

Michelle Amanda Berg

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<https://mberg3.github.io>

SUMMARY

Research Interests: I am an astrophysicist interested in understanding galaxy evolution through the gas dynamics and metallicity content of the circumgalactic medium, its connection to the galaxy, and the escape of Lyman continuum photons through the intergalactic medium. I am also interested in galaxy quenching and how the environment (groups and clusters) plays a role in this process.

Skills: Expert in UV/optical spectral analysis (long-slit, echelle, slitless grism, and IFU); observing experience with Keck/HIRES and KCWI, Magellan/MIKE, HJST/GCMS, and the Green Bank Telescope; Python and IDL coding languages; proficient in Cloudy, DESI redrock, SExtractor, kcorrect, and pPXF software tools.

EDUCATION

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| University of Notre Dame | Notre Dame, IN |
| Ph.D., Physics | January 2022 |
| Dissertation: The Role of Dense Circumgalactic Gas in Shaping Galaxies | |
| M.S., Physics | January 2018 |
| Florida Institute of Technology | Melbourne, FL |
| B.S., Physics and Astronomy & Astrophysics | May 2014 |
| <i>summa cum laude</i> | |

PROFESSIONAL EXPERIENCE

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| Postdoctoral Fellow | September 2021 – Present |
| Department of Astronomy, University of Texas at Austin | |
| Advisor: John Chisholm | |

GRANTS & FELLOWSHIPS

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| Future Investigators in NASA Earth and Space Science and Technology (FINESST) NASA SMD | |
| • Received funding of \$90,000 for 2 years | September 2019 – August 2021 |
| NASA/STScI Hubble Cycle 30 GO-17138, Co-I (PI: Mainali, Goddard) | 2023 |
| NASA/STScI Hubble Cycle 29 GO-16645, Co-I (PI: Howk, ND) | 2022 |
| NASA/STScI Hubble Cycle 29 GO-16730, Co-I (PI: Lehner, ND) | 2022 |
| NASA/STScI Hubble Cycle 29 GO-16733, Co-I (PI: Rigby, STScI) | 2022 |
| Keck Principal Investigator Data Award PID30/2019A_N051, Co-I (PI: Howk, ND) | 2019 |
| NASA/STScI Hubble Cycle 25 GO-15075, Co-I (PI: Howk, ND) | 2018 |
| NASA/STScI Hubble Cycle 25 GO-15313, Co-I (PI: Lehner, ND) | 2018 |
| Graduate School Notebaert Professional Development Fund of \$1000 | Spring 2017 |
| Graduate Student Union Conference Presentation Grant of \$350 | Spring 2017 |

