Claire E. Murray

Curriculum vitae

Space Telescope Science Institute
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Appointments

Assistant Astronomer, Space Telescope Science Institute	2022–present
Associate Research Scientist, Johns Hopkins University	2022–present
NSF Astronomy & Astrophysics Postdoctoral Fellow, Johns Hopkins University	2018–2021
Postdoctoral Fellow, Space Telescope Science Institute	2017

Education

Ph.D. Astronomy (minor: Physics), University of Wisconsin–Madison, 2017
- Advisor: Prof S. Stanimirović
- Thesis: *Unveiling the Diffuse, Neutral Interstellar Medium: Absorption Spectroscopy of Galactic HI*

M.S. Astronomy, University of Wisconsin–Madison, 2013

B.A. Physics, Carleton College, 2011, *Magna cum laude*

Honors, Awards & Grants

2022 NSF ACCESS Accelerate Grant (PI: 2 million CPU hours)
2019 NSF Special Programs in Astronomy “2020 NSF AAPF Symposium" (co-PI: $30,806)
2018 NSF Astronomy & Astrophysics Postdoctoral Fellowship (PI: $300,000)
2017 Robert L. Brown Outstanding Doctoral Dissertation Award, NRAO
2016 Bautz Fellowship, UW–Madison
2015 Jansky Award for Outstanding Research in Physics & Astronomy, UW–Madison
2015 Chambliss Astronomy Achievement Award, American Astronomical Society
2013 Stebbins Award for Significant Astronomy Research Achievement, UW–Madison
2012, 2014, 2016 Graduate Research Fellowship, Wisconsin Space Grant Consortium (PI: $15,000)
2012 National Science Foundation Graduate Research Fellowship (PI: $96,000)
2011 Distinction in Physics & Astronomy Major, Carleton College
2010 Mike Ewers Award, Carleton College & Minnesota Space Grant Consortium

Selected Observing Programs

James Webb Space Telescope — *Admin PI: 12 hours*

2023 Winging the SMC: 3D Structure of the ISM in the Tidally Disrupted Wing (Cycle 2)

Hubble Space Telescope — *PI: 512 orbits*

2023 Winging the SMC: 3D Structure of the ISM in the Tidally Disrupted Wing (Cycle 31)
2022 Taming the BEAST of N66 to resolve star formation in the ISM at low metallicity (Cycle 30)

2019 Scylla: a pure-parallel, multi-headed attack on dust evolution and star formation in ULLYSES galaxies (Cycles 27-29)

Atacama Large Millimeter/submillimeter Array (ALMA) — *PI: 8 hours; Co-I: 24 hours*

