

# CLAIRE E. MURRAY

## CURRICULUM VITAE

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## RESEARCH INTERESTS

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Structure of the interstellar medium; the role of atomic and molecular gas in star formation; gas accretion and feedback in galaxies; the Magellanic System; radio (cm and mm) observations.

## PROFESSIONAL PREPARATION

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NSF Astronomy & Astrophysics Postdoctoral Fellow, Johns Hopkins University, 2018–present

Postdoctoral Fellow, Space Telescope Science Institute, 2017–2018

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

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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 (PI: \$2000)

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

## OBSERVING PROGRAMS AS PRINCIPAL INVESTIGATOR

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*Hubble Space Telescope* — PI: 500 orbits

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 H<sub>i</sub> emission to complement 21-SPONGE (53 hours)

## SELECTED SEMINAR & CONFERENCE PRESENTATIONS

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- 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)
- 2015 Talk, Feedback in the Magellanic Clouds, STScI (Baltimore, MD; October)
- 2015 Talk, Life Cycle of Gas in Galaxies (Dwingeloo, Netherlands; September)
- 2015 Talk, SKA Pathfinders HI Science Coord. Committee Meeting (Rutgers, NJ; March)
- 2014 Talk, Galactic Science with the SKA and Pathfinders, Lorentz Center (Leiden, DE; May)
- 2014 Invited talk, Stebbins Award Seminar, UW–Madison (Madison, WI; February)
- 2013 Talk, Phase Transitions in the Diffuse ISM, CSIRO (Sydney, Australia; November)
- 2012 Talk, Midwest Magnetic Fields, UW–Madison (Madison, WI; April)

## MENTORING & TEACHING

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### 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

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2016–present Referee, *The Astrophysical Journal*, *Monthly Notices of the Royal Astronomical Society*  
2018–2020 Organizer, Low-Density Universe Lunch (STScI/JHU)  
2019–2020 Review panelist: NSF, NASA, NRAO  
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

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2019–present Volunteer, #popscope Baltimore  
2019–present 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

## REFEREED PUBLICATIONS

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*Summary: 21 total; 9 first-author; 6 second- or third-author*

First-author publications:

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, *submitted*
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<sup>+</sup> 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- $\alpha$  radiation field*. 2014, The Astrophysical Journal, 781, L41-L47.

Other publications:

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 HI 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 (CH<sub>3</sub>OH) Maser in the Andromeda Galaxy*. 2010, The Astrophysical Journal, 724, L158-L160.

## TECHNICAL REPORTS

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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.

## MEETING ABSTRACTS

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6. **C. E. Murray**, J. E. G. Peek. *Improving Galactic foregrounds with dusty, multiphase gas from GALFA-HI*. 2018, American Astronomical Society Meeting Abstracts, 231, #247.29
5. **C. E. Murray**, S. Stanimirović, *the 21-SPONGE team*. *Deciphering Galactic Hydrogen with 21-SPONGE*. 2017, American Astronomical Society Meeting Abstracts, 229, #204.02
4. **C. E. Murray**, S. Stanimirović, R. Lindner, *the 21-SPONGE team*. *21-SPONGE Detects Unexpectedly Warm Neutral Medium*. 2015, American Astronomical Society Meeting Abstracts, 225, #141.09
3. J. Miller, M.-Y. Lee, **C. E. Murray**, S. Stanimirović, C. Heiles. *Cold Atomic Hydrogen in the Perseus Molecular Cloud*. 2012, American Astronomical Society Meeting Abstracts, 221, #349.12
2. **C. E. Murray**, L. Sjouwerman, Y. Pihlstrom. *Discovery of the First Methanol Maser in M31*. 2011, American Astronomical Society Meeting Abstracts, 217, #246.07
1. C. Blaha, T. Johnson, R. Cawthon, M. Dixon, **C. E. Murray**, P. Massey, P. Hodge. *H $\alpha$  Survey of Emission Line Regions in M33 and Local Group Dwarf Galaxies*. 2011, American Astronomical Society Meeting Abstracts, 217, #251.12