

Emily M. Silich

Department of Astronomy, California Institute of Technology

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Education

California Institute of Technology (Caltech)

Astrophysics, PhD (expected 2026) Astrophysics, MS (2023)

NSF Graduate Research Fellow

2023 - 2026

SAO Predoctoral Fellow

2024 - 2025

Wallace L. W. Sargent Graduate Fellow

2021 - 2022

University of Iowa

Astronomy, BS Physics, BS Mathematics, minor

2017 - 2021

with University Honors, High Distinction, Honors in Astronomy, Phi Beta Kappa

Research

Interests:

Galaxy clusters (584), Intracluster medium (858), X-ray astronomy (1810), Hydrodynamical simulations (767), Sunyaev-Zeldovich effect (1654), Circumgalactic medium (1897)

Experience:

Graduate Research Assistant

2021 - *pres.*

Division of Physics, Mathematics and Astronomy, Caltech

Predoctoral Fellow

2024 - 2025

Center for Astrophysics | Harvard & Smithsonian

Undergraduate Research Assistant

2017 - 2021

Department of Physics & Astronomy, University of Iowa

Research Intern

Summer 2020

X-ray Astrophysics Laboratory, NASA Goddard Space Flight Center

Student Researcher

Winter 2019

Canada-Norway Student Sounding Rocket Program (CaNoRock)

Peer-reviewed publications

1. **E.M. Silich**, J. ZuHone, E. Bellomi, et al., “*X-ray emission signatures of galactic feedback in the hot circumgalactic medium: predictions from cosmological hydrodynamical simulations*”, 2025, accepted for publication in The Astrophysical Journal.
2. **E.M. Silich**, E. Bellomi, J. Sayers, et al., “*ICM-SHOX. Paper II: Galaxy cluster sample overview*”, 2024, Proc. of the mm Universe 2023 conference, EPJ Web of conferences, EDP Sciences.

3. **E.M. Silich**, E. Bellomi, J. Sayers, et al., “*ICM-SHOX. Paper I: Methodology overview and discovery of a gas–dark matter velocity decoupling in the MACS J0018.5+1626 merger*”, 2024, *The Astrophysical Journal*, 968, 74.
4. **E.M. Silich**, K. Jahoda, L. Angelini, et al., “*A Search for the 3.5 keV Line from the Milky Way’s Dark Matter Halo with HaloSat*”, 2021, *The Astrophysical Journal*, 916, 2.
5. **E.M. Silich**, P. Kaaret, A. Zajczyk, et al., “*Global X-Ray Properties of the Vela and Puppis A Supernova Remnants*”, 2020, *The Astronomical Journal*, 160, 1.
6. P.F. Hopkins, E. Quataert, S.B. Ponnada, & **E.M. Silich**, “*Cosmic Rays Masquerading as Hot CGM Gas: An Inverse-Compton Origin for Diffuse X-ray Emission in the Circumgalactic Medium*”, 2025, *The Open Journal of Astrophysics*, 8, 78.
7. P.F. Hopkins, E. Quataert, **E.M. Silich**, et al., “*Cosmic Rays Masquerading as Cool Cores: An Inverse-Compton Origin for Cool Core Cluster Emission*”, 2025, submitted to *The Open Journal of Astrophysics*.
8. A. Zajczyk, P. Kaaret, D. LaRocca, et al. (including **E.M. Silich**), “*On-ground calibration of the HaloSat science instrument*”, 2020, *J. Astron. Telesc. Instrum. Syst.* 6(4), 044005.
9. P. Kaaret, A. Zajczyk, D.M. LaRocca, et al. (including **E.M. Silich**), “*HaloSat - A CubeSat to Study the Hot Galactic Halo*”, 2019, *The Astrophysical Journal*, 884, 2.

Press Releases

1. “*Dark Matter Flies Ahead of Normal Matter in Mega Galaxy Cluster Collision*”, Caltech PR, July 2024. [Read here](#).

Teaching

Ay 105: Optical Astronomy Instrumentation Lab	Graduate TA, Spring 2023
Ay 122c: High Energy Astronomical Measurements	Graduate TA, Winter 2023
Ay 127: Astrophysical Cosmology	Graduate TA, Fall 2022
PHYS 1611: Introductory Physics I	Undergraduate TA, Spring 2020
PHYS 1512: College Physics II	Undergraduate TA, Spring 2020

Fellowships & Awards (selected)

Smithsonian Astrophysical Observatory (SAO) Predoctoral Fellow	2024 - 2025
Garmire Scholar, France A Cordova Graduate Student Fund (Caltech)	2023
NSF Graduate Research Fellowship (GRFP)	2023 - 2026
Wallace L. W. Sargent Graduate Fellowship (Caltech)	2021 - 2022
Chambliss Astronomy Achievement Student Awards - Honorable Mention	2021
University of Iowa Dare to Discover	2021
Barry Goldwater Scholar	2020
James A. Van Allen Award (UI)	2020
John Mather Nobel Scholar (NASA/GSFC)	2020

Western Dubuque High School Young Accomplished Alumni	2020
APS Division of Astrophysics (DAP) Travel Grant	2020
Manuel Paul & Abraham Chinitz Liberal Arts & Sciences Scholarship (UI)	2019 - 2021
Myrtle K. Maier Scholarship (UI)	2019 - 2020
ICRU Academic Year Research Fellowship	2019 - 2020
NASA Iowa Space Grant Consortium Research Fellowship	2018 - 2020
Rhodes Dunlap Award for Excellence in the First/Second Year (UI)	2018 - 2020
ICRU Academic Year Research Fellowship	2018 - 2019
Charles A. Wert Summer Research Fund (UI)	2019
ICRU Summer Research Fellowship	2018
<i>+6 others</i>	

