Gillian D. Beltz-Mohrmann, Ph.D.

Department of Physics and Program in Statistical & Data Sciences
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Professional Appointments

Assistant Professor - Smith College 2025-
Department of Physics and Program in Statistical & Data Sciences

Postdoctoral Research Fellow - Argonne National Laboratory 2022-2025
Cosmological Physics and Advanced Computing Group

Graduate Research Assistant - Vanderbilt University 2016-2022
Department of Physics & Astronomy

Education

Vanderbilt University, Nashville, TN May 2022
Ph.D. in Astrophysics Advisor: Andreas Berlind
Thesis: *Developing an Accurate Probe of the Galaxy-Halo Connection: Baryonic Effects, Small-Scale Galaxy Clustering, and Halo Model Extensions*

Wellesley College, Wellesley, MA May 2016
B.A., *cum laude* Advisors: Kim McLeod, James Battat
Major: Astrophysics; Minor: German

Honors & Awards

Most Outstanding Student Publication Award 2020
Vanderbilt Physics & Astronomy Department

Graduate Student Poster Competition Winner 2019
Vanderbilt Data Science Symposium

Akunuri V. Ramayya Award for Outstanding Teaching Assistant 2018
Vanderbilt Physics & Astronomy Department

Provost Graduate Fellowship 2016–2021
Vanderbilt University

Undergraduate Chambliss Achievement Honorable Mention 2016
227th American Astronomical Society Meeting

Sarah Frances Whiting Medal for Achievement in Astronomy 2014
Wellesley College

1st & 2nd Author Publications

Submitted & Published
Total Citations: 102

8. **Beltz-Mohrmann, G. D.**, Pope, A., et al., 2025, "Illuminating the Physics of Dark Energy with the Discovery Simulations," submitted to The Open Journal of Astrophysics, arXiv:2503.05947
7. Pearl, A. N., **Beltz-Mohrmann, G. D.**, Hearin, A. P., 2024, "DiffOpt: Parallel optimization of Jax models," Journal of Open Source Software, 9(104), 7522
6. **Beltz-Mohrmann, G. D.**, Szewciw, A. O., Berlind, A. A., Sinha, M., 2023, "Toward Accurate Modeling of Galaxy Clustering on Small Scales: Halo Model Extensions and Lingering Tension," The Astrophysical Journal, 948, 100
5. Szewciw, A. O., **Beltz-Mohrmann, G. D.**, Berlind, A. A., Sinha, M., 2021, "Toward Accurate Modeling of Galaxy Clustering on Small Scales: Constraining the Galaxy-Halo Connection with Optimal Statistics," The Astrophysical Journal, 926, 15
4. **Beltz-Mohrmann, G. D.**, Berlind, A. A., 2021, "The impact of baryonic physics on the abundance, clustering, and concentration of halos," The Astrophysical Journal, 921, 112
3. **Beltz-Mohrmann, G. D.**, Berlind, A. A., Szewciw, A. O., 2020, "Testing the Accuracy of Halo Occupation Distribution Modelling using Hydrodynamical Simulations," Monthly Notices of the Royal Astronomical Society, 491, 5771

2. Dale, D. A., **Beltz-Mohrmann, G. D.**, et al., 2016, "Radial Star Formation Histories in Fifteen Nearby Galaxies," The Astronomical Journal, 151, 4

1. Souza, S. P., **Beltz-Mohrmann, G.**, Sami, M., 2014, "The Light Curve and Period of MT696," The Journal of the American Association of Variable Star Observers, 42, 154

Nth Author Publications

Submitted & Published

Total Citations: 16

3. OpenUniverse Collaboration et al., 2025, "OpenUniverse2024: A shared, simulated view of the sky for the next generation of cosmological surveys", arXiv:2501.05632

2. Lange, Johannes U. et al., 2024, "Systematic Effects in Galaxy-Galaxy Lensing with DESI", The Open Journal of Astrophysics, 7, 57

1. Yuan, Sihan et al., 2024, "Redshift evolution and covariances for joint lensing and clustering studies with DESI Y1", Monthly Notices of the Royal Astronomical Society, 533, 1

Teaching

SDS 271 Programming for Data Science in Python, Smith College — Fall 2025
SDS 291 Multiple Regression, Smith College — Fall 2025
Python workshop, Conference for Undergraduate Women in Physics — Jan. 2023
Graduate Teaching Assistant, Vanderbilt University — Fall 2016 – Spring 2019
Introductory Astronomy Lab instructor
Astronomy Tutor, Vanderbilt University — Fall 2016
Summer Academy at Vanderbilt for the Young — July 2017
Supplemental Instruction Leader, Wellesley College — Fall 2014 – Spring 2016
Physics Tutor, Wellesley College — Fall 2013 – Spring 2016

Mentoring

Harmandeep Gill (University of Toronto, undergraduate) — October 2024 -
Topic: Modeling Lyman Break Galaxies in Jax
Ivan Kraskov (University of Toronto, undergraduate) — October 2024 -
Topic: Modeling IGM absorption in Jax
Emily Martsen (University of Chicago, graduate) — September 2024 -
Topic: Measuring the Two-point Clustering of Galaxy Clusters
DESI Mentorship Program — October 2023 -
Resherle Verna (UT Austin, graduate) — Summer 2023
GEM Fellowship Program
Topic: Forward modeling galaxy SEDs with Jax
Caleigh Dennis (Harpeth Hall High School) — September 2017 – May 2019
Topic: Measuring the rotation of galaxy groups in SDSS
1st place winner at Middle Tennessee Science & Engineering Fair in 2018 & 2019

