

H Perry Hatchfield

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Education

- 2016 - 2022 **University of Connecticut**, Storrs, CT.
PhD in Physics
Advisor: Dr. Cara Battersby
Dissertation: *Gas Dynamics and Star Formation in the Milky Way's Central Molecular Zone*
- 2012 - 2016 **Oberlin College**, Oberlin, OH.
B.A. with High Honors in Physics, **B.A.** in Creative Writing

Proposals and Grants Awarded

- 2021 SOFIA Archival Research Proposal, Cycle 9. **Principle Investigator** of the *Investigating Galactic Nuclear Infrared Thermal Evolution of young Stars (IGNITES)* project to study the thermal evolution of young stellar and pre-stellar objects in the central molecular zone, awarded **\$166,000**
- 2021 ALMA, Cycle 8, 121.4 hours 12 meter time awarded. *The Alma CMZ Exploration Survey (ACES)*, **Co-Investigator**
- 2021 ALMA, Cycle 8, 34.7 hours 12 meter time awarded. *How does the Environment Impact the Origin of Stellar Masses? A Census of Protostellar Distribution in the CMZ.*, **Co-Investigator**

Research Highlights

- 2022 - present **University of Connecticut, Department of Physics**, Storrs, CT.
Postdoctoral Researcher, Principle Investigator of the IGNITES project: investigating the massive protostellar population throughout the Central Molecular Zone
- Facilitating collaboration between several of the leading Galactic Center observational survey and theory groups in multiple wavebands
 - Analyzing and interpreting the overlap of data from a variety of modern observatories including ALMA, the SMA, SOFIA, Herschel, Spitzer, and the VLA.
 - Adapting and utilizing cutting-edge models of spectral emission from massive protostars to understand the extreme star formation environment of the Galactic Center
- 2018 - 2022 **Universität Heidelberg, Institute of Theoretical Astrophysics**, Heidelberg, Germany.
- Research collaboration appointment:** ongoing remote collaboration with Dr. Ralf Klessen and Dr. Mattia Sormani, developing a hydrodynamical model of the Milky Way's Central Molecular Zone
- Designed and ran AREPO hydrodynamic simulations of gas dynamics and star formation in the Milky Way's Galactic Center using high performance computing resources
 - Measured the most accurate to-date inflow rate towards the Milky Way's Galactic Center using simulation-informed interpretations of observations of the Milky Way's Dust Lanes
 - Analyzed Galactic-scale dynamical influences on molecular cloud properties in hydrodynamic simulations

- 2017 - 2022 **University of Connecticut, Department of Physics**, Storrs, CT.
Graduate Research Assistant: advised by Dr. Cara Battersby, studying star formation, gas flows, and turbulence in the Milky Way's Galactic Center
- Led the design of the CMZoom survey catalogs of all possible sites of massive star formation in the Milky Way's Central Molecular Zone
 - Simulated interferometric observations to test catalog completeness
 - Developed technique to calculate the star formation potential of the Central Molecular Zone
 - Characterized all deeply embedded massive protostellar clusters using CMZoom's 1.3mm dust continuum data and archival Herschel and Spitzer data

Mentoring Experience

- 2020 - present **Primary mentor** for Hannah Koziol, undergraduate at University of Connecticut, determining effects of interferometric observation on measurements of the column density probability distribution function, and inferred turbulent properties of molecular clouds. (Koziol, Hatchfield et al. in prep.)
- 2019 - 2020 **Primary mentor** for Bryan Garcia-Medina, undergraduate at University of Connecticut, developing catalog techniques to identify consistent molecular cloud structures across time in moving mesh hydrodynamic simulations
- 2018 - 2019 **Primary mentor** for Christopher Anuzzi, undergraduate at University of Connecticut, cross-correlating legacy catalogs of methanol / water masers, and young stellar objects in the Central Molecular Zone

Selected Leadership and Service Experience

- 2021 - present **Member** of the Astrobites Climate Change Committee
- 2021 - present **Member** of the Astrobites Diversity, Equity and Inclusion Committee
- 2021 - present **Member** of the Astrobites Policy Committee
- 2019 - 2021 **President** of the University of Connecticut Physics Graduate Student Association
- 2016 - 2019 **Treasurer** of the University of Connecticut Physics Graduate Student Association