2015 Searching for molecular gas in high-velocity clouds (Cycle 3, 8 hours)

Karl G. Jansky Very Large Array (VLA) — *PI: 109 hours; Co-I: 714 hours*

2017 Measuring Absorption by Cold Hydrogen (MACH) (86 hours)

2015 Completing 21-SPONGE (23 hours)

Australia Telescope Compact Array (ATCA) — *PI: 157 hours; Co-I: 97 hours*

2016 Hunting for molecules in high-velocity clouds (60 hours)

2015 The formation of dark molecular gas from HI in the Magellanic System (51 hours)

2014 Dark molecular gas in the Magellanic Clouds (46 hours)

Arecibo Observatory — *PI: 53 hours*

2012 High-sensitivity HI emission to complement 21-SPONGE (53 hours)

Selected Seminar & Conference Presentations

2024 Invited talk, Diffuse Gas in the Milky Way (AAS 244) (Madison, WI; June)

2024 Invited talk, IAU Commission H1 Group (remote; Feb)

2024 Invited talk, RMS Seminar, CfA (remote; Feb)

2024 Invited talk, Milky Clouds Above Manhattan (New York, NY; Feb)

2023 Invited talk, The Salpeter ISM Workshop (Ithaca, NY; December)

2023 Talk, Surveying the Milky Way (Pasadena, CA; October)

2023 Talk, Interstellar Institute VI (Paris, France; July)

2023 Talk, Science With the Habitable Worlds Observatory and Beyond (Baltimore, MD; July)

2022 Invited colloquium, University of Massachusetts- Amherst (Amherst, MA; April)

2021 Invited talk, Space Telescope Science Institute Seminar (Baltimore, MD; Oct)

2021 Invited talk, University of Kentucky Astro Seminar (Lexington, KY; Feb)

2020 Invited talk, Observatory of Strasbourg Seminar (France; Nov)

2020 Invited talk, ASTRON/JIVE Colloquium (Netherlands; Oct)

2020 Talk, Princeton Thursday Lunch (Thunch) (Princeton, NJ; Feb)

2019 Talk, HotSci@STScI/JHU colloquium (Baltimore, MD; July)

2019 Invited talk, EWASS: Learning the Milky Way (Lyon, France; June)

2019 Talk, Linking the Milky Way and Nearby Galaxies (Helsinki, Finland; June)

2018 Talk, Wine & Cheese Seminar, Johns Hopkins University (Baltimore, MD; December)

2018 Talk, The Milky Way in the Age of Gaia (Paris, France; October)

2018 Invited colloquium, NRAO/UVA (Charlottesville, VA; September)

2018 Invited talk, Caltech (Pasadena, CA, August)

2018 Talk, Olympian Symposium: Gas and stars from mili- to megaparsecs (Greece; May)

2018 Talk, OH What a Lovely Molecule: Hydroxyl and the dark ISM (NSW, Australia; April)

2017 Talk, PSI2: The ISM Beyond 3D (Orsay, France; July)

2017 Talk, ISM-SPP, The Physics of the ISM (Cologne, Germany; February)
2016 Invited talk, Galaxies & Cosmology Seminar, Harvard CfA (Cambridge, MA; November)
2016 Talk, Astronomy Department Lunch Seminar, UC–San Diego (San Diego, CA; October)
2016 Talk, Lunch Seminar, NRAO (Socorro, NM; October)
2016 Invited talk, UW–Milwaukee CGCA Seminar (Milwaukee, WI; September)
2016 Invited talk, ASKAP 2016: The Future of Radio Astronomy (Sydney, Australia; June)
2016 Invited talk, Star Formation, Diffuse Matter and Magnetic Fields (Madison WI; May)
2016 Invited talk, Jansky Award Seminar, UW–Madison (Madison WI; February)

Mentoring & Teaching

Students Mentored:

2019–present C. Lindberg, Johns Hopkins University PhD student; Scylla
2017 E. Y. Liu, UW–Madison undergraduate; radio astronomy/ALMA
2016–2017 S. Worzalla, UW–Madison freshman Undergraduate Research Scholar; radio astronomy
2012–2013 N. Pingel, UW–Madison undergraduate; interferometric data reduction
2012–2013 A. Lawrence, UW–Madison undergraduate; interferometric data reduction
2013 J. Jencson, NRAO REU; interferometric data reduction
2012 J. Miller, NSF REU; spectral analysis and radiative transfer

Courses:

Teaching Assistant, *The Solar System*, UW–Madison (Spring 2016)
Lab Assistant, *Experiences in Astronomical Observing*, UW–Madison (Fall 2012)

Training:

Teaching in Science and Engineering: The College Classroom, UW–Madison (Fall 2016)

Academic Service

2022–present Executive Committee of the Science Staff (STScI)
2022–present Research Support Advisory Committee (STScI)
2022-2023 Prize Fellowship Selection Committee (STScI)
2022-2023 Science Staff Retreat Organization Committee (STScI)
2019–present Review panelist: NSF (AAG, GRFP), NASA (FINESST, ADAP), NRAO
2016–present Referee, *The Astrophysical Journal*, *Monthly Notices of the Royal Astronomical Society*
2018–2020 Organizer, Low-Density Universe Lunch (STScI/JHU)
2017–2019 Organizer, CoolSci/HotSci colloquium series (STScI/JHU)
2017–2018 Organizer, Friday Science Coffee (STScI)
2011–2017 Member, Women of Wisconsin Strengthening Astronomy (WOWSA)
2016 Local Organizing Committee, *Star formation, diffuse matter and magnetic fields in the Galaxy*
2015 Graduate Student Mentor Committee, UW–Madison Department of Astronomy
2014 Graduate Admissions Committee, UW–Madison Department of Astronomy
2013 Science Lunch Seminar Organizer, UW–Madison Department of Astronomy

