

Catherine Zucker
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EDUCATION

Harvard University: PhD in Astronomy & Astrophysics Dissertation: <i>Charting our Uncharted Milky Way</i> Advisors: Alyssa Goodman & Douglas Finkbeiner	2017 - 2020
Harvard University: M.A. in Astronomy and Astrophysics	2015 - 2017
University of Virginia: B.A. in Astronomy-Physics and B.A. in History	2011 - 2015

RESEARCH INTERESTS

My research focuses on developing novel techniques to tease out the true 3D structure of our Galaxy. I use a combination of observations, simulations, astrostatistics, and data visualization to gain new insight into the nature and structure of our Milky Way's interstellar medium. Some of my research highlights include:

- Producing the largest and most accurate map of stellar nurseries in our solar neighborhood
- The discovery of the *Radcliffe Wave*, a 2.7 kpc long sinusoidal structure which redefines the shape of the Local Arm in our Galaxy. [Press](#).
- Knitting together gas and dust observations to produce high-resolution 4D views of nearby molecular clouds
- Characterizing the physical properties of the largest-scale filaments in the interstellar medium of our Galaxy via observations and simulations
- *Big Data*, bayesian statistics, statistical computing, and interactive data visualization

PUBLICATIONS

I have co-authored 16 publications, including eight as (co-) first author. A full listing of my publications can be found on [ADS](#).

First Author/co-PI

1. **Zucker, C**, Speagle, J; Schlafly, E.; Green, G.; Finkbeiner, D.; Goodman, A.; Alves, J. 2020. *A&A*. 633, A51. [A Compendium of Distances to Molecular Clouds in the Star Formation Handbook](#).
2. **Zucker, C**; Smith, R.; Goodman, A. 2019. *ApJ*, 887, 186. [Synthetic Large-Scale Galactic Filaments — on their Formation, Physical Properties, and Resemblance to Observations](#).
3. **Zucker, C** & Speagle, J; Schlafly, E.; Green, G.; Finkbeiner, D.; Goodman, A.; Alves, J. 2019. *ApJ*, 879, 125. [A Large Catalog of Accurate Distances to Local Molecular Clouds: The Gaia DR2 Edition](#)
4. **Zucker, C**; Schlafly, E.; Green, G.; Speagle, J.; Portillo, S.; Finkbeiner, D.; Goodman, A. 2018c. *ApJ*, 869, 83. [Mapping Distances across the Perseus Molecular Cloud Using CO Observations, Stellar Photometry, and Gaia DR2 Parallax Measurements](#).
5. **Zucker, C** & Chen, H. H. 2018b. *ApJ*, 864, 162. [RadFil: A Python Package for Building and Fitting Radial Profiles for Interstellar Filaments](#).
6. **Zucker, C**; Battersby, C.; Goodman, A. 2018a. *ApJ*, 864, 2. [The Physical Properties of Large-scale Galactic Filaments](#).

7. **Zucker, C**; Walker, L.M.; Johnson, K.; Gallagher, S.; Alatalo, K.; Tzanavaris, P. 2016. *ApJ*, 821, 113. [Hierarchical Formation in Action: Characterizing Accelerated Galaxy Evolution in Compact Groups using Whole-Sky WISE Data.](#)
8. **Zucker, C**; Battersby, C.; Goodman, A. 2015. *ApJ*, 815, 23. [The Skeleton of the Milky Way.](#)

Contributing Author

1. Wang, Y., Beuther, H., Schneider, N., Meidt, S., Linz, H., Ragan, S., **Zucker, C**, Battersby, C., Soler, J., Schinnerer, E., Bigiel, F., Colombo, D. and Henning T. 2020. *A&A*. Submitted. [Dense Gas in a Giant Molecular Filament](#)
2. Alves, J., **Zucker, C.**, Goodman, A., Speagle, J., Meingast, S., Robitaille, T., Finkbeiner, D., Schlafly, E., Green, G. 2020. *Nature*, 578, 237. [A Galactic-scale gas wave in the Solar Neighborhood.](#)
3. Smith, R. J., Tress, R., Sormani, C., Clover, S. Klessen, R., Clark, P., Izquierdo, A., Duarte-Cabral, A., **Zucker, C.**. 2019. *MNRAS*, 492, 1594. [The Cloud Factory I: Generating resolved filamentary molecular clouds from galactic-scale forces](#)
4. Green, G.; Schlafly, E.; **Zucker, C.**; Speagle, J.; Finkbeiner, D. 2019. *MNRAS*, 887, 93. [A 3D Dust Map Based on Gaia, Pan-STARRS 1 and 2MASS.](#)
5. Fissel, L. & 39 co-authors, including **Zucker, C.**. 2019. *ApJ*, 878, 110. [Relative Alignment between the Magnetic Field and Molecular Gas Structure in the Vela C Giant Molecular Cloud Using Low- and High-density Tracers.](#)
6. Monsch, K.; Pineda, J.; Liu, H.B., **Zucker, C.**, H.; Chen, H.; Pattle, K.; Offner, S.; Di Francesco, J.; Ginsburg, A.; Ercolano, B.; Arce, H.; Friesen, R.; Kirk, H.; Caselli, P.; Goodman, A. 2018. *ApJ*, 861, 77. [Dense Gas Kinematics and a Narrow Filament in the Orion A OMC1 Region using NH₃.](#)
7. Lisenfeld, U.; Alatalo, K.; **Zucker, C.**; Appleton, P. N.; Gallagher, S.; Guillard, P.; Johnson, K.. 2017. *A&A*, 607, A110. [The role of molecular gas in galaxy transition in compact groups](#)
8. Walker, L.M.; Butterfield, N.; Johnson, K.; **Zucker, C.**; Gallagher, S.; Konstantopoulos, I., Hornschemeier, A.; Tzanavaris, P.; Charlton, J. 2013. *ApJ*, 775, 129. [The Optical Green Valley vs Mid-IR Canyon in Compact Groups](#)