TIME GRANTED ON SPACE- AND GROUND-BASED TELESCOPES

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| Hobby-Eberly Telescope, UT23-3-018, 3 hours, PI | 2023 |
| Harlan J. Smith Telescope, McD23-3-013, 4 nights, PI | 2023 |
| Hobby-Eberly Telescope, UT23-2-017, 6.5 hours, PI | 2023 |
| Harlan J. Smith Telescope, McD23-2-007, 5 nights, PI | 2023 |
| Hobby-Eberly Telescope, UT23-1-008, 22 hours, PI | 2023 |
| Harlan J. Smith Telescope, McD23-1-006, 5 nights, PI | 2023 |
| Hubble Space Telescope, Cycle 30 GO-17138, 10 orbits, Co-I (PI: Mainali, Goddard) | 2023 |
| Hobby-Eberly Telescope, UT22-3-014, 7 hours, PI | 2022 |
| Hubble Space Telescope, Cycle 29 GO-16645, 24 orbits, Co-I (PI: Howk, ND) | 2021 |
| Hubble Space Telescope, Cycle 29 GO-16730, 137 orbits, Co-I (PI: Lehner, ND) | 2021 |
| Hubble Space Telescope, Cycle 29 GO-16733, 10 orbits, Co-I (PI: Rigby, STScI) | 2021 |
| Gemini 8.1-m telescope, GN-2020B-FT-103, 3.6 hours, Co-I (PI: Howk, ND) | 2020 |
| Green Bank Telescope, NRAO GBT20A-105, 20 hours, Co-I (PI: Galaz, U. Católica) | 2020 |
| Green Bank Telescope, NRAO GBT19A-326, 32 hours, Co-I (PI: Galaz, U. Católica) | 2019 |
| Keck 10-m telescope, NASA NExSci PID30/2019A_N051, 1 night, Co-I (PI: Howk, ND) | 2019 |
| Magellan 6.5-m telescope, Chilean National TAC CN2019A-23, 1 night, Co-I (PI: Tejos, U. Católica-Valparaíso) | 2019 |
| Green Bank Telescope, NRAO GBT18B-296, 175 hours, Co-I (PI: Howk, ND) | 2018 |
| Green Bank Telescope, NRAO GBT18A-291, 27 hours, Co-I (PI: Galaz, U. Católica) | 2018 |
| Green Bank Telescope, NRAO GBT18A-246, 176 hours, Co-I (PI: Lockman, NRAO) | 2018 |
| Green Bank Telescope, NRAO GBT17B-155, 57 hours, Co-I (PI: Howk, ND) | 2017 |
| Hubble Space Telescope, Cycle 25 GO-15075, 45 orbits, Co-I (PI: Howk, ND) | 2017 |
| Hubble Space Telescope, Cycle 25 GO-15313, 29 orbits, Co-I (PI: Lehner, ND) | 2017 |
| Green Bank Telescope, NRAO GBT16B-139, 72 hours, Co-I (PI: Lockman, NRAO) | 2016 |
| Green Bank Telescope, NRAO GBT16A-433, 12 hours, Co-I (PI: Lehner, ND) | 2016 |

RESEARCH EXPERIENCE

University of Texas at Austin

Postdoctoral Fellow, Astronomy

September 2021 – Present

Advisor: John Chisholm

- Reduced HST/WFC3 UVIS G280 slitless grism observations of the Sunburst Arc to analyze and compare the ionizing stellar continuum with models. Calculated absolute and relative escape fractions of the galaxy.
- Observed QSO fields with strong H I absorbers along the line of sight with the large IFU GCMS on the Harlan J. Smith Telescope to identify and characterize the host galaxies.

- Observed the 21cm hydrogen line with the Green Bank Telescope for a subset of the CLASSY galaxies for HI mass determinations.
- Observed the 21cm hydrogen line with the Green Bank Telescope for a sample of low-mass, low-metallicity dwarf galaxies for HI mass determinations.

University of Notre Dame

Graduate Research Assistant, Physics

August 2016 – January 2022

Advisors: Chris Howk and Nicolas Lehner, Doctoral Thesis

- Determined the HI covering factor in the circumgalactic medium (CGM) for a sample of 21 luminous red galaxies (LRGs) using QSO absorption line spectroscopy. Estimated the metallicity of the detected Lyman limit systems.
- Identified and characterized the host galaxies associated with a sample of 19 Lyman limit systems with measured metallicities using IFU observations. Explored the connections between the CGM and host galaxy properties.
- Determined the metallicity distribution function in the inner CGM of a sample of 55 LRGs using QSO absorption line spectroscopy.

NSF-REU, Physics

May – August 2013

Advisor: Justin Crepp

- Drafted the first mechanical design of the “iLocator” spectrograph that will be used with the Large Binocular Telescope to search for exoplanets in the Y-band of the infrared spectrum using the 3D CAD software *SolidWorks*.

Florida Institute of Technology

Undergraduate Research Assistant, Physics and Space Sciences

January 2013 – May 2014

Advisor: Daniel Batcheldor

- Analyzed doubly ionized oxygen [OIII] emission from active galactic nuclei (AGN) to determine constraints for outflow rates in galaxy models using IRAF and Graphical Astronomy and Image Analysis software to reduce the spectra.

Southeastern Association for Research in Astronomy NSF-REU

May – August 2012

Advisor: Daniel Batcheldor

- Measured and analyzed AGN light curves to determine how their brightness changes on small timescales using IRAF.

