Catherine Zucker

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EDUCATION

Harvard University: PhD in Astronomy — Spring 2020
Dissertation: *Charting our Uncharted Milky Way*
Advisors: Alyssa Goodman & Douglas Finkbeiner

Harvard University: M.A. in Astronomy and Astrophysics — Fall 2017

University of Virginia: B.A. in Astronomy-Physics and History — Spring 2015

PROFESSIONAL APPOINTMENTS

Postdoctoral Fellow, Center for Astrophysics (Harvard) — Summer 2020 - Present

PUBLICATIONS

I have co-authored 23 publications (refereed/under review). This includes **9 first-author publications [with over 200 total citations]** and 2 second-author publications. My second-author publications include one *Nature* publication, and one undergraduate student-led publication for which I served as the primary science advisor. A full listing of my publications can be found on the ADS.

First Author/co-PI

1. **Zucker, C.**, Goodman, A., Alves, J., Bialy, S., Koch, E., Speagle, J., Foley, M., Finkbeiner, D., Leike, R., Enßlin, T., Peek, J., and Edenhofer, G. 2021. Submitted to *ApJ*. On the Three-Dimensional Structure of Local Molecular Clouds.
2. **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.
3. **Zucker, C.**, Smith, R., Goodman, A. 2019. *ApJ*, 887, 186. Synthetic Large-Scale Galactic Filaments — on their Formation, Physical Properties, and Resemblance to Observations.
4. **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.
5. **Zucker, C.**, Schlafly, E., Green, G., Speagle, J., Portillo, S., Finkbeiner, D., Goodman, A. 2018. *ApJ*, 869, 83. Mapping Distances across the Perseus Molecular Cloud Using CO Observations, Stellar Photometry, and Gaia DR2 Parallax Measurements.
6. **Zucker, C.** & Chen, H. H. 2018. *ApJ*, 864, 162. RadFil: A Python Package for Building and Fitting Radial Profiles for Interstellar Filaments.
7. **Zucker, C.**, Battersby, C., Goodman, A. 2018. *ApJ*, 864, 2. The Physical Properties of Large-scale Galactic Filaments.
8. **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.
9. **Zucker, C.**, Battersby, C., Goodman, A. 2015. *ApJ*, 815, 23. The Skeleton of the Milky Way.

Second Author

1. Das, K., **Zucker, C.**, Speagle, J., Goodman, A., Green, G., and Alves, J. 2020. *MNRAS*. 498, 4. Constraining the Distance to the North Polar Spur with Gaia DR2.

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.

Other Co-Authored Publications

1. Grasser, N., Ratzenböck, S., Alves, J., Großschedl, J., Meingast, S., **Zucker, C.**, Hacar, A., Lada, C., Goodman, A., Lombardi, M., Forbes, J., Bomze, I., and Möller, T., 2021. A&A. Submitted. The ρ Oph region revisited with Gaia EDR3: Two young populations, new members, and old impostors.
2. Swiggum, C., D'Onghia, E., Alves, J., Großschedl, J., Foley, M., **Zucker, C.**, Meingast, S., Chen, B., Goodman, A. 2021. *ApJ*. Submitted. Evidence for Radial Expansion at the Core of the Orion Complex with Gaia EDR3.
3. Kong, S., Arce, H., Carpenter, J., [9 authors], **Zucker, C.**, [5 authors]. *ApJ*, 2021. Submitted. High-resolution CARMA Observations of Molecular Gas in the North America and Pelican Nebulae.
4. Green, G., Rix, H-W., Tschesche, L., Finkbeiner, D., **Zucker, C.**, Schlafly, E., Rybizki, J., and Speagle, J. 2020. *ApJ*. Submitted. Data-Driven Stellar Models.
5. Izquierdo, A., Smith, R., Glover, S., Klessen, R., Treß, R., Sormani, M., Clark, P., Duarte-Cabral, A., and **Zucker, C**. 2020. *MNRAS*. Accepted. The Cloud Factory II: Gravoturbulent Line-Widths of Resolved Molecular Clouds in a Galactic Potential.
6. 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*, 641, A53. Dense Gas in a Giant Molecular Filament.
7. 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.
8. 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.
9. 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.
10. 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 NH_3.
11. 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.
12. 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.

PRESENTATIONS

I have given a total of 29 talks, including **13 invited talks and colloquia**:

Invited

1. **Tea Talk**, KIPAC Tea — November 2020
2. **Seminar**, Ringberg Virtual Seminar Series — November 2020
3. **Lunch Talk**, STScI Low Density Universe — October 2020
4. **Colloquium**, University of Wisconsin-Madison — September 2020

5. **Colloquium**, ITC Colloquium (Harvard CfA) September 2020
6. **Conference Talk**, AAS 236 Meeting-in-Meeting: *The ISM in the Era of Big Data* June 2020
7. **Colloquium**, AMNH (New York, New York) December 2019
8. **Conference Talk**, The self-organized star formation process (Orsay, France) October 2019
9. **Colloquium** (with J. Speagle), SAO REU Summer Colloquium (Harvard CfA) June 2019
10. **Lunch Talk**, ITC Luncheon (Harvard CfA) November 2018
11. **Conference Talk**, The Milky Way in the Age of Gaia (Orsay, France) October 2018
12. **Lunch Talk**, MIT Haystack August, 2018
13. **Lunch Talk/Workshop**, Dunlap Institute (Toronto, Canada) May 2017