Teaching, Outreach, and Writing Experience

- 2021 - present **Writer for Astrobites**, a graduate student-run daily astrophysics literature journal which aims to make current research more accessible to undergraduates
- 2020 University of Connecticut, **Co-instructor (IOR) for PHYS1025Q (Introductory Astrophysics)**. Independently converted and rewrote all course material into an online format during the first semester of the COVID-19 pandemic while other Co-instructor was on leave
- 2018, 2020 **Research Scientist and Writer for the Bitescis K12 program**, working with classroom teachers to develop lesson plans based on current research in astronomy
- 2019 **Invited classroom Q&A** at Avon High School, Avon CT
- 2017 **Eclipse viewing event** at Horsebarn Hill, Storrs, CT
- 2016 - 2017 University of Connecticut, **Teaching Assistant in Physics and Astronomy** for PHYS1502 (Introductory electromagnetism), PHYS1202 (Introductory Electromagnetism), PHYS1025 (Introductory Astrophysics)
- 2016 Independent tutor for high school math and physics students
- 2014 - 2015 Oberlin College, Course Assistant for Modern Physics and Classical Mechanics

Awards, Fellowships and Honors

- 2018 - 2020 LSST Data Science Fellowship
- 2016, 2017 Letter of Recognition for Excellence in Teaching Reviews, twice awarded
- 2016 Research Fellowship Award from the Kurt Haller Endowment for Physics Research and Graduate Education
- 2016 High Honors, Oberlin College Department of Physics and Astronomy for thesis: "Cosmic Strings and Filaments: Unraveling the Subtleties of Femtolensing and Accretion in Cylindrically Symmetric Spacetime"
- 2012-2016 Oberlin College Dean's Scholarship

Select Programming and Technical Skills

- Expert proficiency of programming in Python, using common toolboxes for data manipulation, analysis and visualization including astropy, matplotlib, scipy, pandas.
- Expert proficiency in the use of common Astronomy data reduction and analysis tools including CASA, DS9, and Glue.
- Experienced in the use of high performance computing resources, bash scripting, and GPU optimization techniques using CUDA and Numba.
- Experience implementing supervised and unsupervised machine learning techniques using pytorch and tensorflow, including random forests and convolutional neural nets.
- Skilled in the use of version control and deployment tools, such as Github and Docker.
- Working knowledge of programming in C++, Java, and MATLAB.
- Proficient in database querying and management using SQL and SQLite.

Invited Talks

- Sep. 2022 *Puzzles of the Galactic Center* conference at the University of Heidelberg, "What is the Cluster Formation Efficiency Within the Galactic Center"
- Jan. 2022 SOFIA Special Session, "The extreme ISM in the inner 200 pc of the Galaxy"
- Dec. 2021 University of Kansas, Space Physics seminar
- Nov. 2021 UCLA, Galactic Center Group lunch talk. "Gas Dynamics and Star Formation in the Milky Way's Galactic Center"
- Oct. 2021 Caltech, TAPIR Science Seminar. "Gas Dynamics and Star Formation in the Milky Way's Galactic Center"
- Oct. 2021 Carnegie Institute, lunch talk series. "Gas Dynamics and Star Formation in the Milky Way's Galactic Center"
- Oct. 2021 Flatiron Institute, Galaxy Group lunch talk. "Gas Dynamics and Star Formation in the Milky Way's Galactic Center"
- Oct. 2021 NRAO, Charlottesville, TUNA talk. "Gas Dynamics and Star Formation in the Milky Way's Galactic Center"
- Oct. 2021 Harvard University, Center for Astrophysics, SMA Science Seminar. "Gas Dynamics and Star Formation in the Milky Way's Galactic Center"
- Sep. 2021 Astronomy Research Seminar, University of Connecticut. "Gas Dynamics and Star Formation in the Milky Way's Galactic Center"

- Jan. 2021 Research contributed talk at the 237th Meeting of the American Astronomical Society. “The CMZoom Catalog of Compact Submillimeter Dust Continuum Sources in the Milky Way’s Central Molecular Zone”
- Dec. 2020 Greenbank Observatory, invited GBO/NRAO science lunch talk. “The CMZoom Survey and Catalog of Compact Substructure in the Milky Way’s Galactic Center”
- Jan. 2020 University of Connecticut, New England Star Formation Meeting. “The CMZoom Survey Catalog”
- Nov. 2019 Northeast CMZ Meeting at MIT Haystack Observatory. “ The CMZoom Survey: a high resolution search for star formation in the Galactic Center”