REFEREED PUBLICATIONS

“The Bimodal Absorption System Imaging Campaign (BASIC) I. A Dual Population of Low-metallicity Absorbers at $z < 1$,” **Berg, M.A.**, et al., *The Astrophysical Journal*, 944, 101 (2023)

“Project AMIGA: The Circumgalactic Medium of Andromeda,” Lehner, N., et al. **including Berg, M.A.**, *The Astrophysical Journal*, 900, 9 (2020)

“The Red Dead Redemption Survey of Circumgalactic Gas About Massive Galaxies. I. Mass and Metallicity of the Cool Phase,” **Berg, M.A.**, et al., *The Astrophysical Journal*, 883, 5 (2019)

“Think Global, Act Local: The Influence of Environment Age and Host Mass on Type Ia Supernova Light Curves,” Rose, B.M., Garnavich, P.M., & **Berg, M.A.**, *The Astrophysical Journal*, 874, 32 (2019)

“Quantifying the AGN-driven Outflows in ULIRGs (QUADROS) II: Evidence for Compact Outflow Regions from HST [OIII] Imaging Observations,” Tadhunter, C., et al. **including Berg, M.A.**, *Monthly Notices of the Royal Astronomical Society*, 478, 1558 (2018)

“Project AMIGA: A Minimal Covering Factor for Optically Thick Circumgalactic Gas Around the Andromeda Galaxy,” Howk, J.C., Wotta, C.B., **Berg, M.A.**, et al., *The Astrophysical Journal*, 846, 141 (2017)

“Optical Monitoring of Three Active Galactic Nuclei,” **Berg, M.A.**, Twadelle, K.F., & Batcheldor, D., *Journal of the Southeastern Association for Research in Astronomy*, 7, 13 (2012)

“Reverberation Mapping of AGN Dusty Tori with Spitzer and IRAC,” Twadelle, K.F., **Berg, M.A.**, & Batcheldor, D., *Journal of the Southeastern Association for Research in Astronomy*, 7, 17 (2012)

INVITED PRESENTATIONS

“First Observations of the Stellar Continuum from 600-900Å with the Sunburst Arc,” UV Galaxies 2023, Reykjavik, Iceland, July 3-7, 2023

- Session Chair

“Is Empty Space Really That Empty?,” McDonald Observatory Star Party, McDonald Observatory Visitor Center, March 28, 2023

“Bimodal Absorption System Imaging Campaign: IFU Survey Results,” 2022 Arthur M. Wolfe Symposium in Astrophysics, University of California, Santa Cruz, March 21-25, 2022

“Revealing the Stellar Continuum Below the LyC Limit with the Sunburst Arc,” 2022 Galaxy Evolution Workshop, University of Texas at Austin, January 13, 2022

- Workshop Discussion Section Lead

“The Bimodal Absorption System Imaging Campaign: Origin of the Metal-poor Gas at $z < 1$,” Astrophysics Brown Bag Lunch Talk, Massachusetts Institute of Technology, March 29, 2021

“The Role of Dense Circumgalactic Gas in Shaping Galaxies,” CGI Seminar, University of California, Santa Cruz, November 9, 2020

PRESENTATIONS

“The Bimodal Absorption System Imaging Campaign (BASIC): A Dual Population of Low-metallicity Absorbers at $z < 1$,” What Matter(s) Around Galaxies 2022, Champuloc, Italy, September 12-16, 2022

“The Role of Dense Circumgalactic Gas in Shaping Galaxies,” Galaxies and Cosmology Seminar, University of Texas at Austin, September 20, 2021

“The Circumgalactic Medium and its Effect on Galaxy Evolution,” 237th meeting of the American Astronomical Society, January 11-15, 2021

“Galaxies with Accretion Signatures at $z < 1$,” Astrophysics Seminar, University of Notre Dame, October 27, 2020

“The Galaxies Associated With the Bimodal Metallicity Distribution,” 235th meeting of the American Astronomical Society, Honolulu, HI, January 4-8, 2020

“New Results from the RDR and BASIC Programs,” What Matter(s) Between Galaxies conference, Abbazia di Spineto, Italy, June 3-7, 2019

