light Curves of Type IIP Supernovae to the Properties of their Progenitors"; *The Astrophysical Journal*, 934:67B

2021 **Harris, Chelsea E.**, Chomiuk, L., Nugent, P. E., "Tumbling Dice: Radio Constraints on the Presence of Circumstellar Shells around Type Ia Supernovae with Impact Near Maximum Light"; *The Astrophysical Journal* 912:23

2020 **Harris, Chelsea E.**, Nugent, P. E., "Outside the Wall: Hydrodynamics of Type I Supernovae Interacting with a Partially Swept-up Circumstellar Medium"; *The Astrophysical Journal* 894:122

2019 Keel, W.C., and 11 coauthors including Harris, Chelsea E., "AGN photoionization of gas in companion galaxies as a probe of AGN radiation in time and direction," *Monthly Notices of the Royal Astronomical Socieity* 483:4847

2019 Graham, M. L., **Harris, Chelsea E.**, and 12 coauthors, "Delayed Circumstellar Interaction for Type Ia SN 2015cp Reveated by an HST Ultraviolet Imaging Survey"; *The Astrophysical Journal* 871:62

2018 **Harris, Chelsea E.**, Nugent, P. E., Horesh, A., and 12 coauthors, "Don't Blink: Constraining the Circumstellar Environment of the Interacting Type Ia Supernova 2015cp"; *The Astrophysical Journal* 868:21

2017 Graham, M. L., **Harris, Chelsea E.**, and 5 coauthors "PTF11kx: A Type Ia Supernova with Hydrogen Emission Persisting After 3.5 Years"; *The Astrophysical Journal* 843:102

2016 **Harris, Chelsea E.**; Nugent, P.E.; Kasen, D.N.; "Against the Wind: Radio Light Curves of Type Ia Supernovae Interacting with Low-Density Circumstellar Shells"; *The Astrophysical Journal* 823:100

2015 Bennert, V.N. and 8 coauthors including Harris, Chelsea E., "A Local Baseline of the Black Hole Mass Scaling Relations for Active Galaxies. III. The Black Hole Mass - Velocity Dispersion Relation", *The Astrophysical Journal* 809:20

2014 Goobar, A. and 33 coauthors including Harris, Chelsea E., "The Rise of SN 2014J in the Nearby Galaxy M82", *The Astrophysical Journal* 784:12

2012 **Harris, Chelsea E.**, Bennert, V.N., Auger, M.W., Treu, T., Woo, J.-H., Malkan, M.A., "A Local Baseline of Black Hole Mass Scaling Relations for Active Galaxies. II. Measuring Stellar Velocity Dispersion in Active Galaxies", *The Astrophysical Journal Supplement Series* 201:29

2012 Keel, W. C. and 10 coauthors including Harris, Chelsea E., "The Galaxy Zoo survey for Giant AGN-ionized clouds: past and present black hole accretion events", *Monthly Notices of the Royal Astronomical Society* 420:878

2011 Barth, A.J. and 48 coauthors including Harris, Chelsea E., "The Lick AGN Monitoring Project 2011: Reverberation Mapping of Markarian 50", *The Astrophysical Journal* 743:4

2011 Barth, A.J. and 47 coauthors including Harris, Chelsea E., "Broad-line Reverberation in the

Kepler-field Seyfert Galaxy Zw 229-015", *The Astrophysical Journal* 743:4

NON-REFEREED

2019 Graham, M. L., **Harris, Chelsea E.**, and 12 coauthors, "Delayed Circumstellar Interaction for Type Ia SN 2015cp Reveated by an HST Ultraviolet Imaging Survey"; American Astronomical Society, AAS Meeting #233, id.410.06

2017 Bennert, V.N. and 8 coauthors including Harris, Chelsea E., "VizieR Online Data Catalog: The $M_{BH} - \sigma$ relation for active galaxies," VizieR On-line Data Catalog, J/ApJ/809/20

2015 Bennert, V.N. and 6 coauthors including Harris, Chelsea E., "Towards an Understanding of the Black Hole Mass Scaling Relations," IAU General Assembly, Meeting #29, id.2235821

2015 Harris, Chelsea E., Nugent, P. E., Kasen, D. N., and Roth, N., "Interaction of a Type Ia Supernovae with Circumstellar Mass," American Astronomical Society, AAS Meeting #225, id.104.01

2013 Bennert, V.N. and 5 coauthors including Harris, Chelsea E., "Towards an Understanding of the Black Hole Mass Scaling Relations," American Astronomical Society, AAS Meeting #221, id.309.03

2013 Harris, Chelsea E. and 4 coauthors, "OI Signatures in Type Ia Supernovae from the Palomar Transient Factory Survey," American Astronomical Society, AAS Meeting #221, id.253.23

2012 Harris, Chelsea E., Bennert, V.N., Treu, T.T., "A Local Baseline for the Black Hole Mass Scaling Relations for Active Galaxies. II. Stellar Kinematics: Results and Practical Guidelines for Future Studies," American Astronomical Society, AAS Meeting #219, id.246.09

2011 Bennert, V.N. and 8 coauthors including Harris, Chelsea E.,"The black-hole mass scaling relations of active galaxies: From the local Universe out to a lookback time of 10 Gyrs," Galaxy Formation: An International Conference, Online at http://astro.dur.ac.uk/Gal2011, id.95

SELECT RESEARCH TALKS

2022 "Understanding the Emerging Class of Type Ia Supernovae with Circumstellar Material." *seminar series*, Ohio State University

