Bingjie Wang

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The Pennsylvania State University
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Research Interests

Galaxy formation and evolution, stellar populations, reionization, statistics, and machine learning

Education

Johns Hopkins University — Baltimore, MD
Ph.D. in Astronomy & Astrophysics — 2016–2021

- Thesis: "Implications for the Epoch of Reionization in the Local Universe"
- Advisor: Prof. Timothy Heckman

University of Pittsburgh — Pittsburgh, PA
B.A. in Philosophy, B.Phil. in Physics with honors, *Magna Cum Laude* — 2012–2016

- Thesis: "Evaluating the Standard Model of Cosmology in Light of Large-scale Anomalies in the Cosmic Microwave Background"
- Advisor: Prof. Arthur Kosowsky

Professional Positions

Assistant Research Professor — 2024–present

Postdoctoral Scholar — 2022–2024

The Pennsylvania State University

- Main focus: spectral energy distribution modeling for various populations discovered by JWST at high redshift
- Mentor: Prof. Joel Leja

Publications

12 as first author, 71 in total (as of 12/2024).
For first-author only: h-index = 10, citations > 400; ADS.
For all publications: h-index = 31, citations > 3200; these are listed in a separate section at the end; ADS.

First Author

[1]**B. Wang**, J. Leja, et al., "Population Models for Star Formation Timescales in Early Galaxies: The First Step Towards Solving Outshining", submitted to ApJ (2024).

[2]**B. Wang**, J. Leja, et al., "RUBIES: Evolved Stellar Populations with Extended Formation Histories at $z \sim 7-8$ in Candidate Massive Galaxies Identified with JWST/NIRSpec", ApJL **969**, L13 (2024).

[3]**B. Wang**, A. de Graaff, et al., "RUBIES: JWST/NIRSpec Confirmation of an Infrared-luminous, Broad-line Little Red Dot with an Ionized Outflow", arXiv e-prints, arXiv:2403.02304 (2024).

[4]**B. Wang**, J. Leja, et al., "Quantifying the Effects of Known Unknowns on Inferred High-redshift Galaxy Properties: Burstiness, IMF, and Nebular Physics", ApJ **963**, 74 (2024).

[5]**B. Wang**, J. Leja, et al., "The UNCOVER Survey: A First-look HST+JWST Catalog of Galaxy Redshifts and Stellar Population Properties Spanning $0.2 \lesssim z \lesssim 15$", ApJS **270**, 12 (2024).

[6]**B. Wang**, S. Fujimoto, et al., "UNCOVER: Illuminating the Early Universe—JWST/NIRSpec Confirmation of $z > 12$ Galaxies", ApJL **957**, L34 (2023).

[7]**B. Wang**, J. Leja, V. A. Villar, and J. S. Speagle, "SBI^{++}: Flexible, Ultra-fast Likelihood-free Inference Customized for Astronomical Applications", ApJL **952**, L10 (2023).

[8]**B. Wang**, J. Leja, et al., "Inferring More from Less: Prospector as a Photometric Redshift Engine in the Era of JWST", ApJL **944**, L58 (2023).

[9]**B. Wang**, J. Leja, A. Villar, and J. S. Speagle, "Monte Carlo Techniques for Addressing Large Errors and Missing Data in Simulation-based Inference", ML4PS, NeurIPS (2022).

[10]**B. Wang**, T. M. Heckman, et al., "The Low-redshift Lyman-continuum Survey: [S II] Deficiency and the Leakage of Ionizing Radiation", ApJ **916**, 3 (2021).

[11]**B. Wang**, T. M. Heckman, G. Zhu, and C. A. Norman, "A Systematic Study of Galactic Outflows via Fluorescence Emission: Implications for Their Size and Structure", ApJ **894**, 149 (2020).

[12]**B. Wang**, T. M. Heckman, et al., "A New Technique for Finding Galaxies Leaking Lyman-continuum Radiation: [S II] Deficiency", ApJ **885**, 57 (2019).