2013 Chair, Prospective Graduate Student Coordination Committee, UW–Madison Astronomy
2011 Student Departmental Advisor, Carleton College Department of Physics & Astronomy

Public Outreach

2019–2022 Volunteer, #popscope Baltimore
2019–2020 Volunteer, *Astronomy on Tap*, Baltimore
2011–2017 *Universe in the Park*, presenter of public talks and telescope shows
2011–2017 Volunteer, public observing at Washburn Observatory, UW–Madison
2016 Invited talk, UW Space Place "Great Eye in the Desert: Astronomy with the VLA" (June 2016)
2016 Wisconsin State Journal *Blue Sky Science* feature, "Is there life on other planets?" (January 2016)
2012-2014 Leader, WOWSA delegation to "Expanding Your Horizons"
2010–2011 Volunteer, *Northfield Students Teaching Astronomy (NSTAr)*, Carleton College
2010 Volunteer, *Young Astronomer's Summer Experience (YASE)*, Carleton College
2008–2011 Volunteer, public observing at Goodsell Observatory, Carleton College

Selected Press

2024 Nature Magazine, "Congratulations, its twins!"
2024 Science Magazine, "Familiar astronomical object may be two galaxies, not one"
2024 Harvard Science in the News, "The SMC(s): nearby galaxy has a hidden twin"
2024 Le Figaro, "Le spectaculaire et inattendu «dédoublement» du Petit Nuage de Magellan"
2024 AstroBites, "Two SMC are Better than One"

Refereed Publications

Summary: 40 total; 11 first-author; 11 second- or third-author

First-author publications:

11. **C. E. Murray**, C. W. Lindberg, P. Yanchulova Merica-Jones, B. F. Williams, R. E. Cohen, K. D. Gordon, K. B. W. McQuinn, Y. Choi, C. Burhenne, K. M. Sandstrom, C. Bot, L. C. Johnson, S. R., Goldman, C. J. R. Clark, J. C. Roman-Duval, K. M. Gilbert, J. E. G. Peek, A. S. Hirschauer, M. L. Boyer, A. E. Dolphin, *Scylla I: A pure-parallel, multi-wavelength imaging survey of the ULLYSES fields in the Magellanic Clouds*. 2024, The Astrophysical Journal Supplement Series, accepted, in press.

10. **C. E. Murray**, S. Hasselquist, J. E. G. Peek, C. W. Lindberg, A. Almeida, Y. Choi, J. Craig, H. Dénes, J. M. Dickey, E. Di Teodoro, C. Federrath, I. A. Gerrard, S. J. Gibson, D. Leahy, M. Y. Lee, C. Lynn, Y. K. Ma, A. Marchal, N. M. McClure-Griffiths, D. Nidever, H. Nguyen, N. M. Pingel, E. Tarantino, L. Uscanga, J. T. van Loon. *A Galactic Eclipse: The Small Magellanic Cloud Is Forming Stars in Two Superimposed Systems*. 2024, The Astrophysical Journal, 962, 120.

9. **C. E. Murray**, S. Stanimirović, C. Heiles, J. M. Dickey, N. M. McClure-Griffiths, M.-Y. Lee, W. M. Goss, N. Killerby-Smith, *The MACH HI Absorption Survey I: cold gas outside of the Galactic plane*. 2021, The Astrophysical Journal Supplement Series, 256, 2.

8. **C. E. Murray**, J. E. G. Peek, C. G. Kim, *Extracting the cold neutral medium from HI emission with deep learning: Implications for Galactic foregrounds at high latitude*. 2020, The Astrophysical Journal, 899, 15.

