Bingjie Wang

Postdoc, Astronomy & Astrophysics
The Pennsylvania State University
520 Davey Laboratory, University Park, PA 16802, USA

bwang@psu.edu
https://wangbingjie.github.io

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 Position

Postdoctoral Scholar — 2022–present
The Pennsylvania State University

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

Publications

11 as first author, 55 in total (as of 06/2024).
For first-author only: h-index = 9, citations > 250; ADS.
For all publications: h-index = 25, citations > 2000; these are listed in a separate section at the end; ADS.

First Author

[1]**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).

[2]**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).

[3]**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).

[4]**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).

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

[6]**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).

[7]**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).

[8]**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).

[9]**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).

[10]**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).

[11]**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

[12]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).

[13]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", arXiv e-prints, arXiv:2308.11609 (2023).

[14]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).

[15]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).

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

[17]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)

PHYSTAT–Simulation Based Inference in Fundamental Physics, Max Planck Institute for Physics (**invited focus talk**, 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 $\times$ 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
"Too many stars, too fast?"; AAS NOVA research highlights 2024
see also the PSU release (Space.com, The Independent, ...)
"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 commentaries for:

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

JWST Director's Discretionary proposal reviewer 2024
NASA proposal review: panelist 2023
Reviewer for *The Astrophysical Journal*, *The Astrophysical Journal Letters* 2021–

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

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

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)

Proposals

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

[18]K. A. Suess, J. R. Weaver, et al., "Medium Bands, Mega Science: a JWST/NIRCam Medium-Band Imaging Survey of Abell 2744", arXiv e-prints, arXiv:2404.13132 (2024).

[19]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).

[20]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 $z_{spec} = 3.97$", arXiv e-prints, arXiv:2402.05664 (2024).

[21]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).

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

[23]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).

[24]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).

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

[26]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).

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

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

[29]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).

[30]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).

[31]O. Bait, S. Borthakur, et al., "The Low-redshift Lyman Continuum Survey: Radio Continuum Properties of Low-z Lyman Continuum Emitters", arXiv e-prints, arXiv:2310.18817 (2023).

[32]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).

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

[34]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).

[35]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).

[36]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).

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

[38]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).

[39]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).

[40]I. Labbé, J. E. Greene, et al., "UNCOVER: Candidate Red Active Galactic Nuclei at $3 < z < 7$ with JWST and ALMA", arXiv e-prints, arXiv:2306.07320 (2023).

[41]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).

[42]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).

[43]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).

[44]R. Bezanson, I. Labbe, et al., "The JWST UNCOVER Treasury Survey: Ultradeep NIRSpec and NIRCam ObserVations before the Epoch of Reionization", arXiv e-prints, arXiv:2212.04026 (2022).

[45]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).

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

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

[48]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).

[49]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).

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

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

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

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

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

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