Academic Presentations (selected)

Talks:

1. *mm Universe*, Kavli Institute for Cosmological Physics, University of Chicago. Chicago, IL. June 2025.
 2. *Observational Cosmology Seminar*, Caltech. Pasadena, CA. November 2024, October 2023, & February 2023.
 3. *Galaxy Clusters & Radio Relics II*. Center for Astrophysics | Harvard & Smithsonian. Cambridge, MA. September 2024.
 4. *Multiphase Madness: Resolving the CGM in Theory and Observations*. Center for Astrophysics | Harvard & Smithsonian. Cambridge, MA. August 2024.
 5. *7th ICM Theory & Computation Workshop*. Ann Arbor, MI. June 2024.
 6. *Galaxy Cluster Discussion Group Meeting*, Center for Astrophysics | Harvard & Smithsonian. Cambridge, MA. February 2024 & November 2022.
 7. *High Energy Astrophysics Seminar*, Center for Astrophysics | Harvard & Smithsonian. Cambridge, MA. February 2024.
 8. *Merging Cluster Workshop*, Yonsei University. Seoul, KR. December 2023.
 9. *Observing the Universe at Millimetre Wavelengths (mm Universe)*, Laboratory of Subatomic Physics & Cosmology (LPSC). Grenoble, FR. June 2023.
 10. *240th American Astronomical Society (AAS) Meeting*, Pasadena, CA. June 2022.
 11. *Department of Physics & Astronomy Colloquium*, University of Iowa. Virtual. April 2021 & October 2020.
 12. *Astrophysics & Space Physics Seminar*, University of Iowa. Iowa City, IA. October 2019.
- +7 others*

Posters:

1. *STScI Galaxy Clusters 2022: Challenging Our Cosmological Perspectives*, Virtual. April 2022.

2. *237th American Astronomical Society (AAS) Meeting*, Virtual. January 2021.
 3. *American Physical Society (APS) April Meeting*, Virtual. April 2020.
- +5 others

Observing

Awarded PI telescope proposals:

1. “*Revealing the nature of the putative equatorial shock in the MACS J0018.5+1626 galaxy cluster merger with ALMA*”, 31 hrs, ALMA Cycle 12, ranked Priority C.
2. “*Separating dark matter and hot gas velocities in a unique merging cluster: first comparison of X-rays and the kSZ effect*”, 300 ks, XRISM AO-1, ranked Priority C.

Observing time:

1. Keck Observatory, DEIMOS: 7.5 nights
2. Keck Observatory, LRIS: 4 nights

Mentoring

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| 2 high school students from Gabrielino High School | Summer 2023 |
| <i>Data reduction of cluster-member optical spectroscopy from Keck/DEIMOS</i> | |
| 3 high school students from Gabrielino High School | Summer 2024 |
| <i>Visualization of galaxy cluster merger simulations with volume rendering techniques</i> | |
| 3 high school students from Gabrielino High School | Summer 2025 |
| <i>Visualization of galaxy cluster merger simulations with volume rendering techniques</i> | |

Public Outreach

Lectures & speaking engagements:

1. Astronomy on Tap – Death Valley, “*Galaxy Clusters Collide: The Most Energetic Events since the Big Bang*”, DVNP, CA. February 2025.
2. Caltech Stargazing Lectures, “*Galaxy Clusters Collide: The Most Energetic Events since the Big Bang*”, Pasadena, CA. August 2023. Watch here.
3. Death Valley Dark Sky Festival, “*Ask an Astrophysicist*” Q&A panelist, DVNP, CA. March 2023.

Science writing (and “Science writing”):

1. Altadena Poetry Review (digital anthology), “*Asymmetry*”. 2025. Read here.
2. Altadena Poetry Review (print anthology), “*Illustrations of Astrograd School*”. 2024. Nominated for the Pushcart Prize in Poetry.
3. Altadena Poetry Review (print anthology), “*An Experiment in Poetic Physics*”. 2024.
4. Astrobites, “*A Search for Dark Matter with HaloSat*”, 2021. Read here

Volunteering:

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|---------------------------------------------------|----------------------------------------------|
| 1. Astronomy on Tap – Los Angeles | Telescope operator, 2022 - <i>pres.</i> |
| 2. Caltech Stargazing Lectures & Public Observing | Telescope operator, 2022 - <i>pres.</i> |
| 3. Gabrielino High School physics classrooms | Lab assistant & speaker, 2021 - <i>pres.</i> |
| 4. Death Valley Dark Sky Festival | Telescope operator, 2022 - <i>pres.</i> |
| 5. Girl Scouts Troop 6371 (Monrovia, CA) | Guest speaker, 2023 |
| 6. Iowa Center for Research by Undergraduates | Research ambassador, 2020 - 2021 |
| 7. Society of Physics Students, UIowa | Vice president & secretary, 2017 - 2021 |
| 8. Van Allen Observatory Public Observing | Telescope operator, 2017 - 2021 |
| 9. Drexler Middle School FIRST Lego League | Team mentor, 2018 |