7. **C. E. Murray**, J. E. G. Peek, E. M. Di Teodoro, N. M. McClure-Griffiths, J. M. Dickey, H. Dénes, *The 3D Kinematics of Gas in the Small Magellanic Cloud*. 2019, The Astrophysical Journal, 887, 267.

6. **C. E. Murray**, S. Stanimirović, W. M. Goss, C. Heiles, J. M. Dickey, B. L. Babler, C.-G. Kim, *The 21-SPONGE HI Absorption Line Survey II: The temperature of Galactic HI*. 2018, The Astrophysical Journal Supplement Series, 238, 14-38.

5. **C. E. Murray**, J. E. G. Peek, M.-Y. Lee, S. Stanimirović, *Optically thick HI does not dominate dark gas in the local ISM*. 2018, The Astrophysical Journal, 862, 131-138.

4. **C. E. Murray**, S. Stanimirović, C.-G. Kim, E. C. Ostriker, R. R. Lindner, C. Heiles, J. M. Dickey, B. L. Babler, *Recovering interstellar clouds with HI spectral lines: A comparison between synthetic observations and 21-SPONGE*. 2017, The Astrophysical Journal, 837, 55-73.

3. **C. E. Murray**, S. Stanimirović, N. M. McClure-Griffiths, M. E. Putman, H. S. Liszt, T. Wong, P. Richter, J. R. Dawson, J. M. Dickey, R. R. Lindner, B. L. Babler, J. R. Allison. *First Detection of HCO^+ Absorption in the Magellanic System*. 2015, The Astrophysical Journal, 808, 41-47.

2. **C. E. Murray**, S. Stanimirović, W. M. Goss, C. Heiles, J. M. Dickey, R. R. Lindner, B. L. Babler, P. Hennebelle. *The 21-SPONGE Survey I: Techniques and Initial Results*. 2015, The Astrophysical Journal, 804, 89-110.

1. **C. E. Murray**, R. R. Lindner, S. Stanimirović, W. M. Goss , C. Heiles, J. M. Dickey, P. Hennebelle, N. M. Pingel, A. Lawrence, J. Jencson, B. L. Babler. *Excitation temperature of the warm neutral medium as a new probe of the Ly-α radiation field*. 2014, The Astrophysical Journal, 781, L41-L47.

Other publications:

29. K. M. Gilbert, Y. Choi, M. L. Boyer, [19 authors, incl **C. E. Murray**] *The Local Ultraviolet to Infrared Treasury I. Survey Overview of the Broadband Imaging*. 2024, The Astrophysical Journal, submitted.

28. C. Lynn, N. M. McClure-Griffiths, A. Marchal, M.-A. Miville-Deschenes, **C. E. Murray**, [13 authors], *Theoretical Considerations with Stacking Absorption Spectra and Spatial Properties of Cold and Unstable HI Gas in Cirrus Region of the Milky Way*. 2024, Monthly Notices of the Royal Astronomical Society, submitted.

27. R. E. Cohen, K. B. W. McQuinn, **C. E. Murray**, B. F. Williams, Y. Choi, C. W. Lindberg, C. Burhenne, K. D. Gordon, P. Yanchulova Merica-Jones, C. Bot, A. E. Dolphin, K. M. Gilbert, S. R., Goldman, A. S. Hirschauer, K. M. Sandstrom, O. G. Telford, *Scylla III. The Spatially Resolved Star Formation History of the Small Magellanic Cloud*. 2024, The Astrophysical Journal, submitted.

26. R. E. Cohen, K. B. W. McQuinn, **C. E. Murray**, B. F. Williams, Y. Choi, C. W. Lindberg, C. Burhenne, K. D. Gordon, P. Yanchulova Merica-Jones, K. M. Gilbert, M. L. Boyer, S. R., Goldman, A. E. Dolphin, O. G. Telford, *Scylla II. The Spatially Resolved Star Formation History of the Large Magellanic Cloud Reveals an Inverted Radial Age Gradient*. 2024, The Astrophysical Journal, submitted.