Second/Third Author

[13]P. van Dokkum, G. Brammer, **B. Wang**, J. Leja, and C. Conroy, "A Massive Compact Quiescent Galaxy at $z = 2$ with a Complete Einstein Ring in JWST Imaging", Nature Astronomy **8**, 119–125 (2024).

[14]S. Fujimoto, **B. Wang**, et al., "UNCOVER: A NIRSpec Census of Lensed Galaxies at $z = 8.50 - 13.08$ Probing a High-AGN Fraction and Ionized Bubbles in the Shadow", ApJ **977**, 250 (2024).

[15]H. Atek, I. Chemerynska, **B. Wang**, et al., "JWST UNCOVER: Discovery of $z > 9$ Galaxy Candidates Behind the Lensing Cluster Abell 2744", MNRAS **524**, 5486–5496 (2023).

[16]D. J. Watts, **B. Wang**, et al., "A Projected Estimate of the Reionization Optical Depth Using the CLASS Experiment's Sample Variance Limited E-mode Measurement", ApJ **863**, 121 (2018).

[17]S. Aiola, **B. Wang**, et al., "Microwave Background Correlations from Dipole Anisotropy Modulation", PRD **92**, 063008 (2015).

[18]S. Aiola, A. Kosowsky, and **B. Wang**, "Gaussian Approximation of Peak Values in the Integrated Sachs-Wolfe Effect", PRD **91**, 043510 (2015).

Science Talks (Selected)

Special session on harnessing AI for advanced statistical inference in astrophysics, 245th meeting of the American Astronomical Society (**invited**)	01/25
Astronomy colloquium, Kavli Institute for Astronomy and Astrophysics, Peking University (**invited**)	12/24
Astronomy colloquium, Tsung-Dao Lee Institute, Shanghai Jiao Tong University	12/24
40th symposium, Institut d'Astrophysique de Paris	12/24
HEP-Astro seminar, University of Michigan (**invited**)	10/24
Galaxies journal club, Space Telescope Science Institute (**invited**)	10/24
Thunch, Galread, Princeton University	10/24

Galaxy lunch, Yale University 09/24

Astronomy colloquium, Pennsylvania State University 09/24

PHYSTAT–simulation based inference in fundamental physics, Max Planck Institute for Physics (**invited**, declined due to a temporary visa issue) 05/24

SED fitting for JWST data, Pan-survey SED-fitting Forum (**invited**) 01/24

ELT science in light of JWST, University of California at Los Angeles 12/23

Statistical challenges in modern astronomy VIII, Pennsylvania State University 06/23

Modern statistics of galaxies, Ludwig-Maximilians-Universität (**invited**) 06/23

Cosmic connections: a ML × astrophysics symposium, Simons Foundation 05/23

Astronomy seminar, University of Pittsburgh (**invited**) 03/23

Astrostatistics seminar, University of Toronto (**invited**) 03/23

Astronomy seminar, University of Connecticut (**invited**) 03/22

Dissertation talk, 237th meeting of the American Astronomical Society 01/21

Lunch talk, University of California at Berkeley 10/20

First light, University of São Paulo 08/19

Annual Sanielevici lecture, University of Pittsburgh 02/15

Workshop on large-scale anomalies, Case Western Reserve University 09/14

DAAD RISE scholarship holder meeting, Heidelberg, Germany 07/14

Neighborhood workshop, Pennsylvania State University 04/14

Press

Based on lead-author works:

"Trio of early galaxies test our ideas of cosmic evolution"; Sky & Telescope 2024

"JWST discovery of ancient stellar populations in little red dots"; PSU release 2024
(Space.com, Universe Today, The Independent, ...)

"Too many stars, too fast?"; AAS NOVA research highlights 2024
also featured in AAS Journal Series Author Series.

"JWST discovery of the second- and fourth-most distant galaxies"; PSU release 2023
(Space.com, Newsweek, Daily Mail, ...)

