# DR. HANNAH BISH

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European Southern Observatory
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## Education

**University of Washington**, Seattle WA, USA
Ph.D., Astronomy 2022
Advisor: Prof. Jessica Werk
Ph.D. Thesis: *Multiphase Gas Flows in the Milky Way's Halo*
M.S., Astronomy 2016

**Rutgers University**, New Brunswick NJ, USA
B.S., Astrophysics, *magna cum laude* 2014
Advisor: Prof. Eric Gawiser
Senior Thesis: *Ly-α Emission in High-Redshift Galaxies*

## Professional Appointments

**Marie Curie Postdoctoral Fellow**, European Southern Observatory, Garching, Germany
Research: *The Circumgalactic Medium in the ByCycle Survey* 2026 - present
Supervisor: Dr. Celine Peroux

**Postdoctoral Fellow**, Space Telescope Science Institute, Baltimore MD, USA 2022 - 2026
Primary Research: *Mapping the UV Interstellar Radiation Field in 3D*
Secondary Research: *Impact of Satellite Galaxies on the CGM*
Supervisor: Dr. Joshua Peek

**Research Assistant**, University of Washington, Seattle WA, USA 2016 - 2022
Research: *Kinematics & Structure of Gas Flows in the Galactic Halo*
Advisor: Prof. Jessica Werk

**Teaching Assistant**, University of Washington, Seattle WA, USA 2014 - 2016
Courses Taught: Intro Astronomy (ASTR 101), The Planets (ASTR 150)

**Research Assistant**, Rutgers University, New Brunswick NJ, USA 2012 - 2014
Research: *Ly-α Emission Strength in Star-Forming Galaxies*
Advisor: Prof. Eric Gawiser

**REU Student Researcher**, American Museum of Natural History, New York NY, USA 2010
Research: *High Proper Motion Stars in the SUPERBLINK Survey*
Advisor: Prof. Sebastien Lepine

## Honors and Awards

PI, HST Proposal (HST-GO-17733), 75 orbits 2025
Title: *Reaping the Whirlwind: Accretion & Outflow in the Inner Milky Way*
Marie Skłodowska-Curie Postdoctoral Fellowship 2025-2028
PI, ACCESS Explore Proposal (PHY230181), 400,000 SUs (∼333,000 compute hours) 2025
Co-I, HST Proposal (HST-GO-17733), 30 orbits 2024
Title: *When Clouds Collide: Observing Gas Accretion onto the Milky Way's Disk*
PI, ACCESS Explore Proposal (PHY230181), 400,000 SUs (∼333,000 compute hours) 2023

AAS Rodger Doxsey Prize 2022

Co-I, HST Proposal (HST-GO-16679), 71 orbits 2021
Title: *Mainly on the Plane: Solving the Milky Way CGM Anomaly with Low-Latitude QSOs*

Graduate Student Prize for Research Excellence, University of Washington 2019

Graduate Student Presentation Award, Wolfe Symposium in Astrophysics 2018

Co-I, HST Proposal (HST-GO-15154), 17 orbits 2017
Title: *Tracing Gas Flows from Halo to Disk: Observing the Milky Way's Galactic Fountain*

ARCS Foundation Graduate Fellowship 2014 - 2017

Magna cum laude, Rutgers University 2014

Honors thesis in Astrophysics, Rutgers University 2014

Aresty Research Center Grant, Rutgers University 2013

Richard J. Plano Summer Research Internship Award 2013

Rutgers University Academic Excellence Award 2013

## Scientific Presentations

### Invited Talks:

Pan-Experiment Galactic Science Group - *A 3D Model of the Local UV Interstellar Radiation Field* 2026

Rutgers University seminar series - *A 3D View of the Local ISM: Accretion at the Disk-Halo Interface and the UV Interstellar Radiation Field* 2026

American Museum of Natural History seminar series - *A 3D View of the Local ISM: Accretion at the Disk-Halo Interface and the UV Interstellar Radiation Field* 2026

CCA Accretion at the Disk-Halo Interface Workshop - *Low-Velocity Accretion and DHI Kinematics in the Inner Milky Way* 2025

University of Wisconsin - *LightCube: A 3D Model of the Local UV Interstellar Radiation Field* 2023

