

Michelle Amanda Berg

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<https://mberg3.github.io>

SUMMARY

Research Interests: I am an observational astrophysicist interested in understanding galaxy evolution and the baryon cycle through the gas dynamics, metallicity content, and interplay between the interstellar medium, circumgalactic medium, and intergalactic medium, and their connection to the galaxy. The escape of Lyman continuum photons is also highly affected by these regions. Additionally, I am 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.

Time Awarded on Telescopes: James Webb Space Telescope 7.5 hours as PI, Hobby-Eberly Telescope 46 hours as PI, Harlan J. Smith Telescope 14 nights as PI, Hubble Space Telescope 255 orbits as Co-I, Green Bank Telescope 571 hours as Co-I, Keck 10-m telescope 1 night as Co-I, Magellan 6.5-m telescope 1 night as Co-I, Gemini 8.1-m telescope 3.6 hours as Co-I.

Observing Experience: Green Bank Telescope 145.75 hours, Harlan J. Smith Telescope 14 nights, Keck Telescopes 1.5 nights, Magellan Baade Telescope 1 night, SARA Kitt Peak Telescope 1 night.

EDUCATION

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

Assistant Professor	August 2024 – Present
Department of Physics & Astronomy, Texas Christian University	
Postdoctoral Fellow	September 2021 – July 2024
Department of Astronomy, University of Texas at Austin	
Advisor: John Chisholm	

TIME GRANTED ON SPACE- AND GROUND-BASED TELESCOPES

James Webb Space Telescope, Cycle 3 GO-5394, 7.5 hours, PI	2024
Hobby-Eberly Telescope, UT24-2-006, 7.5 hours, PI	2024
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

GRANTS & FELLOWSHIPS

American Astronomical Society International Travel Grant	Fall 2023
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
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
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	Spring 2017

RESEARCH EXPERIENCE

University of Texas at Austin

Postdoctoral Fellow, Astronomy

September 2021 – July 2024

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. Characterized foreground IGM absorbers along the line of sight.
- Created a pilot program using a novel technique to study the intragroup medium by observing proximate absorbers around QSOs.
- Observed QSO fields with strong HI 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.**, Lehner, N., Howk, J.C., O’Meara, J.M., Schaye, J., Straka, L.A., Cooksey, K.L., Tripp, T.M., Prochaska, J.X., Oppenheimer, B.D., Johnson, S.D., Muzahid, S., Bordoloi, R., Werk, J.K., Fox, A.J., Katz, N., Wendt, M., Peeples, M.S., Ribaldo, J., Tumlinson, J., *The Astrophysical Journal*, 944, 101 (2023)

“Project AMIGA: The Circumgalactic Medium of Andromeda,” Lehner, N., Berek, S.C., Howk, J.C., Wakker, B.P., Tumlinson, J., Jenkins, E.B., Prochaska, J.X., Augustin, R., Ji, S., Faucher-Giguère, C., Hafen, Z., Peeples, M.S., Barger, K.A., **Berg, M.A.**, Bordoloi, R., Brown, T.M., Fox, A.J., Gilbert, K.M., Guhathakurta, P., Kalirai, J.S., Lockman, F.J., O’Meara, J.M., Pisano, D. J., Ribaldo, J., Werk, J.K., *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.**, Howk, J.C., Lehner, N., Wotta, C.B., O’Meara, J.M., Bowen, D.V., Burchett, J.N., Peeples, M.S., Tejos, N., *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., Rodríguez, Z.J., Rose, M., Spence, R.A.W., Batcheldor, D., **Berg, M.A.**, Ramos Almeida, C., Spoon, H.W.W., Sparks, W., Chiaberge, M., *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.**, Lehner, N., Lockman, F.J., Hafen, Z., Pisano, D. J., Faucher-Giguère, C., Wakker, B.P., Prochaska, J.X., Wolfe, S.A., Ribaldo, J., Barger, K.A., Corlies, L., Fox, A.J., Guhathakurta, P., Jenkins, E.B., Kalirai, J., O’Meara, J.M., Peeples, M.S., Stewart, K.R., Strader, J., *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)

NON-REFEREED PUBLICATIONS

“Merger Interactions Enhance Star Formation Rates in Galaxy Group Housing QSO PKS0405–123 and Gaseous Nebulae,” Wolter, I.E., **Berg, M.A.**, Chisholm, J., *Research Notes of the American Astronomical Society*, 7, 232 (2023)

INVITED PRESENTATIONS

“Mapping the Full Baryon Cycle of Galaxies in Emission and Absorption,” Special seminar, Texas Christian University, April 1, 2024

