

JAKOB M. HELTON

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CURRENT POSITION AND RESEARCH INTERESTS

I am an Evolving Universe Postdoctoral Scholar at The Pennsylvania State University. My time is spent studying high-redshift galaxies, high-redshift galaxy clusters, and the large-scale structure of the Universe. I am one of the key members of the James Webb Space Telescope (JWST) Advanced Deep Extragalactic Survey (JADES) in addition to the Near Infrared Camera (NIRCam) and Mid-Infrared Instrument (MIRI) Science Teams. My contributions to extragalactic astronomy have been featured in national and international press, and I have worked to share my work and acquired knowledge with the broader community. I have extensive experience in academic research, problem solving, public speaking, and technical writing.

EDUCATION

University of Arizona

August 2021 - July 2025

Degree: M.S. and Ph.D. in Astronomy and Astrophysics

Thesis: *At the Break of Cosmic Dawn: Identifying and Understanding the Most Distant Galaxies and Galaxy Clusters with JWST* (Advisors: Marcia Rieke and Kevin Hainline)

Princeton University

September 2017 - May 2021

Degree: A.B. in Astrophysical Sciences with High Honors

Thesis: *The Nebular Properties of Star-Forming Galaxies at Intermediate Redshifts from LEGA-C* (Advisors: Allison Strom and Jenny Greene)

PUBLICATIONS

[Link to ADS Public Library](#)

Last Updated: 20 August 2025

Summary of All Publications

number: 69; citations: 5693; h-index: 34

Summary of Refereed Publications

number: 49; citations: 5009; h-index: 33

First-Author

- [6] **J. M. Helton**, S. Alberts, G. H. Rieke, et al., *The Stellar Populations and Rest-Frame Colors of Star-Forming Galaxies at $z \approx 8$: Exploring the Impact of Filter Choice and Star Formation History Assumption with JADES*, 2025, [ApJ, in review](#)
- [5] **J. M. Helton**, G. H. Rieke, S. Alberts, et al., *Photometric detection at $7.7 \mu\text{m}$ of a galaxy beyond redshift 14 with JWST/MIRI*, 2025, [Nature Astronomy](#), 9, 729
- [4] **J. M. Helton**, F. Sun, C. Woodrum, et al., *Identification of High-Redshift Galaxy Overdensities in GOODS-N and GOODS-S*, 2024, [ApJ](#), 974, 41

- [3] **J. M. Helton**, F. Sun, C. Woodrum, et al., *The JWST Advanced Deep Extragalactic Survey: Discovery of an Extreme Galaxy Overdensity at $z = 5.4$ with JWST/NIRCam in GOODS-S*, 2024, [ApJ, 962, 124](#)
- [2] **J. M. Helton**, A. L. Strom, J. E. Greene, et al., *The nebular properties of star-forming galaxies at intermediate redshift from the Large Early Galaxy Astrophysics Census*, 2022, [ApJ, 934, 81](#)
- [1] **J. M. Helton**, S. D. Johnson, J. E. Greene, et al., *Discovery and origins of giant optical nebulae surrounding quasar PKS0454-22*, 2021, [MNRAS, 505, 4](#)

Second-Author

- [4] Y. Fudamoto, **J. M. Helton**, X. Lin, et al., *SAPPHIRES: A Galaxy Over-Density in the Heart of Cosmic Reionization at $z = 8.47$* , 2025, [ApJ, in review](#)
- [3] F. D'Eugenio, **J. M. Helton**, K. N. Hainline, et al., *JADES and SAPPHIRES: Galaxy Metamorphosis Amidst a Huge, Luminous Emission-Line Region*, 2025, [MNRAS, accepted](#)
- [2] K. N. Hainline, **J. M. Helton**, B. D. Johnson, et al., *Brown Dwarf Candidates in the JADES and CEERS Extragalactic Surveys*, 2024, [ApJ, 964, 66](#)
- [1] F. Sun, **J. M. Helton**, E. Egami, et al., *JADES: Resolving the Stellar Component and Filamentary Overdense Environment of Hubble Space Telescope (HST)-dark Submillimeter Galaxy HDF850.1 at $z = 5.18$* , 2024, [ApJ, 961, 69](#)