Carnegie Observatories - *LightCube: A 3D Model of the Local UV Interstellar Radiation Field* 2023

SAGA Collaboration Meeting - *QuaStar: A First Look at the Milky Way's Hidden CGM* 2023

STScI RadioQuiet Meeting - *QuaStar: A First Look at the Milky Way's Hidden CGM* 2021

STScI Milky Way Halo Meeting - *QuaStar: A First Look at the Milky Way's Hidden CGM* 2021

MUSYC LAE Meeting - *SED Properties of z∼2-3 LAEs* 2013

MUSYC LAE Meeting - *SpeedyMC Results for z=2.1 LAEs with CANDELS SEDs* 2012

### Contributed Talks:

Inter+Stellar Symposium - *LightCube: A 3D Model of the Local UV Interstellar Radiation Field* 2025

EAS 2025 - *LightCube: A 3D Model of the Local UV Interstellar Radiation Field* 2025

IAU GA XXIII - *LightCube: A 3D Model of the Local UV Interstellar Radiation Field* 2024

AAS #243 353.06 - *LightCube: A 3D Model of the Local UV Interstellar Radiation Field* 2024

AAS #241 245.03D - *Galactic Gas Flows from Halo to Disk* 2023

AAS #236 205.03 - *QuaStar: A First Look at the Milky Way's Hidden CGM* 2020

Wolfe Symposium in Astrophysics - *Milky Way Gas Kinematics at the Disk-Halo Interface* 2018

Rutgers University - *MCMC SED Fitting in CANDELS* 2013

Tri-State Astronomy Conference - *Physical Properties of LAEs at z = 2.1* 2013

CANDELS Team Meeting - *To Stack or Not to Stack: SED Properties of z=2.1 LAEs* 2013

### Posters:

AAS #225 143.55 - *What Determines the Strength of Lyα Emission in Star-Forming Galaxies?* 2015
AAS #223 145.05 - *To Stack or Not to Stack: Physical Properties of LAEs at z = 2.1* 2014
Aresty Research Symposium - *To Stack or Not to Stack: Physical Properties of LAEs at z = 2.1* 2014
AAS #221 147.32 - *Physical Properties of Lyman Alpha Emitters in CANDELS* 2013

## Professional Service

*Representative*, ESO Postdoctoral Fellows 2026 - present
*Committee Member*, PhD Student Selection Committee, ESO 2026
*Committee Member*, ISM* Code of Conduct Committee, STScI 2025 - 2026
*Organizer*, Low Density Universe 'supergroup', STScI 2022 - 2026
*Local Organizing Committee Member*, STScI Spring Symposium 2025
*Scientific Referee*, The Astrophysical Journal 2024
*Panel Support*, JWST TAC Cycle 2 Peer Review, STScI 2023
*Committee Member*, University of Washington Graduate Admissions 2020
*Organizer*, EquiTea journal club for equity and inclusion 2018 - 2019
*Organizer*, Prospective Student Visit, University of Washington 2017

## Mentoring and Outreach

*Speaker*, Astronomy on Tap, Baltimore MD, USA 2024
*Speaker*, New Jersey Astronomical Association, Glen Gardner NJ, USA 2023
*Volunteer*, Math Alliance Graduate Recruiting for Underrepresented Students, virtual 2021
*Mentor*, Pre-Major in Astronomy Program (Pre-MAP), University of Washington 2016 - 2020
Supervised research of four students: *Brittany Platt, Magdalyn Paige, Olivia Petry, & Travis Mandeville*
*Speaker*, Everett Astronomical Society, Everett WA, USA 2019
*Speaker*, Astronomy on Tap, Seattle WA, USA 2019
*Volunteer*, Meany Middle School Astronomy Outreach, Seattle WA, USA 2019
*Organizer*, EquiTea Journal Club, University of Washington 2017 - 2019
Planned monthly discussions and workshops about issues of equity and inclusion
*Volunteer*, ARCS Educational Astronomy for Children & Parents, Seattle WA, USA 2017
*Volunteer*, Planetarium Presenter for Visiting Groups, University of Washington 2016 - 2017