Contributed

1. Lunch Seminar, Harvard Astrostatistics Group (Harvard University) March 2020
2. Lunch Seminar, University of Washington (Seattle, Washington) February 2020
3. Conference Talk, NE Regional Star Formation Meeting (U. Conn.) January 2020
4. Conference Talk, Harvard-Heidelberg Meeting on Star Formation (Cambridge, MA) November 2019
5. Conference Talk, Crete III – Through dark lanes to new stars (Heraklion, Crete) September 2019
6. Conference Talk, New England Regional SF Meeting (UMass) Januay 2019
7. Conference Talk, Harvard Heidelberg Meeting on Star Formation (MPIA) December 2018
8. Conference Talk, Interstellar Filament Paradigm (Nagoya, Japan) November 2018
9. Conference Talk, The Olympian Symposium (Paralia, Greece) May 2018
10. Workshop Session Lead, AAS Splinter Session (Washington, DC) January 2018
11. Conference Talk, Sun, Stars, and Galaxies (U. Manchester, UK) October 2017
12. Lunch Talk, Harvard Astrostats Day (Harvard CfA) September 2017
13. Conference Talk, Galactic Star Formation with Survey (MPIA) July 2017
14. Conference Talk, New England Region SF Meeting January 2016
15. Conference Talk, Filamentary Structure in Molecular Clouds (Charlottesville, VA) October 2014
16. Intern Talk, SAO Astronomy Intern Symposium (Harvard CfA) August 2014

SELECTED AWARDS/HONORS

- Protostars & Planets VII Chapter Lead (The Solar Neighborhood in the Age of Gaia) Fall 2020
  Competitively selected to lead a review chapter and accompanying review talk at the upcoming Protostars and Planets VII meeting
- Fireman Fellow Spring 2020
  Department's highest honor, awarded by the Harvard Astronomy Faculty to a single graduating PhD student on the basis of his or her doctoral work
- Harvard-Horizons 2020 Scholar Spring 2020
  Top eight graduate students selected across Harvard to receive professional development training, culminating in public "TED-style" talk
- Harvard Astronomy Departmental Teaching Award Spring 2018
- Certificate of Distinction in Teaching, Harvard University Fall 2017, Spring 2019
- La Serena School for Data Science Full Scholarship Summer 2017

- NSF Graduate Research Fellowship Award — Fall 2016-Spring 2020
- Merrill Graduate Fellowship, Harvard University — Fall 2015-Spring 2017
- Peirce Fellowship, Harvard Astronomy — Fall 2015-Fall 2018
  Fellowship for top three admitted Harvard Astronomy applicants
- UVA Undergraduate Physics Research Symposium, 1st Place — Fall 2014
- Vyssotsky Prize, University of Virginia — Spring 2014
  Awarded to one outstanding third year astrophysics major
- Double Hoo Research Award, University of Virginia — Spring 2014
  Supports joint research between undergraduate and PhD students
- Intermediate Honors, University of Virginia — Fall 2013
- Virginia Space Grant Consortium Research Fellowship — Summer 2013–Spring 2014
- Kate Cabell Claiborne Cox Scholarship, University of Virginia — Spring 2013
  Awarded to one outstanding third year history major
- Harrison Research Award, University of Virginia — Summer 2013–Spring 2014
- Echols Scholar, University of Virginia — Fall 2011–Fall 2015

TEACHING, MENTORING, & OUTREACH

Teaching

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

- Physics & Chemistry of the ISM, Harvard University. — Spring 2019
- Galactic & Extragalactic Astronomy, Harvard University. — Fall 2017

Mentoring

I have served as a primary science advisor for five undergraduate students:

- Diana Khimey (Harvard University) — Winter 2020 - Present
  How Young Stars Leave Home
- Shlomo Cahlon (Harvard University). Senior Thesis Research. — Fall 2020 - Present
  A Uniform Catalog of Local Clouds Based on 3D Dust Mapping
- Alan Tu (Harvard University). PRISE Research. — Summer 2020 - Present
  Characterizing the 3D Motion of a Galactic-scale Gas Wave
- Kaustav Das (IIT Kanpur). — Summer 2019 - Fall 2020
  Constraining the Distance to the North Polar Spur with Gaia DR2
  Published in *MNRAS*.
- Laura Chapman (Harvard University). — Summer 2018
  A Statistics Plugin for the glue Visualization Environment.
  Code available on pypi.

Education and Public Outreach

- Subject Matter Expert, NASA *Cosmic Data Stories* Grant — Fall 2020 - Present
  Public understanding of data science via interactive research stories
- WorldWide Telescope Ambassador — Fall 2015 - Present

- 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 — Spring 2016, 2017, 2018, 2019
- *Dark Skies, Bright Kids Planetarium Lead* — March 2012–May 2015
- Harrison Institute for American History Docent — September 2011–May 2015

PROFESSIONAL ACTIVITIES

- Plate Vetter, SDSS-V Dust Team — Fall 2020 - Present
- Referee for *ApJ*, *A&A*, *MNRAS*, and *AJ* — Fall 2018 - Present
- Star Formation Newsletter, Associate Editor — Winter 2020 - Present
- Harvard Data Science Review, Emerging Scholars Board — Spring 2020 - Present
- SOC, Harvard-Heidelberg Star Formation Meetings — Fall 2019, Winter 2020
- CfA Star Formation Journal Club Series Co-Organizer — Spring 2018 - Present
- Core member, `glue` visualization software team — Spring 2017 - Present
- American Astronomical Society member — Fall 2015 - Present

PRESS

Hundreds of news stories covering the discovery of a *Galactic-scale Gas Wave in the Solar Neighborhood*. For full details, see our official website. Some interview highlights include:

- Appeared live on NPR's Science Friday — January 2020
- Interview with The Associated Press — January 2020
- Interview with the Harvard Gazette — January 2020
- Interview with Popular Science — January 2020