Third-Author

- [2] L. Sandles, F. D'Eugenio, **J. M. Helton**, et al., *JADES: deep spectroscopy of a low-mass galaxy at redshift 2.3 quenched by environment*, 2023, [A&A, in review](#)
- [1] S. Alberts, C. C. Williams, **J. M. Helton**, et al., *To high redshift and low mass: exploring the emergence of quenched galaxies and their environments at $3 < z < 6$ in the ultra-deep JADES MIRI F770W parallel*, 2024, [ApJ, 975, 85](#)

Co-Author with Major Contributions

- [22] X. Lin, E. Egami, et al., including **J. M. Helton**, *The Large-scale Environments of Low-luminosity AGNs at $3.9 < z < 6.0$ and Implications for Their Host Dark Matter Halos from a Complete NIRCam Grism Redshift Survey*, 2025, [ApJ, in review](#)
- [21] X. Lin, E. Egami, et al., including **J. M. Helton**, *The Luminosity Function and Clustering of H α Emitting Galaxies at $z \approx 4 - 6$ from a Complete NIRCam Grism Redshift Survey*, 2025, [ApJ, in review](#)
- [20] F. Sun, Y. Fudamoto, et al., including **J. M. Helton**, *Slitless Areal Pure-Parallel HIgh-Redshift Emission Survey (SAPPHIRES): Early Data Release of Deep JWST/NIRCam Images and Spectra in MACS J0416 Parallel Field*, 2025, [ApJ, in review](#)

- [19] Z. Ji, C. C. Williams, et al., including **J. M. Helton**, *Extended hot dust emission around the earliest massive quiescent galaxy*, 2024, [Nature, in review](#)
- [18] Z. Li, Z. Cai, et al., including **J. M. Helton**, *MAGNIF: A Tentative Lensed Rotating Disk at $z = 8.34$ detected by JWST NIRCam WFSS with Dynamical Forward Modeling*, 2023, [ApJ, in review](#)
- [17] Y. Zhu, S. Alberts, et al., including **J. M. Helton**, *SMILES: Potentially Higher Ionizing Photon Production Efficiency in Overdense Regions*, 2025, [ApJ, 986, 18](#)
- [16] J. Witstok, P. Jakobsen, et al., including **J. M. Helton**, *Witnessing the onset of reionization through Lyman- α emission at redshift 13*, 2025, [Nature, 639, 897](#)
- [15] K. N. Hainline, R. Maiolino, et al., including **J. M. Helton**, *An Investigation into the Selection and Colors of Little Red Dots and Active Galactic Nuclei*, 2025, [ApJ, 979, 138](#)
- [14] J. Witstok, R. Maiolino, et al., including **J. M. Helton**, *JADES: Primaeval Lyman- α emitting galaxies reveal early sites of reionization out to redshift $z \sim 9$* , 2025, [MNRAS, 536, 27](#)
- [13] S. Alberts, J. Lyu, et al., including **J. M. Helton**, *SMILES Initial Data Release: Unveiling the Obscured Universe with MIRI Multiband Imaging*, 2024, [ApJ, 976, 224](#)
- [12] K. N. Hainline, F. D'Eugenio, et al., including **J. M. Helton**, *Searching for Emission Lines at $z > 11$: The Role of Damped Ly α and Hints About the Escape of Ionizing Photons*, 2024, [ApJ, 976, 160](#)
- [11] K. N. Hainline, F. D'Eugenio, et al., including **J. M. Helton**, *JADES: Spectroscopic Confirmation and Proper Motion for a T-Dwarf at 2 kpc*, 2024, [ApJ, 975, 31](#)
- [10] S. Carniani, K. Hainline, et al., including **J. M. Helton**, *Spectroscopic confirmation of two luminous galaxies at a redshift of 14*, 2024, [Nature, 633, 318](#)
- [9] S. Lim, S. Tacchella, et al., including **J. M. Helton**, *The FLAMINGO simulation view of cluster progenitors observed in the epoch of reionization with JWST*, 2024, [MNRAS, 532, 4551](#)
- [8] B. Robertson, B. D. Johnson, et al., including **J. M. Helton**, *Earliest Galaxies in the JADES Origins Field: Luminosity Function and Cosmic Star-Formation Rate Density 300 Myr after the Big Bang*, 2024, [ApJ, 970, 31](#)
- [7] Y. Sun, G.-H. Lee, et al., including **J. M. Helton**, *Evolution of gas flows along the starburst to post-starburst to quiescent galaxy sequence*, 2024, [MNRAS, 682, 40](#)
- [6] K. N. Hainline, B. D. Johnson, et al., including **J. M. Helton**, *The Cosmos in its Infancy: JADES Galaxy Candidates at $z > 8$ in GOODS-S and GOODS-N*, 2024, [ApJ, 964, 71](#)
- [5] J. Witstok, R. Smit, et al., including **J. M. Helton**, *Inside the bubble: exploring the environments of reionization-era Lyman- α emitting galaxies with JADES and FRESCO*, 2024, [A&A, 682, A40](#)