Unrefereed

1. Invited *Perspective* article for the February 2020 issue of the Star Formation Newsletter (distributed to > 1000 star formation researchers in 34 countries). [Distances to Star-Forming Regions.](#)

PRESENTATIONS

I have given a total of 24 talks, including 8 invited talks.

Talks

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| 1. Invited Talk, AAS 236 Special Session: <i>The ISM of Galaxies in the Era of Big Data</i> | June 2020 |
| 2. Lunch Seminar, Harvard Astrostatistics Group (Harvard University) | March 2020 |
| 3. Lunch Seminar, University of Washington (Seattle, Washington) | February 2020 |
| 4. Contributed Talk, NE Regional Star Formation Meeting (U. Conn.) | January 2020 |
| 5. Invited Colloquium, AMNH (New York, New York) | December 2019 |
| 6. Contributed Talk, Harvard-Heidelberg Meeting on Star Formation (Cambridge, MA) | November 2019 |

7. Invited Talk, The self-organized star formation process (Orsay, France)	October 2019
8. Contributed Talk, Crete III – Through dark lanes to new stars (Heraklion, Crete)	September 2019
9. Invited Colloquium, SAO REU Summer Colloquium Series (Harvard CfA)	June 2019
10. Contributed Talk, New England Regional SF Meeting (UMass)	January 2019
11. Contributed Talk, Harvard Heidelberg Meeting on Star Formation (MPIA)	December 2018
12. Invited Talk , ITC Luncheon (Harvard CfA)	November 2018
13. Contributed Talk, Interstellar Filament Paradigm (Nagoya, Japan)	November 2018
14. Invited Talk, The Milky Way in the Age of Gaia (Orsay, France)	October 2018
15. Invited Talk, MIT Haystack	August, 2018
16. Contributed Talk, the Olympian Symposium (Paralia, Greece)	May 2018
17. Contributed Talk, AAS Splinter Session (Washington, DC)	January 2018
18. Contributed Talk, Sun, Stars, and Galaxies (U. Manchester, UK)	October 2017
19. Contributed Talk, Harvard Astrostats Day (Harvard CfA)	September 2017
20. Contributed Talk, Galactic Star Formation with Survey (MPIA)	July 2017
21. Invited Talk, Dunlap Institute (Toronto, Canada)	May 2017
22. Contributed Talk, New England Region SF Meeting	January 2016
23. Contributed Talk, Filamentary Structure in Molecular Clouds (Charlottesville, VA)	October 2014
24. Talk, SAO Astronomy Intern Symposium (Harvard CfA)	August 2014

SELECTED AWARDS

<ul style="list-style-type: none"> • Fireman Fellow <i>Awarded by the Harvard Astronomy Faculty to one graduating PhD student for their doctoral work</i> 	Spring 2020
<ul style="list-style-type: none"> • Harvard-Horizons 2020 Scholar <i>Top eight graduate students selected across Harvard to receive professional development training, culminating in public “TED-style” talk</i> 	Spring 2020
<ul style="list-style-type: none"> • Certificate of Distinction in Teaching, Harvard University 	Fall 2019
<ul style="list-style-type: none"> • Harvard Astronomy Departmental Teaching Award 	Spring 2018
<ul style="list-style-type: none"> • Certificate of Distinction in Teaching, Harvard University 	Spring 2018
<ul style="list-style-type: none"> • La Serena School for Data Science Full Scholarship 	Summer 2017
<ul style="list-style-type: none"> • NSF Graduate Research Fellowship Award <i>Supports outstanding graduate students in NSF-supported science disciplines</i> 	Fall 2016-Spring 2020
<ul style="list-style-type: none"> • John P. and Carol J. Merrill Graduate Fellowship, Harvard University 	Fall 2015-Spring 2017
<ul style="list-style-type: none"> • Peirce Fellowship, Harvard Astronomy <i>Internal fellowship for top three admitted Harvard Astronomy applicants</i> 	Fall 2015-Fall 2018
<ul style="list-style-type: none"> • UVA Undergraduate Physics Research Symposium, 1st Place 	Fall 2014
<ul style="list-style-type: none"> • Vyssotsky Prize, University of Virginia Astronomy <i>Awarded to one outstanding third year astrophysics major at the University of Virginia</i> 	Spring 2014
<ul style="list-style-type: none"> • Double Hoo Research Award, University of Virginia 	Spring 2014
<ul style="list-style-type: none"> • Intermediate Honors, University of Virginia 	Fall 2013
<ul style="list-style-type: none"> • Virginia Space Grant Consortium Research Fellowship 	Summer 2013–Spring 2014