"JWST uncovers new details in Pandora's Cluster"; NASA/STScI/PSU release 2023

"[S II] deficiency and the leakage of ionizing radiation"; AAS journal author series 2021

"Tracing gas flows out of star-forming galaxies"; AAS NOVA research highlights 2020

Expert comments for:

BBC, New Scientist, Sky & Telescope

Selected other press releases:

"NASA telescopes discover record-breaking black hole"; NASA release 2023
(CNN, ...)

''Massive early galaxies defy prior understanding of the universe"; NASA/Nature/ANU/PSU release 2023
(CNN, The Guardian, NPR, ...)

Professional Experience

NASA proposal review: panelist 2023, 2025

JWST Director's Discretionary proposal reviewer 2024

Climate and diversity committee member, Penn State 2024–

Reviewer for *The Astrophysical Journal*, *The Astrophysical Journal Letters* 2021–

Teaching & Mentoring Experience

Co-advising Kanishk Pandey, Penn State graduate student 2024–

Primary advisor for Emilie Burnham, Penn State graduate student 2023–

Co-advising Nathan Cristello, Penn State undergraduate 2023

Guest Lecturer, Penn State University 2023–
Graduate level: extragalactic astronomy
Undergraduate level: introduction to astronomy for non-majors

Graduate Teaching Assistant, Johns Hopkins University 2016–2018
Graduate level: astrophysical dynamics, radiative astrophysics
Undergraduate level: cosmology, general physics for biological science majors, general physics for physical science majors, general physics labs

Honors and Awards

Rodger Doxsey Travel Prize, American Astronomical Society 2020

First-prize poster, First Light at University of São Paulo 2019

ΣΠΣ physics honors society initiate 2016

Thompson award for excellence in scientific writing, Physics & Astronomy, UPitt 2016

Halliday award for excellence in undergraduate research, Physics & Astronomy, UPitt 2015

Thomas-Lain fund scholarship, Physics & Astronomy, UPitt 2015

Research Internship in Science & Engineering, Deutschen Akademischen Austauschdienstes 2014

Sanielevici undergraduate research scholarship, Physics & Astronomy, UPitt 2014

Open-source Software

sbi_pp: simulation-based inference customized for astronomical applications

Prospector: bayesian inference of stellar population properties from photometric and/or spectroscopic data (contributor)

blast: a web application for characterizing the host galaxies of astrophysical transients (contributor)

Proposals

NOEMA (Co-I): Extremely Compact Galaxies at Cosmic Dawn: Ultra-massive Galaxies or AGN?

ALMA Cycle 11 (Co-I): Of Dust and Dots: ALMA's View of the Brightest of JWST's Little Red Dots

HST GO Cycle 32 (Co-I): Fulfilling the UV Legacy of the Hubble and Webb Deep Public Frontier Field

HST GO Cycle 32 (Co-I): Mg II Maps to Reveal How Ionizing Photons Escape Local LyC-emitting Galaxies

JWST GO Cycle 3 (Co-I): Clumpy Relics: The First Spectroscopic Confirmation of Globular Clusters at $z \sim 3$

HST GO Cycle 31 (Co-I): The Optical Emission of the Highest Redshift Lens System

JWST GO Cycle 2 (Co-I): Medium Bands, Mega Science: Spatially-resolved Spectrophotometry of 50,000 sources at $z = 0.3 - 12$

JWST GO Cycle 2 (Co-I): Extremely Massive Galaxies in the Early Universe: A Challenge to ΛCDM?

HST GO Cycle 30 (Co-I): Are There Two Classes of Lyman-leaky Galaxies?

HST GO Cycle 30 (Co-I): Resolving Lyman Alpha Emission in a Complete Sample of Lyman Continuum Leakers and Non-leakers

HST GO Cycle 30 (Co-I): The Lyman-alpha and Continuum Origins Survey

JWST GO Cycle 1 (Co-I): LyC22—Deep Spectroscopic Insights on Star-forming Galaxies 2.2 Gyr After the Big Bang

Co-authored Publications

Peer-reviewed

[19]I. Labbé, J. E. Greene, et al., "UNCOVER: Candidate Red Active Galactic Nuclei at $3 < z < 7$ with JWST and ALMA", ApJ **978**, 92 (2025).