Recent Talks

Cosmology from Lyman-Break Galaxies — May 2025
University of Toronto
Modeling the Galaxy-Halo Connection of LBGs
ELG Mock Challenge Workshop — February 2025
Donostia International Physics Center
Lessons Learned from the DESI Emulator Mock Challenge
Simulation-based Forward Modeling with Diffsky
Winter DESI Meeting, Cancun, Mexico — December 2024
Updates on the DESI Emulator Mock Challenge
University of Arizona — October 2024
A Differentiable Forward Model of the Galaxy-Halo Connection
Cosmology Talks Miniworkshop (invited expert) — August 2024
Cosmology Beyond 2pt Statistics
DHWFEST, University of Utah — July 2024
A New Forward Model of the Galaxy-Halo Connection
Summer DESI Meeting, Marseille, France — July 2024

DESI Alternative Clustering Methods

New Strategies for Extracting Cosmology from Galaxy Surveys July 2024
Sesto, Italy
Simulation-based Forward Modeling of Cross-Survey Cross-Correlations with Diffsky

Fundamental Physics from Future Spectroscopic Surveys May 2024
Lawrence Berkeley National Lab
Making multi-wavelength, multi-redshift predictions for Cross-Survey Cosmological Analyses

Winter DESI Meeting, Hawaii, USA Dec. 2023
Introducing DESI-Diffsky: A Differentiable Forward Model for Making Multi-wavelength, Multi-tracer DESI Mocks

KITP Workshop, UC Santa Barbara Jan. 2023
Building a physical understanding of galaxy evolution with data-driven astronomy
Toward Accurate Modeling of Galaxy Clustering on Small Scales: Halo Model Extensions & Lingering Tension

CAMELS Workshop, Center for Computational Astrophysics Dec. 2022
Toward Accurate Modeling of Galaxy Clustering on Small Scales: Halo Model Extensions & Lingering Tension

N-Body Shop Workshop, Center for Computational Astrophysics June 2022
Accurate Modeling of Galaxy Clustering on Small Scales

High-Energy and AstroPhysics Seminar, University of Utah Jan. 2022
Developing an Accurate Probe of the Galaxy-Halo Connection

KICP Seminar, University of Chicago Nov. 2021
Developing an Accurate Probe of the Galaxy-Halo Connection

Galaxies and AGN Journal Club, Johns Hopkins University July 2021
Impact of baryonic physics on the abundance, clustering, & concentration of halos

Galaxy Lunch talk, Yale University March 2021
Can we ignore baryons in halo modeling?

KITP Workshop, UC Santa Barbara Aug. 2020
Galaxy-Halo Connection Across Cosmic Time
HMF Discrepancies between Hydrodynamic and DMO Simulations

Galaxy-halo Connection Workshop, Universität Innsbruck March 2020
Taking Halo Modeling to the Next Level

Grants

XSEDE Grant 2019, 2020
Awarded 58.4k total Node Hours (2.8M CPU hours) on Stampede2

McMinn Research Grant 2019, 2020
Vanderbilt Physics & Astronomy Department ($3,000 total)

Graduate Summer Research Award 2018
Vanderbilt College of Arts and Sciences ($1,900)

Skills & Experience

Programming Languages: PYTHON, C, BASH, GIT, LaTeX
Misc.: Jax, scikit-learn, emcee, GADGET, CAMB, 2LPTIC, ROCKSTAR
Parallel Computing: MPI, OPENMP
Observing Experience:
$\sim$ 80 hours using 2.3 meter telescope at Wyoming Infrared Observatory
$\sim$ 80 hours using 0.6 meter telescope at Williams College
$\sim$ 200 hours using 0.6 meter telescope at Wellesley College
$\sim$ 100 hours using $8''$ reflector telescopes at Wellesley College and Vanderbilt University
$\sim$ 100 hours using $6''$ and $12''$ historic refractor telescopes at Wellesley College

Public Service & Outreach

Science Careers in Search of Women panelist, Argonne	March 2023
Conference for Undergraduate Women in Physics, Argonne	Jan. 2023
AAS Congressional Visits Day (virtual)	Sept. 2020
Science Day with Nashville Girl Scout Troop	March 2019
Meet the Astronomer Night at Dyer Observatory	Oct. 2018
Vanderbilt Student Volunteers for Science	Fall 2016

Whitin Observatory Volunteer, Wellesley College 2012–2016

In the Media

DESI Blog: At the Big Reveal: DESI's December 2024 Unblinding Results
Podcast: Particle Mysteries: The Coldest Case - "Chasing Shadows"
YouTube: Science 101: What are dark matter and dark energy?

Collaborations

Dark Energy Spectroscopic Instrument (DESI) 2022–
C3 and GQC Working Groups
Alternative Clustering Methods Topical Group (co-leader, November 2024-)
LSST Dark Energy Science (DESC) 2022–
Large Suite of Dark Matter Simulations (LasDamas) 2017–2022
Co-Investigator & XSEDE Allocation Manager
CAMELS 2022–
N-Body Shop 2020–
American Astronomical Society 2015–

Professional Service

Scholarly Journal Peer Reviewer:
Monthly Notices of the Royal Astronomical Society
Astronomy & Astrophysics
Journal of Cosmology and Astroparticle Physics
Physics of the Dark Universe