“The Red Dead Redemption Survey: Cool Gas in the Halos of Massive Galaxies,” Astrophysics Seminar, University of Notre Dame, March 19, 2019

“Unexpected Detection of a Cool Gas Reservoir in the Hot Halos of LRGs,” Intergalactic Interconnections conference, Aix Marseille Université, France, July 9-13, 2018

“A First Look at the Origin of the Bimodal Metallicity Distribution of the Dense $z < 1$ CGM Gas with HST/ACS and VLT/MUSE Observations,” What Matter(s) Around Galaxies conference, Durham University, UK, June 19-23, 2017

POSTER PRESENTATIONS

“VLT/MUSE and HST/ACS Observations of $z < 1$ Galaxies: Origin of the Bimodal Metallicity Distribution of the Lyman Limit Systems,” Space Telescope Science Institute 2017 Spring Symposium

“Green Bank Telescope Observations of HI in the Circumgalactic Medium of M31,” Denny, L., et al. **including Berg, M.**, *American Astronomical Society, meeting #231*. Abstract (2018)

“iLocator: A Diffraction-Limited Doppler Spectrometer for the Large Binocular Telescope,” Crepp, J.R., et al. **including Berg, M.**, *American Astronomical Society, meeting #223*. Abstract (2014)

“Reverberation Mapping of AGN Dusty Tori in the Infrared,” Twadelle, K., **Berg, M.**, & Batcheldor, D., *American Astronomical Society, meeting #221*. Abstract (2013)

TEACHING EXPERIENCE

University of Texas at Austin

Substitute Lecturer

- Introduction to Astronomy: Fall 2022
Delivered two 50-minute lectures to (~70) non-science undergraduates students (ranging from freshman to seniors) on dark matter, dark energy, the fate of the universe and life in the universe.

Astronomy Graduate Student Observing Program

Spring 2023

- Co-wrote a proposal for an observing workshop and McDonald Observatory trip for astronomy graduate students to fill in their knowledge gap with seminars on observing, instrumentation, data reduction, and proposal writing.
- Co-organized an observing trip to McDonald Observatory where 11 students completed 4 observing projects (one at each telescope) to gain skills in observing with ground-based telescopes.
- Lead of McDonald Observatory trip for logistics and observer trainings
- Co-created the student observing projects focused on the McDonald instrumentation.
- Co-trained the students on how to observe with the McDonald telescopes.
- Co-created surveys to assess the student growth and enthusiasm for observing
- Co-presented the program and outcomes to the Astronomy department with recommendations to continue the program and/or integrate it into a graduate observing course

University of Notre Dame

Teaching Assistant, Physics

August 2014 – May 2016

- Physics I and II for Engineers Tutorials: Fall 2014, Spring 2015, 2016
Guided ~25 students through 1-3 problems in a group setting to reinforce topics from the lectures for a 50-minute class period, graded their work, and graded exams.
- Observatory: Fall 2014, Spring 2015, 2016
Set up 8" telescopes, helped students in Descriptive Astronomy (~60) and Elementary Cosmology (~100) complete projects, and graded exams.
- Descriptive Astronomy: Spring 2015
Guided (~60) non-science undergraduate students through a spectroscopy lecture and hands-on lab identifying ground-state emission lines of hydrogen, helium, and sodium using light boxes, gas tubes, and hand-held diffraction gratings.
- Modern Observational Techniques: Fall 2015
Attended lectures, created homework solutions, and facilitated the observatory project using the 0.8m telescope for ~15 students.

Physics Practicum

Fall 2019

- Delivered 3 lectures for the 75-minute class Physics of Astrophysics to ~10 students with an observer. Received peer-evaluations from professors and reflected on teaching and lecture goals. Topics covered: ionization equilibrium, thermal equilibrium, and emission line diagnostics.