25. Z. Chen, B. F. Williams, D. Lang, [5 authors], **C. E. Murray**, [19 authors] *The Panchromatic Hubble Andromeda Southern Treasury (PHAST).4 I. Ultraviolet and Optical Photometry of 96 Million stars in M31*. 2024, The Astrophysical Journal, in press.

24. K. D. Gordon, E. L. Fitzpatrick, D. Massa, R. Bohlin, J. Chastenet, **C. E. Murray** [3 authors], *Expanded Sample of Small Magellanic Cloud Ultraviolet Dust Extinction Curves: Correlations between the 2175 A bump, q_pah, UV extinction shape, and N(HI)/A(V)*. 2024, ApJ, 970, 51.

23. E. Mullens, C. Zucker, **C. E. Murray**, R. Smith. *Characterizing the 3D Structure of Molecular Cloud Envelopes in the "Cloud Factory" Simulations*. 2024, ApJ, 966, 127.

22. C. W. Lindberg, **C. E. Murray**, J. Dalcanton, J. E. G. Peek, K. Gordon. *Dust around Massive Stars Is Agnostic to Galactic Environment: New Insights from PHAT/BEAST*. 2024, ApJ, 963, 58.

21. G. Park, M.-Y. Lee, S. Bialy, B. Burkhart, J. R. Dawson, C. Heiles, Di Li, **C. E. Murray**, H. Nguyen, A. Hafner, D. Rybarczyk, S. Stanimirović, *Probing the Conditions for the H I-to-H2 Transition in the Interstellar Medium*. 2023, ApJ, 955, 145.

20. J. Rigby, M. Perrin, M. McElwain, R. Kimble, [607 authors, incl **C. E. Murray**], *The Science Performance of JWST as Characterized in Commissioning*. 2023, PASP, 135, 1046.

19. A. Petzler, J. Dawson, H. Nguyen, C. Heiles, M. Wardle, M.-Y. Lee, **C. E. Murray**, K. L. Thompson, *GNOMES II: Analysis of the Galactic diffuse molecular ISM in all four ground state hydroxyl transitions using AMOEBA*. 2023, PASA, 440, 15.

18. J. Dempsey, N. M. McClure-Griffiths, **C. E. Murray**, [10 authors] *GASKAP-HI Pilot Survey Science III: An unbiased view of cold gas in the Small Magellanic Cloud*. 2022, PASA, 39, 34.

17. D. Rybarczyk, M. Gong, S. Stanimirović, B. Babler, **C. E. Murray**, [4 authors] *The role of neutral hydrogen in setting the abundances of molecular species in the Milky Way's diffuse interstellar medium. II. Comparison between observations and theoretical models*. 2022, The Astrophysical Journal, 926 190.

16. N. M. Pingel, J. Dempsey, N. M. McClure-Griffiths, J. M. Dickey, [20 authors], **C. E. Murray**, [12 authors], *GASKAP-HI Pilot Survey Science I: ASKAP Zoom Observations of HI Emission in the Small Magellanic Cloud*. 2022, PASA, 39, 5.

15. B. S. Hensley, **C. E. Murray**, M. Dodici, *Polycyclic Aromatic Hydrocarbons, the Anomalous Microwave Emission, and Their Connection to the Cold Neutral Medium*. 2022, The Astrophysical Journal, 929, 23.

14. D. Rybarczyk, S. Stanimirović, M. Gong, B. Babler, **C. E. Murray**, [5 authors] *The role of neutral hydrogen in setting the abundances of molecular species in the Milky Way's diffuse interstellar medium. I. Observational constraints from ALMA and NOEMA*. 2022, The Astrophysical Journal, 928, 79.

13. D. Rybarczyk, S. Stanimirović, E. G. Zweibel, **C. E. Murray**, J. M. Dickey, B. Babler, C. Heiles, *Small-scale structure traced by neutral hydrogen absorption in the direction of multiple-component radio continuum sources*. 2020, The Astrophysical Journal, 893, 152.

12. H. Nguyen, J. R. Dawson, M.-Y. Lee, **C. E. Murray**, [4 authors] *Exploring the properties of warm and cold atomic hydrogen in the Taurus and Gemini Regions*. 2019, The Astrophysical Journal, 880, 141.