## Teaching

*Guest Lecturer*, Astronomy Course for Middle School Girls, University of Washington Summer 2016
*Teaching Assistant*, ASTR 101: Intro to Astronomy with Prof. Oliver Fraser Winter 2016
*Teaching Assistant*, ASTR 101: Intro to Astronomy with Prof. Ana Larson Fall 2015
*Teaching Assistant*, ASTR 150: The Planets with Prof. Toby Smith Summer 2015
*Teaching Assistant*, ASTR 101: Intro to Astronomy with Prof. Chris Laws Spring 2015
*Teaching Assistant*, ASTR 101: Intro to Astronomy with Prof. Oliver Fraser Winter 2015
*Teaching Assistant*, ASTR 150: The Planets with Prof. Toby Smith Fall 2014

# Journal Articles

## First Author:

1. **Bish, H.V.**; Tollerud, E.; Hamanowicz, A. "*COS-SAGA I: Connecting the CGM of Milky Way Analogs and Their Satellite Populations*" (in prep.)
2. **Bish, H.V.**; Peek, J.E.G.; Murray, C.; Gordon, K.; Clark, S.; Hamden, E. "*LightCube: A Parsec-Resolution 3D Model of the Local Far-Ultraviolet Interstellar Radiation Field*" (submitted to ApJ)
3. **Bish, H.V.**; Werk, J.K.; Di Teodoro, E.M.; Peek, J.E.G.; Zheng, Y.; Putman, M.E. "*Differential Accretion of Ionized Low-Velocity Gas at the Milky Way's Disk-Halo Interface*" 2026, ApJ, 997, 2
4. **Bish, H.V.**; Werk, J.K.; Peek, J.E.G.; Putman, M.E.; Zheng, Y. "*QuaStar: Measuring the Milky Way's Obscured Low-Velocity Circumgalactic Medium*" 2021, ApJ, 912, 8
5. **Bish, H.V.**; Werk, J.K.; Prochaska, J.X.; Rubin, K.H.R.; Zheng, Y.; O'Meara, J.M.; Deason, A.J. "*Galactic Gas Flows from Halo to Disk: Tomography and Kinematics at the Milky Way's Disk-Halo Interface*" 2019, ApJ, 882, 76

## Co-Authored:

1. Sanchez, N.N.; Benson, A.; Rudie, G.; Oppenheimer, B.; **Bish, H.V.**; ZuHone, J.; Tremmel, M. "*Extra! Extra! X-Ray Emission!: X-Rays in ROMULUS25, Part II - Physical Drivers of X-Ray Emission in the CGM*" (submitted to ApJ)
   – Contribution: Development of science ideas and discussion.
2. Sanchez, N.N.; Benson, A.; Rudie, G.; **Bish, H.V.**; Oppenheimer, B.; Silich, E.; ZuHone, J.; Truong, N.; Tremmel, M.; Pontzen, A.; Quinn, T. "*Hot off the Stacks: X-Rays in ROMULUS25, Part I - Comparisons to Observations from eROSITA*" (submitted to ApJ)
   – Contribution: Development of science ideas and discussion.
3. Tollerud, E.J.; Hamanowicz, A.; **Bish, H.V.**; Geha, M.; Wechsler, R.H.; Mao, Y; Kallivayalil, N.; Weinder, B.; Bordoloi, R.; Tumlinson, J.; Wetzel, A. "*COS-SAGA I: The Circumgalactic Medium of NGC3067 and its Lone Satellite*" (submitted to ApJL)
   – Contribution: Reduced and analyzed COS spectra, assisted with metallicity calculation.
4. Werk, J.K.; Tchernyshyov, K.; **Bish, H.V.**; Zheng, Y.; Putman, M.; Peek, J.E.G.; Schiminovich, D. "*The Plane Quasar Survey: First Data Release*", 2024, ApJS, 273, 21
   – Contribution: Carried out four half-nights of observations, reduced data for catalog.
5. Werk, J.K., Rubin, K.H.R., **Bish, H.V.**; Prochaska, J.X.; Zheng, Y.; O'Meara, J.M.; Lenz, D.; Hummels, C.; Deason, A.J. "*The Nature of Ionized Gas in the Milky Way Galactic Fountain*" 2019, ApJ, 887, 89
   – Contribution: Data reduction and analysis of low ions, two figures, scientific discussion.
6. Vargas, C.J., **Bish, H.V.**, Acquaviva, V., Gawiser, E.J., Finkelstein, S.L., Ciardullo, R., Ashby, M., Feldmeier, J., Ferguson, H., Gronwall, C., Guaita, L., Hagen, A., Koekemoer, A., Kurczynski, P., Newman, J., & Padilla, N. "*To Stack or Not to Stack: Spectral Energy Distribution Properties of Ly-Emitting Galaxies at z=2.1*". 2013, ApJ, 783, 26.
   – Contribution: SED fitting and primary data analysis, six figures, scientific discussion.