[20]J. F. W. Baggen, P. van Dokkum, et al., "The Small Sizes and High Implied Densities of "Little Red Dots" with Balmer Breaks Could Explain Their Broad Emission Lines without an Active Galactic Nucleus", ApJL **977**, L13 (2024).

[21]I. Chemerynska, H. Atek, et al., "The Extreme Low-mass End of the Mass–Metallicity Relation at $z \sim 7$", ApJL **976**, L15 (2024).

[22]K. A. Suess, J. R. Weaver, et al., "Medium Bands, Mega Science: A JWST/NIRCam Medium-band Imaging Survey of A2744", ApJ **976**, 101 (2024).

[23]D. J. Setton, G. Khullar, et al., "UNCOVER NIRSpec/PRISM Spectroscopy Unveils Evidence of Early Core Formation in a Massive, Centrally Dusty Quiescent Galaxy at $z_{\rm spec} = 3.97$", ApJ **974**, 145 (2024).

[24]R. Bezanson, I. Labbe, et al., "The JWST UNCOVER Treasury Survey: Ultradeep NIRSpec and NIRCam Observations before the Epoch of Reionization", ApJ **974**, 92 (2024).

[25]O. Bait, S. Borthakur, et al., "Low-redshift Lyman Continuum Survey (LzLCS). Radio continuum properties of low-z Lyman continuum emitters", A&A **688**, A198, A198 (2024).

[26]F. Leclercq, J. Chisholm, et al., "Linking Mg II and [O II] Spatial Distribution to Ionizing Photon Escape in Confirmed LyC Leakers and Non-leakers", A&A **687**, A73 (2024).

[27]I. Chemerynska, H. Atek, et al., "JWST UNCOVER: The Overabundance of Ultraviolet-luminous Galaxies at z > 9", MNRAS **531**, 2615–2625 (2024).

[28]S. E. Cutler, K. E. Whitaker, et al., "Two Distinct Classes of Quiescent Galaxies at Cosmic Noon Revealed by JWST PRIMER and UNCOVER", ApJL **967**, L23 (2024).

[29]L. J. Furtak, I. Labbé, et al., "A High Black-hole-to-host Mass Ratio in a Lensed AGN in the Early Universe", Nature **628**, 57–61 (2024).

[30]L. Wright, K. E. Whitaker, et al., "Remarkably Compact Quiescent Candidates at $3 < z < 5$ in JWST-CEERS", ApJL **964**, L10 (2024).

[31]J. E. Greene, I. Labbé, et al., "UNCOVER Spectroscopy Confirms the Surprising Ubiquity of Active Galactic Nuclei in Red Sources at $z > 5$", ApJ **964**, 39 (2024).

[32]H. Atek, I. Labbé, et al., "Most of the Photons that Reionized the Universe Came from Dwarf Galaxies", Nature **626**, 975–978 (2024).

[33]A. J. Burgasser, R. Bezanson, et al., "UNCOVER: JWST Spectroscopy of Three Cold Brown Dwarfs at Kiloparsec-scale Distances", ApJ **962**, 177 (2024).

[34]R. O. Amorín, M. Rodríguez-Henríquez, et al., "Ubiquitous Broad-line Emission and the Relation between Ionized Gas Outflows and Lyman Continuum Escape in Green Pea Galaxies", A&A **682**, L25 (2024).

[35]J. R. Weaver, S. E. Cutler, et al., "The UNCOVER Survey: A First-look HST + JWST Catalog of 60,000 Galaxies near A2744 and beyond", ApJS **270**, 7 (2024).