- [4] S. Tacchella, D. J. Eisenstein, et al., including **J. M. Helton**, *JADES Imaging of GN-z11: Revealing the Morphology and Environment of a Luminous Galaxy 430 Myr After the Big Bang*, 2023, [ApJ, 952, 74](#)
- [3] E. Curtis-Lake, S. Carniani, et al., including **J. M. Helton**, *Spectroscopic confirmation of four metal-poor galaxies at $z = 10.3 - 13.2$* , 2023, [Nature Astronomy, 7, 622](#)
- [2] B. E. Robertson, S. Tacchella, et al., including **J. M. Helton**, *Identification and properties of intense star-forming galaxies at redshifts $z > 10$* , 2023, [Nature Astronomy, 7, 611](#)
- [1] S. Aiola, E. Calabrese, et al., including **J. M. Helton**, *The Atacama Cosmology Telescope: DR4 Maps and Cosmological Parameters*, 2020, [JCAP, 12, 047](#)

Co-Author with Minor Contributions

- [34] Y. Zhu, N. Bonaventura, et al., including **J. M. Helton**, *SMILES Data Release II: Probing Galaxy Evolution during Cosmic Noon and Beyond with NIRSpec Medium-Resolution Spectra*, 2025, [MNRAS, in review](#)
- [33] C. Simmonds, S. Tacchella, et al., including **J. M. Helton**, *Bursting at the seams: the star-forming main sequence and its scatter at $z = 3 - 9$ using NIRCam photometry from JADES*, 2025, [MNRAS, in review](#)
- [32] J. Witstok, R. Smit, et al., including **J. M. Helton**, *On the origins of oxygen: ALMA and JWST characterize the multi-phase, metal-enriched, star-bursting medium within a ‘normal’ $z > 11$ galaxy*, 2025, [ApJ, in review](#)
- [31] Z. Wu, D. J. Eisenstein, et al., including **J. M. Helton**, *JADES-GS-z14-1: A Compact, Faint Galaxy at $z \approx 14$ with Weak Metal Lines from Extremely Deep JWST MIRI, NIRCam, and NIRSpec Observations*, 2025, [ApJ, in review](#)
- [30] T. Y.-Y. Hsiao, F. Sun, et al., including **J. M. Helton**, *SAPPHIRES: Extremely Metal-Poor Galaxy Candidates with $12 + \log(O/H) < 7.0$ at $z \sim 5 - 7$ from Deep JWST/NIRCam Grism Observations*, 2025, [ApJ, in review](#)
- [29] J. Zhang, E. Egami, et al., including **J. M. Helton**, *Abundant Population of Broad $H\alpha$ Emitters in the GOODS-N Field Revealed by CONGRESS, FRESCO, and JADES*, 2025, [ApJ, in review](#)
- [28] A. L. Danhaive, S. Tacchella, et al., including **J. M. Helton**, *The dawn of disks: unveiling the turbulent ionized gas kinematics of the galaxy population at $z \sim 4 - 6$ with JWST/NIRCam grism spectroscopy*, 2025, [MNRAS, in review](#)
- [27] P. Rinaldi, N. Bonaventura, et al., including **J. M. Helton**, *Not Just a Dot: the complex UV morphology and underlying properties of Little Red Dots*, 2024, [ApJ, in review](#)
- [26] Z. Ji, C. C. Williams, et al., including **J. M. Helton**, *JADES: Rest-frame UV-to-NIR Size Evolution of Massive Quiescent Galaxies from Redshift $z = 5$ to $z = 0.5$* , 2024, [ApJ, in review](#)