“The Role of Dense Circumgalactic Gas in Shaping Galaxies,” CGM@ND Workshop II, Kylemore, Ireland, September 3-15, 2023

- Member of the local organizing committee
- Session Chair

“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

“LyC Escape and IGM Tomography Using the 600-900Å Continuum of the Sunburst Arc,” 243rd meeting of the American Astronomical Society, January 7-11, 2024

“LyC Escape and IGM Tomography Using the 600-900Å Continuum of the Sunburst Arc,” Galaxies and Cosmology Seminar, University of Texas at Austin, November 7, 2023

“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

“Green Bank Telescope Observations of HI in the Circumgalactic Medium of M31,” Denny, L., Early, L., **Berg, M.**, Howk, C., Lehner, N., Lockman, F., Wotta, C., *American Astronomical Society, meeting #231*. Poster abstract (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

“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, poster presentation

“iLocater: A Diffraction-Limited Doppler Spectrometer for the Large Binocular Telescope,” Crepp, J.R., Bechter, A., Bechter, E., **Berg, M.**, Carroll, J., Collins, K., Corpuz, T., Ketterer, R., Kielb, E., Stoddard, R., Eisner, J.A., Gaudi, B.S., Hinz, P., Kratter, K.M., Macela, G., Quirrenbach, A., Skrutskie, M.F., Sozzetti, A., Woodward, C.E., Zhao, B., *American Astronomical Society, meeting #223*. Poster abstract (2014)

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

TEACHING EXPERIENCE

Texas Christian University

Introductory Astronomy: Earth and Planets

Fall 2024

University of Texas at Austin

Astronomy Graduate Student Observing Program

Spring 2023, Summer 2024

- 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.

Substitute Lecturer

- Galaxies, Quasars, and the Universe: Spring 2024
Delivered five 50-minute lecture to (~100) non-science undergraduate students (ranging from freshman to seniors) on the scale and history of the universe, galaxy evolution, dark matter, and dark energy.
- Introduction to Astronomy: Fall 2022
Delivered two 50-minute lectures to (~70) non-science undergraduate students (ranging from freshman to seniors) on dark matter, dark energy, the fate of the universe and life in the universe.

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

Savannah Solis, REU mentee, Summer 2024
Sarah Healy, Virginia Tech graduate student, 2023-present
Florence de Almeida, Universidad Diego Portales graduate student, 2023-2024
Ananya Tuli, University of Notre Dame graduate student, 2021-present
Malia Kao, University of Texas at Austin graduate student, 2021-2023
Ian Wolter, TAURUS mentee, Summer 2022

ACADEMIC & PROFESSIONAL SERVICE

University of Texas at Austin

Subject-matter expert reviewer in a NASA peer review	2024
Postdoctoral panel for external departmental review	Spring 2024
Hubble Space Telescope Cycle 31 IGM-CGM time allocation review panel member	2023
McDonald Observatory time allocation committee member	2023-2024
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, 2024

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

Total Eclipse of the Horns volunteer	Spring 2024
Astronomy's Poverty Problem working group	2023 – Present

The Supernova Foundation Mentor	2023 – Present
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, 2024
Women in STEM day camp Career Conversation Luncheon STEM role model	Summer 2022
Affirming LGBTQIA+ People: Interpersonal Allyship workshop attendee	Fall 2021
Equity and Inclusion Discussion Group member	Fall 2021 – July 2024

University of Notre Dame

Graduate Certificate in Community Engagement and Public Scholarship	Spring 2021
greeNDot Bystander Training	Spring 2021
Building an Antiracist Vocabulary Lecture Series attendee	Fall 2020 – Fall 2022
Inter-University Anti-racist Reading Group	Summer 2020 – Spring 2021
Summertime Stargazing volunteer	Summer 2018
Astronomy Star Party volunteer	Fall 2014

PROFESSIONAL MEMBERSHIPS, AFFILIATIONS, & ORGANIZATIONS

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

REFERENCES

Dr. John Chisholm

University of Texas at Austin
Assistant Professor, Astronomy
Postdoctoral Fellow Research Advisor
chisholm@austin.utexas.edu

Dr. J. Christopher Howk

University of Notre Dame
Professor, Physics
Graduate Research Advisor
jhowk@nd.edu
574-631-8594

Dr. Nicolas Lehner

University of Notre Dame
Research Professor, Physics
Graduate Research Co-Advisor
nlehner@nd.edu
574-631-5755

Dr. Danielle Berg

University of Texas at Austin
Assistant Professor, Astronomy
Collaborator
daberg@austin.utexas.edu