[36]A. D. Goulding, J. E. Greene, et al., "UNCOVER: The Growth of the First Massive Black Holes from JWST/NIRSpec – Spectroscopic Redshift Confirmation of an X-Ray Luminous AGN at z = 10.1", ApJL **955**, L24 (2023).

[37]J. F. W. Baggen, P. van Dokkum, et al., "Sizes and Mass Profiles of Candidate Massive Galaxies Discovered by JWST at $7 < z < 9$: Evidence for Very Early Formation of the Central 100 pc of Present-day Ellipticals", ApJL **955**, L12 (2023).

[38]E. P. Mathews, J. Leja, et al., "As Simple as Possible but No Simpler: Optimizing the Performance of Neural Net Emulators for Galaxy SED Fitting", ApJ **954**, 132 (2023).

[39]V. Kokorev, S. Fujimoto, et al., "UNCOVER: A NIRSpec Identification of a Broad-line AGN at z = 8.50", ApJL **957**, L7 (2023).

[40]L. J. Furtak, A. Zitrin, et al., "UNCOVERing the Extended Strong Lensing Structures of Abell 2744 with the Deepest JWST Imaging", MNRAS **523**, 4568–4582 (2023).

[41]L. J. Furtak, A. Zitrin, et al., "JWST UNCOVER: Extremely Red and Compact Object at $z_{\rm phot} \sim 7.6$ Triply Imaged by A2744", ApJ **952**, 142 (2023).

[42]E. J. Nelson, K. A. Suess, et al., "JWST Reveals a Population of Ultrared, Flattened Galaxies at $2 \lesssim z \lesssim 6$ Previously Missed by HST", ApJL **948**, L18 (2023).

[43]I. Labbé, P. van Dokkum, et al., "A Population of Red Candidate Massive Galaxies ∼600 Myr after the Big Bang", Nature **616**, 266–269 (2023).

[44]J. Chisholm, A. Saldana-Lopez, et al., "The Far-ultraviolet Continuum Slope as a Lyman Continuum Escape Estimator at High Redshift", MNRAS **517**, 5104–5120 (2022).

[45]X. Xu, A. Henry, et al., "Tracing Lyα and LyC Escape in Galaxies with Mg II Emission", ApJ **933**, 202 (2022).

[46]R. Marques-Chaves, D. Schaerer, et al., "No Correlation of the Lyman Continuum Escape Fraction with Spectral Hardness", A&A **663**, L1 (2022).

[47]S. R. Flury, A. E. Jaskot, et al., "The Low-redshift Lyman Continuum Survey. I. New, Diverse Local Lyman Continuum Emitters", ApJS **260**, 1 (2022).

[48]W. Wang, S. A. Kassin, et al., "The Baltimore Oriole's Nest: Cool Winds from the Inner and Outer Parts of a Star-forming Galaxy at z = 1.3", ApJ **930**, 146 (2022).

[49]S. R. Flury, A. E. Jaskot, et al., "The Low-redshift Lyman Continuum Survey. II. New Insights into LyC Diagnostics", ApJ **930**, 126 (2022).

[50]J. W. Appel, Z. Xu, et al., "On-sky Performance of the CLASS Q-band Telescope", ApJ **876**, 126 (2019).

[51]F. Krauß, K. Deoskar, et al., "Fermi/LAT Counterparts of IceCube Neutrinos Above 100 TeV", A&A **620**, A174 (2018).

[52]K. Harrington, J. Eimer, et al., "Variable-delay Polarization Modulators for the CLASS Telescopes", SPIE, 107082M (2018).

[53]J. Iuliano, J. Eimer, et al., "The Cosmology Large Angular Scale Surveyor Receiver Design", SPIE, 1070828 (2018).

[54]S. Dahal, A. Ali, et al., "Design and Characterization of the Cosmology Large Angular Scale Surveyor 93 GHz Focal Plane", SPIE, 107081Y (2018).