- [25] D. J. Eisenstein, B. D. Johnson, et al., including **J. M. Helton**, *The JADES Origins Field: A New JWST Deep Field in the JADES Second NIRCam Data Release*, 2023, [ApJ, in review](#)
- [24] D. J. Eisenstein, C. Willott, et al., including **J. M. Helton**, *Overview of the JWST Advanced Deep Extragalactic Survey (JADES)*, 2023, [ApJ, in review](#)
- [23] L. Whitler, D. P. Stark, et al., including **J. M. Helton**, *The $z \geq 9$ galaxy UV luminosity function from the JWST Advanced Deep Extragalactic Survey: insights into early galaxy evolution and reionization*, 2025, [ApJ, accepted](#)
- [22] K. Ormerod, J. Witstok, et al., including **J. M. Helton**, *Detection of the 2175 Å UV Bump at $z > 7$: Evidence for Rapid Dust Evolution in a Merging Reionization-Era Galaxy*, 2025, [MNRAS, accepted](#)
- [21] S. Tacchella, W. McClymont, et al., including **J. M. Helton**, *Resolving the nature and putative nebular emission of GS9422: an obscured AGN without exotic stars*, 2025, [MNRAS, 540, 1](#)
- [20] Y. Zhu, M. J. Rieke, et al., including **J. M. Helton**, *A Systematic Search for Galaxies with Extended Emission Lines and Potential Outflows in JADES Medium-band Images*, 2025, [ApJ, 986, 162](#)
- [19] S. Carniani, F. D'Eugenio, et al., including **J. M. Helton**, *The eventful life of a luminous galaxy at $z = 14$: metal enrichment, feedback, and low gas fraction?*, 2025, [A&A, 696, A87](#)
- [18] F. D'Eugenio, A. J. Cameron, et al., including **J. M. Helton**, *JADES Data Release 3: NIRSpec/Microshutter Assembly Spectroscopy for 4000 Galaxies in the GOODS Fields*, 2025, [ApJS, 277, 4](#)
- [17] W. M. Baker, S. Tacchella, et al., including **J. M. Helton**, *A core in a star-forming disc as evidence of inside-out growth in the early Universe*, 2025, [Nature Astronomy, 9, 141](#)
- [16] F. D'Eugenio, R. Maiolino, et al., including **J. M. Helton**, *JWST/NIRSpec WIDE survey: a $z = 4.6$ low-mass star-forming galaxy hosting a jet-driven shock with low ionization and solar metallicity*, 2025, [MNRAS, 536, 51](#)
- [15] Y. Sun, J. Lyu, et al., including **J. M. Helton**, *No Evidence for a Significant Evolution of $M_\bullet - M_*$ Relation in Massive Galaxies up to $z \sim 4$* , 2025, [ApJ, 978, 98](#)
- [14] C. Woodrum, M. J. Rieke, et al., including **J. M. Helton**, *JADES: Using NIRCam photometry to investigate the dependence of stellar mass inferences on the IMF in the early Universe*, 2024, [PNAS, 121, 42](#)
- [13] Z. Ji, C. C. Williams, et al., including **J. M. Helton**, *JADES+JEMS: A Detailed Look at the Buildup of Central Stellar Cores and Suppression of Star Formation in Galaxies at Redshifts $3 < z < 4.5$* , 2024, [ApJ, 974, 135](#)