- Kate Cabell Claiborne Cox Scholarship, University of Virginia History Spring 2013
- Harrison Undergraduate Research Award, University of Virginia Summer 2013–Spring 2014
- Echols Scholarship Fund Grant, University of Virginia Summer 2012
- Small Research and Travel Grant, University of Virginia Summer 2012
- Wolfe Undergraduate Docent Award, University of Virginia Spring 2012
- Echols Scholar, University of Virginia Fall 2011–Fall 2015

TEACHING & MENTORING

Teaching

I have served as a teaching fellow for both an undergraduate and graduate course. Both times, I received the Bok Center Certificate of Distinction in Teaching, based on high evaluations in student course feedback. I also received the Harvard Astronomy departmental award for teaching excellence in Spring 2018.

- Physics & Chemistry of the ISM (AY203). Harvard University. Spring 2019
- Galactic and Extragalactic Astronomy (AY17). Harvard University. Fall 2017

Mentoring

- Alan Tu (Harvard University). Undergraduate Research. Summer 2020 - Present
Characterizing the 3D Motion of Young Stars in the Radcliffe Wave
- Kaustav Das (IIT Kanpur). Undergraduate Research. Summer 2019 - Present
Constraining the Distance to the North Polar Spur with Gaia DR2
- Laura Chapman (Harvard University). Undergraduate Research. Summer 2018
A Statistics Plugin for the glue Visualization Environment

PROFESSIONAL ACTIVITIES

- Harvard Data Science Review, Student Editorial Board Spring 2020 - Present
- Scientific Organizing Committee, Harvard-Heidelberg Star Formation Meeting 2019 Fall 2019
- Referee for *A&A*, *AJ*, and *MNRAS* Fall 2018 - Present
- Core member, [glue](#) visualization software team Spring 2017 - Present
- CfA Star Formation Journal Club Series Co-Organizer Spring 2018 - Present
- American Astronomical Society, Junior Member Fall 2015 - Present

PRESS

For full overview of *Radcliffe Wave* press coverage, see our [website](#). Total of 324 news stories, with selected highlights below.

- Appeared live on NPR's [Science Friday](#) (with A. Goodman) discussing the *Radcliffe Wave* January 2020
- [Harvard Gazette Interview](#) on the discovery of the *Radcliffe Wave* January 2020
- Interview with [The Associated Press](#) on the *Radcliffe Wave* January 2020
- Interview with [Sky & Telescope](#) on the *Radcliffe Wave*
- Appeared on [Dr. Becky](#) podcast (with A. Goodman & J. Alves) on the *Radcliffe Wave* January 2020
- Interview with [Space.com](#) on the Milky Way Skeleton January 2015

OUTREACH

- Public Talk, Gloucester Area Astronomy Club Summer 2019
- [Astronomy Rewind](#), Volunteer Lead Fall 2018
- Public Talk, New Hampshire Astronomical Society Spring 2018
- Cambridge Explores the Universe Volunteer, Harvard University Spring 2016, 2017, 2018, 2019
- Development of the MilkyWay3D.com Galactic Plane Mapper Tool Fall 2016
- Harvard College Undergraduate Research Association Conference Invited Speaker Fall 2016
- *Dark Skies, Bright Kids Planetarium Lead*, University of Virginia March 2012–May 2015
- Harrison Institute for American History Docent, University of Virginia September 2011–May 2015

OBSERVING EXPERIENCE

Cerro Tololo Observatory, Chile (Blanco 4m) (2 half-nights)	July 2019
Cerro Tololo Observatory, Chile (Blanco 4m) (2 nights)	May 2019
Cerro Tololo Observatory, Chile (Blanco 4m) (2 half-nights)	January 2019
Cerro Tololo Observatory, Chile (Blanco 4m) (4 half-nights)	August 2018
Cerro Tololo Observatory, Chile (Blanco 4m) (3 nights)	February 2018
MMT Observatory; Tucson, AZ (4 nights)	August 2014
Kitt Peak Observatory (Bok 90"); Tucson, AZ (5 nights)	December 2012