11. M. Riener, J. Kainulainen, J. D. Henshaw, J. H. Orkisz, **C. E. Murray**, H. Beuther, *GaussPy+: A fully automated Gaussian decomposition package for emission line spectra*. 2019, Astronomy & Astrophysics, 628 78.

10. H. Dénes, N. M. McClure-Griffiths, J. M. Dickey, J. R. Dawson, **C. E. Murray**. *Calibrating the HISA temperature: Measuring the temperature of the Riegel-Crutcher cloud*. 2018, Monthly Notices of the Royal Astronomical Society, 479, 1465.

9. H. Nguyen, J. R. Dawson, M.-A. Miville-Deschênes, N. Tang, D. Li, C. Heiles, **C. E. Murray**, [6 authors] *Dust-Gas Scaling Relations and OH Abundance in the Galactic ISM*. 2018, The Astrophysical Journal, 862, 49.

8. D. Li, N. Tang, H. Nguyen, [6 authors], **C. E. Murray**, [8 authors]. *Where is OH and Does It Trace the Dark Molecular Gas?* 2018, The Astrophysical Journal Supplement Series, 235, 1.

7. B. Burkhart, M.-Y. Lee, **C. E. Murray**, S. Stanimirović. *The Lognormal Probability Distribution Function of the Perseus Molecular Cloud: A Comparison of HI and Dust*. 2015, The Astrophysical Journal, 811 L28-L33.

6. M.-Y. Lee, S. Stanimirović, **C. E. Murray**, C. Heiles, J. Miller. *Cold and Warm Atomic Gas Around the Perseus Molecular Cloud II: The Impact of High Optical Depth on the H I Column Density Distribution*. 2015, The Astrophysical Journal, 809, 56-74.

5. N. M. McClure-Griffiths, S. Stanimirović, **C. E. Murray**, D. Li, J. M. Dickey, E. Vazquez-Semadeni, J. E. G. Peek, M. Putman, S. E. Clark, M.-A. Miville-Deschenes, J. Bland-Hawthorn, L. Staveley-Smith, *Galactic and Magellanic Evolution with the SKA*. 2015, Proceedings of Advancing Astrophysics with the Square Kilometer Array (AASKA14), 130.

4. R. R. Lindner, C. Vera-Ciro, **C. E. Murray**, S. Stanimirović, B. Babler, C. Heiles, P. Hennebelle, W. M. Goss, J. M. Dickey. *Autonomous Gaussian Decomposition*. 2015, The Astronomical Journal, 149, 138-152.

3. S. Stanimirović, **C. E. Murray**, M.-Y. Lee, C. Heiles, J. Miller. *Cold and Warm Atomic Gas Around the Perseus Molecular Cloud I: Basic Properties*. 2014, The Astrophysical Journal, 793, 132-148.

2. N. M. Pingel, S. Stanimirović, J. E. G. Peek, [10 authors], **C. E. Murray**, [2 authors]. *Characterizing the Turbulent Properties of the Starless Molecular Cloud MBM16*. 2013, The Astrophysical Journal, 779, 36-44.

1. L. Sjouwerman, **C. E. Murray**, Y. Philstrom, V. L. Fish, E. D. Araya. *Discovery of the First Methanol (CH3OH) Maser in the Andromeda Galaxy*. 2010, The Astrophysical Journal, 724, L158-L160.

Technical Reports

3. **C. E. Murray**, W. M. Goss, S. Stanimirović. *Techniques for Galactic HI calibration from 21-SPONGE*. NRAO VLA Memo #197, Jul 2016.

2. **C. E. Murray**, W. M. Goss, S. Stanimirović. *High-Sensitivity Bandpass Calibration: Combining Observations in Time*. NRAO VLA Memo #176, Jan 2014.

1. **C. E. Murray**, W. M. Goss, S. Stanimirović. *Bandpass Stability: A 59 kHz Ripple*. NRAO VLA Memo #171, Sep 2013.