2021 "Understanding the Emerging Class of Type Ia Supernovae with Circumstellar Material." *seminar series*, University of Colorado at Boulder

2019 "Which SNe Ia Come from the Single Degenerate Channel? The Answer Will Shock You." *Midwest Workshop on Supernovae and Transients*, University of Chicago

2018 "Interpreting the Radiation from SNe interacting with CSM." *Zwicky Transient Facility Theory Network Meeting*, Kavli Institute for Theoretical Physics, University of California at Santa Barbara

2018 "Studying the Circumstellar Medium of SNe Ia in the Near-Infrared." *New Advances in NIR Type Ia Supernova Science*, University of Pittsburgh

2017 "Supernovae Interacting with Circumstellar Material." *LSST: The Supernova Revolution*, Center for Interdisciplinary Exploration and Research in Astrophysics at Northwestern University

2016 "Circumstellar Shells around Type Ia Supernovae." *The Ninth Harvard-Smithsonian Conference on Theoretical Astrophysics: The Transient Sky*, Harvard University

service and community work

TOWARD ASTRONOMERS

Grant Allocation Committees

Years are excluded to protect the privacy of the process.

- *Chandra* space telescope time allocation committee
- NASA Astrophysics Data Analysis Program review committee
- National Science Foundation Astronomy and Astrophysics Research Grant panel

Department Service

2021- Site co-lead for MSU partnership with the National Radio Astronomy Observatory National Astronomy Consortium summer internship program. *(MSU hosts 2-3 undergraduates per year from NAC, a program that ensures research opportunities for exceptional students from underrepresented backgrounds.)*

2021- Facilitator, Physics-Astronomy Drew Outreach Work AssociatioN. *(Freshman and Sophomore undergraduate students from the Drew Scholars program [STEM majors from underrepresented backgrounds] participate in astronomy and physics outreach.)*

2018-2022 Postdoc leader and co-founder, Stellar Mentorship Program, MSU. *(Connecting MSU postdocs with an astronomy faculty mentor outside their research group for career support.)*

Teaching

2021 Course Instructor, ISP 205 "Visions of the Universe" – Michigan State University

2019 Lecturer, "The Many Explosions of White Dwarf Stars" – JINA First Frontiers Summer School, Michigan State University (hour-long talk)

2018 Graduate Student Instructor, Astronomy 207 (graduate inter-disciplinary): "Python Computing for Data Science", Prof. Joshua Bloom, UC Berkeley

2016 Lecturer, Astronomy 2 (undergraduate non-major): "History of the Universe", Prof. D. Andrew Howell, UC Santa Barbara (hour-long guest lecture)

2013 Graduate Student Instructor, Astronomy C10 (undergraduate non-major): "Introduction to General Astronomy", Prof. Alex Filippenko, UC Berkeley

Professional Mentoring

2020-2022 Brandon Barker, Michigan State graduate student. Guided student in first first-author paper, submitted in their second year (see Publications list), including the research content, writing process, and review process.

2016-2018 graduate student mentor to a graduate student, Department of Astronomy Graduate Student Mentorship Program, UC Berkeley

2012-2014 graduate student mentor to three undergraduate students, COMPASS project, UC Berkeley

Selected Outreach Talks to Astronomers

2022 "Tiny Stars and Time Machines" Type Ia supernovae as cosmological tools, Society for Women in Space Exploration talk series (astronomy undergraduates), Michigan State

2021 how to become a professional astronomer, Drew Scholars professional development seminar series, Sophomore level, Michigan State University

2021 the importance of mental health in academic success, Drew Scholars professional development seminar series, Freshman level, Michigan State University

2016 "UC Berkeley Mental Health Conference 2016, Confronting Mental Health Stigmas: takeaway messages for our department" – Astronomy Department Lunch Talk Series, University of California Berkeley

Conference Organizer

2019 local organizer, JINA First Frontiers Summer School, Joint Institute for Nuclear Astrophysics, MSU

TOWARD NON-ASTRONOMERS

2023 participant, Datathon4Justice weekend, Institute for the Quantitative Study of Inclusion, Diversity, and Equity. Teams use data science for social justice work in a weekend-long "hackathon".

2022 Co-founder, Undergraduate Astronomy Outreach Group, Michigan State University. A team of undergraduates perform astronomy outreach projects. Duties include finding outreach opportunities, meeting with students, and facilitating student efforts.

2020- Co-organizer, Lansing Astronomy on Tap. Astronomy talks in a casual setting. Duties include finding event venue, finding speakers, hosting events, giving talks, and general event organization.

Workshops

2020 Paint-Along, supernovae and spectra. Abrams Planetarium (online)

2018 Workshop developer and leader, "Our PEARTHfect Planet" (planet habitability). For ages 3-16 years. Nature Night, Michigan State University Observatory

2016-2017 Workshop leader, stellar nucleosynthesis. For junior high school women. Expand Your Horizons, Saint Mary's College.

2014-2016 Cal Day annual volunteer, Department of Astronomy: taught astronomy concepts to children through hands-on activities

Selected Outreach Talks to Non-Astronomers

2021 "Supernova: King of the Killers" – Astronomy on Tap Lansing (Halloween event)

2020 "The Science of Star Wars" *Abrams Planetarium*, Facebook Live

2019 "Let's use magnets to blow stars up!" – Astronomy on Tap Lansing

2018 "What makes cosmological supernovae?" – Astronomy on Tap Lansing