Posters Presented

- Dec. 2019 Harvard-Heidelberg Star Formation Meeting. Cambridge, MA. “What’s Different about Sgr B2?”
- Dec. 2018 Harvard-Heidelberg Star Formation Meeting. Heidelberg, Germany. “Where do Massive Stars Form in the Central Molecular Zone?”
- Jul. 2018 Tracing the Flow: Galactic Environments and the Formation of Massive Stars. Windermere, United Kingdom. “The CMZoom Survey Catalog of High Mass Star Formation”
- Dec. 2017 Harvard-Heidelberg Star Formation Meeting. Cambridge, MA. “Constructing the CMZoom Survey Core Catalog”

Publications

First or Second Author Contributions

- [1] **Hatchfield, H.**; Sormani, Mattia C.; Tress, Robin G.; Battersby, Cara; Smith, Rowan J.; Glover, Simon C. O.; Klessen, Ralf S., *Dynamically Driven Inflow onto the Galactic Center and its Effect upon Molecular Clouds*. November 2021, ApJ 922, 79. [\[LINK\]](#)
- [2] Orr, M. E.; **Hatchfield, H.**; Battersby, C.; Hayward, C. C.; Hopkins, P. F.; Wetzel, A.; Benincasa, S. M.; Loebman, S. R.; Sormani, M. C.; Klessen, R. S., *Fiery Cores: Bursty and Smooth Star Formation Distributions across Galaxy Centers in Cosmological Zoom-in Simulations*, February. 2021, ApJL, 908, L31. [\[LINK\]](#)
- [3] **Hatchfield, H.**, Battersby, C., Keto, E., Walker, D., Barnes, A., Callanan, D., Ginsburg, A., Henshaw, J., Kauffmann, J., Kruijssen, J. M. D., Longmore, S. N., Lu, X., Mills, E. A. C., Pillai, T., Zhang, Q., Bally, J., Butterfield, N., Contreras, Y. A., Ho, L. C., Ott, J., Patel, N., Tolls, V., *CMZoom: Catalog of Compact Submillimeter Dust Continuum Objects in the Milky Way’s Central Molecular Zone*, November. 2020, ApJS 251, 14. [\[LINK\]](#)
- [4] Myers, P. C., **Hatchfield, H.**, Battersby, C., *Virial Clumps in Central Molecular Zone Clouds*, April. 2022, ApJ 292, 34. [\[LINK\]](#)

Other Refereed Publications

- [4] Tress, R. G.; Sormani, M. C.; Glover, S. C. O.; Klessen, R. S.; Battersby, C. D.; Clark, P. C.; **Hatchfield, H.**; Smith, R. J., *Simulations of the Milky Way’s central molecular zone - I. Gas dynamics*, December. 2020, MNRAS, 499, 4455. [\[LINK\]](#)
- [5] Sormani, M. C.; Tress, R. G.; Glover, S. C. O.; Klessen, R. S.; Battersby, C. D.; Clark, P. C.; **Hatchfield, H.**; Smith, R. J., *Simulations of the Milky Way’s Central Molecular Zone - II. Star formation*, October. 2020, MNRAS, 497, 5024. [\[LINK\]](#)

- [6] Battersby, C., Keto, E., Walker, D., Barnes, A., Callanan, D., Ginsburg, A., **Hatchfield, H.**, Henshaw, J., Kauffmann, J., Kruijssen, J. M. D., Longmore, S. N., Lu, X., Mills, E. A. C., Pillai, T., Zhang, Q., Bally, J., Butterfield, N., Contreras, Y. A., Ho, L. C., Ott, J., Patel, N., Tolls, V., *CMZoom II: Survey Overview and First Data Release*, August. 2020, ApJS 249, 35. [\[LINK\]](#)
- [7] Sormani, M. C.; Tress, R. G.; Glover, S. C. O.; Klessen, R. S.; Barnes, A. T.; Battersby, C. D.; Clark, P. C.; **Hatchfield, H.**; Smith, R. J., *The geometry of the gas surrounding the Central Molecular Zone: on the origin of localized molecular clouds with extreme velocity dispersions*, October. 2019, MNRAS, 488, 4663. [\[LINK\]](#)