# Observing Experience

## Awarded Proposals:

| | |
|---|---|
| HST-GO 18050 Cycle 33, HST COS, 75 orbits (PI) | 2025 |
| HST-GO 17733 Cycle 32, HST COS, 30 orbits (Co-I) | 2024 |
| HST-GO 16679 Cycle 29, HST COS, 71 orbits (Co-I) | 2021 |
| 2020 Q4, APO 3.5-m, 20 hours (Co-I) | 2020 |
| 2020B, MDM 2.4-m OSMOS, 20 hours (Co-I) | 2020 |
| HST-GO 15154 / Cycle 25, HST COS, 17 orbits (Co-I) | 2017 |

### Observing Nights:

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|---|---|
| Apache Point Observatory 3.5-m DIS, 1 night | 2021 |
| Apache Point Observatory 3.5-m DIS, 4 half-nights | 2020 |
| Keck HIRES, 3 half-nights | 2017 |
| Keck HIRES, 3 half-nights | 2016 |
| Apache Point Observatory 3.5-m DIS, 5 half-nights | 2015 |
| Manastash Ridge Observatory 0.75-m, 2 nights | 2015 |
| Schommer Observatory 20-in, 2 nights | 2013 |
| Green Bank Observatory 40-ft, 8 hours | 2012 |

### Data Reduction:

`coaddx1d`/IDL and personal pipeline/Python, HST COS

`xidl`/IDL and `HIRES`/IDL, Keck HIRES

`PypeIt`/Python, Apache Point Observatory 3.5-m DIS and MDM 1.3-m/2.4-m OSMOS

`PyDIS`/Python, MDM 2.4-m OSMOS

`IRAF`, Apache Point Observatory 3.5-m DIS, Schommer Observatory 20-in

## Technical Schools and Workshops

- CosmicAI Astro-AI Boot Camp, University of Texas at Austin 05/2025
  *1-week intensive boot camp covering a broad overview of AI methods and scientific applications in a high-performance computing environment, with a focus on challenges in the domain of astronomy.*
- Docker training, Space Telescope Science Institute, USA 12/2023
  *2-day training on use of Docker containers to effect reproducible computational environments. Such environments are useful for ensuring reproducible research outputs and sharing open-source code.*
- Interstellar Institute, Institut Pascal, France 07/2023
  *3-week program for research development and collaboration among ISM experts. Worked with other participants to determine the best approach to building my 3-D model of the interstellar radiation field (currently under development) and investigate use cases.*
- AWS training, Space Telescope Science Institute, USA 05/2023
  *2-day training on using Amazon Web Services (AWS) for computationally-intensive research tasks.*
- Planetarium training, University of Washington, USA 10/2019
  *1-day training on planetarium equipment/software and development of custom planetarium shows for a range of visiting audiences at the university.*
- Python Software Engineering Boot Camp, University of Washington, USA 09/2014
  *2-day workshop on Python tools for scientific computing in astronomy.*

## Computing

### Awarded Computing Time:

ACCESS Explore (PHY230181), 800,000 SUs/∼666,000 hrs. on Purdue Anvil Cluster (PI) 2024-2025

### Experience:

Python: advanced, daily user

IDL: intermediate

JavaScript & D3: intermediate

Hyak supercomputer user, department time allocation, University of Washington
FASRC supercomputer user, department time allocation, Harvard University
Anvil supercomputer user, ∼666,000 hours, Purdue University

## References

**Prof. Jessica K. Werk**
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Associate Professor
Department of Astronomy, University of Washington

**Dr. Joshua E. G. Peek**
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Associate Astronomer, Project Scientist
Data Science Mission Office, Space Telescope Science Institute

**Dr. Catherine Zucker**
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Astrophysicist
Smithsonian Astrophysical Observatory, Center for Astrophysics | Harvard & Smithsonian