OBSERVING EXPERIENCE

University of Texas at Austin

Harlan J. Smith Telescope, McD23-3-013, GCMS, 4 nights

Harlan J. Smith Telescope, McD23-2-007, GCMS, 5 nights

Harlan J. Smith Telescope, McD23-1-006, GCMS, 5 nights

Green Bank Telescope, GBT22B-359, VEGAS, 3.25 hours

Green Bank Telescope, GBT21B-323, VEGAS, 35.5 hours

University of Notre Dame

Magellan Baade 6.5m Telescope, CN2019A-23, MIKE, 1 night

Keck I Telescope, PID30/2019A_N051, HIRES, 1 night

Keck II Telescope, K356, KWCI, 0.5 nights

Green Bank Telescope, GBT17B-155, VEGAS, 58 hours

Green Bank Telescope, GBT16B-139, VEGAS, 37.5 hours

Green Bank Telescope, GBT16A-433, VEGAS, 6.5 hours

Green Bank Telescope, GBT15A-328, VEGAS, 5 hours

Florida Institute of Technology

SARA Kitt Peak 0.9m Telescope, REU 2012, Imaging CCD, 1 night

STUDENTS ADVISED

University of Texas at Austin

Ian Wolter, TAURUS mentee, Summer 2022

AWARDS & HONORS

Florida Institute of Technology

Northrop Grumman Student Design Showcase President's Cup Award Spring 2014

- Awarded for the best project and presentation for the College of Science

Northrop Grumman Student Design Showcase Best in Show Spring 2014

- Awarded for the best project and presentation for the Department of Physics and Space Sciences

Outstanding Student Award in Astronomy/Astrophysics Spring 2013

- Selected by faculty members and awarded to students for accomplishments in several categories including academic standing, research projects, memberships and honor societies

Outstanding Student Award in Physics Spring 2013

Distinguished Student Scholar Spring 2013, 2014

- Awarded to students with a GPA of 3.8 or higher

ACADEMIC & PROFESSIONAL SERVICE

University of Texas at Austin

McDonald Observatory time allocation committee member 2023

Astronomy Graduate Student Observing Program organizing committee member Spring 2023

TAURUS program mentor Summer 2022

TAURUS program observatory coordinator Summer 2022

Postdoc faculty-hire interviewer Spring 2022

University of Notre Dame

Student member on Faculty Colloquium Committee Fall 2020 – Spring 2021

Student faculty-hire interviewer Spring 2017, 2020, 2021

Student panel for external departmental review Fall 2016

OUTREACH & DEI

University of Texas at Austin

Women in STEM day camp Air and Space Career panel member Summer 2023

Women in STEM day camp Career Conversation Luncheon STEM role model Summer 2023

UT Austin STEM Girl Day volunteer Spring 2023

Women in STEM day camp Career Conversation Luncheon STEM role model Summer 2022

Affirming LGBTQIA+ People: Interpersonal Allyship workshop attendee Fall 2021

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| Equity and Inclusion Discussion Group member | Fall 2021 – Present |
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University of Notre Dame

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| greeNDot Bystander Training | Spring 2021 |
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| Building an Antiracist Vocabulary Lecture Series attendee | Fall 2020 – Fall 2022 |
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| Inter-University Anti-racist Reading Group | Summer 2020 – Spring 2021 |
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| Summertime Stargazing volunteer | Summer 2018 |
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| Astronomy Star Party volunteer | Fall 2014 |
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PROFESSIONAL MEMBERSHIPS, AFFILIATIONS, & ORGANIZATIONS

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| American Astronomical Society | 2019 – Present |
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| Graduate Physics Society | 2014 – 2022 |
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| Sigma Pi Sigma Physics Honor Society | Inducted 2013 |
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| Phi Kappa Phi Honor Society | Inducted 2012 |
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| Phi Eta Sigma Freshman National Honor Society | Inducted 2011 |
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REFERENCES

Dr. John Chisholm

University of Texas at Austin
Assistant Professor, Astronomy
Postdoctoral Fellow Research Advisor

Dr. J. Christopher Howk

University of Notre Dame
Professor, Physics
Graduate Research Advisor

Dr. Nicolas Lehner

University of Notre Dame
Research Professor, Physics
Graduate Research Co-Advisor

Dr. Joseph Burchett

New Mexico State University
Assistant Professor, Astronomy
Collaborator

Dr. John O'Meara

W. M. Keck Observatory
Chief Scientist
Collaborator