Preprints

[55]T. B. Miller, K. A. Suess, et al., "JWST UNCOVERs the Optical Size - Stellar Mass Relation at $4 < z < 8$: Rapid Growth in the Sizes of Low Mass Galaxies in the First Billion Years of the Universe", arXiv e-prints, arXiv:2412.06957 (2024).

[56]I. Labbe, J. E. Greene, et al., "An unambiguous AGN and a Balmer break in an Ultraluminous Little Red Dot at z=4.47 from Ultradeep UNCOVER and All the Little Things Spectroscopy", arXiv e-prints, arXiv:2412.04557 (2024).

[57]D. J. Setton, J. E. Greene, et al., "Little Red Dots at an Inflection Point: Ubiquitous "V-Shaped" Turnover Consistently Occurs at the Balmer Limit", arXiv e-prints, arXiv:2411.03424 (2024).

[58]D. O. Jones, P. McGill, et al., "Blast: a Web Application for Characterizing the Host Galaxies of Astrophysical Transients", arXiv e-prints, arXiv:2410.17322 (2024).

[59]N. Roy, T. Heckman, et al., "Lyman Continuum Leakage from Massive Leaky Starbursts: A Different Class of Emitters?", arXiv e-prints, arXiv:2410.13254 (2024).

[60]Y. Ma, J. E. Greene, et al., "UNCOVER: 404 Error – Models Not Found for the Triply Imaged Little Red Dot A2744-QSO1", arXiv e-prints, arXiv:2410.06257 (2024).

[61]H. Treiber, J. Greene, et al., "UNCOVERing the High-Redshift AGN Population Among Extreme UV Line Emitters", arXiv e-prints, arXiv:2409.12232 (2024).

[62]S. R. Flury, A. E. Jaskot, et al., "The Low-Redshift Lyman Continuum Survey: The Roles of Stellar Feedback and ISM Geometry in LyC Escape", arXiv e-prints, arXiv:2409.12118 (2024).

[63]J. Siegel, D. Setton, et al., "UNCOVER: Significant Reddening in Cosmic Noon Quiescent Galaxies", arXiv e-prints, arXiv:2409.11457 (2024).

[64]A. de Graaff, G. Brammer, et al., "RUBIES: a Complete Census of the Bright and Red Distant Universe with JWST/NIRSpec", arXiv e-prints, arXiv:2409.05948 (2024).

[65]A. Weibel, A. de Graaff, et al., "RUBIES Reveals a Massive Quiescent Galaxy at z=7.3", arXiv e-prints, arXiv:2409.03829 (2024).

[66]S. H. Price, R. Bezanson, et al., "The UNCOVER Survey: First Release of Ultradeep JWST/NIRSpec PRISM spectra for ∼700 galaxies from z∼0.3-13 in Abell 2744", arXiv e-prints, arXiv:2408.03920 (2024).

[67]A. de Graaff, D. J. Setton, et al., "Efficient Formation of a Massive Quiescent Galaxy at Redshift 4.9", arXiv e-prints, arXiv:2404.05683 (2024).

[68]I. G. B. Wold, S. Malhotra, et al., "UNCOVERing the Faint-End of the z=7 [OIII] Luminosity Function with JWST's F410M Medium Bandpass Filter", arXiv e-prints, arXiv:2407.19023 (2024).

[69]S. Fujimoto, R. Bezanson, et al., "DUALZ: Deep UNCOVER-ALMA Legacy High-Z Survey", arXiv e-prints, arXiv:2309.07834 (2023).

[70]S. H. Price, K. A. Suess, et al., "UNCOVER: The Rest Ultraviolet to Near Infrared Multiwavelength Structures and Dust Distributions of Sub-millimeter-Detected Galaxies in Abell 2744", arXiv e-prints, arXiv:2310.02500 (2023).

[71]M. Trebitsch, P. Dayal, et al., “Reionization with Star-forming Galaxies: Insights from the Low-z Lyman Continuum Survey”, arXiv e-prints, arXiv:2212.06177 (2022).