- [12] A. J. Bunker, A. J. Cameron, et al., including **J. M. Helton**, *JADES NIRSpec initial data release for the Hubble Ultra Deep Field: redshifts and line fluxes of distant galaxies from the deepest JWST Cycle 1 NIRSpec multi-object spectroscopy*, 2024, [A&A, 690, 288](#)
- [11] R. Endsley, D. P. Stark, et al., including **J. M. Helton**, *The star-forming and ionizing properties of dwarf $z \sim 6 - 9$ galaxies in JADES: insights on bursty star formation and ionized bubble growth*, 2024, [MNRAS, 533, 1111](#)
- [10] C. C. Williams, S. Alberts, et al., including **J. M. Helton**, *The Galaxies Missed by Hubble and ALMA: The Contribution of Extremely Red Galaxies to the Cosmic Census at $3 < z < 8$* , 2024, [ApJ, 968, 34](#)
- [9] A. Saxena, A. J. Bunker, et al., including **J. M. Helton**, *JADES: The production and escape of ionizing photons from faint Lyman-alpha emitters in the epoch of reionization*, 2024, [A&A, 684, A84](#)
- [8] M. Curti, R. Maiolino, et al., including **J. M. Helton**, *JADES: Insights into the low-mass end of the mass-metallicity-SFR relation at $3 < z < 10$ from deep JWST/NIRSpec spectroscopy*, 2024, [A&A, 684, A75](#)
- [7] R. Maiolino, J. Scholtz, et al., including **J. M. Helton**, *A small and vigorous black hole in the early Universe*, 2024, [Nature, 627, 8002](#)
- [6] M. J. Rieke, B. Robertson, et al., including **J. M. Helton**, *JADES Initial Data Release for the Hubble Ultra Deep Field: Revealing the Faint Infrared Sky with Deep JWST NIRCam Imaging*, 2023, [ApJS, 269, 16](#)
- [5] C. C. Williams, S. Tacchella, et al., including **J. M. Helton**, *JEMS: A Deep Medium-band Imaging Survey in the Hubble Ultra Deep Field with JWST NIRCam and NIRISS*, 2023, [ApJS, 268, 64](#)
- [4] A. J. Cameron, A. Saxena, et al., including **J. M. Helton**, *JADES: Probing interstellar medium conditions at $z \approx 5.5 - 9.5$ with ultra-deep JWST/NIRSpec spectroscopy*, 2023, [A&A, 677, A115](#)
- [3] A. J. Bunker, A. Saxena, et al., including **J. M. Helton**, *JADES NIRSpec Spectroscopy of GN-z11: Lyman- α emission and possible enhanced nitrogen abundance in a $z = 10.60$ luminous galaxy*, 2023, [A&A, 677, A88](#)
- [2] S. Tacchella, B. D. Johnson, et al., including **J. M. Helton**, *JWST NIRCam+NIRSpec: interstellar medium and stellar populations of young galaxies with rising star formation and evolving gas reservoirs*, 2023, [MNRAS, 522, 4](#)
- [1] B. E. Robertson, S. Tacchella, et al., including **J. M. Helton**, *Morpheus Reveals Distant Disk Galaxy Morphologies with JWST: The First AI/ML Analysis of JWST Images*, 2023, [ApJ, 942, 42](#)

SELECTED PRESENTATIONS

- [10] **Invited outreach talk** at the North Houston Astronomy Club in Humble, TX (August 2025). *Understanding the Most Distant Galaxies and Galaxy Clusters with the James Webb Space Telescope (JWST)*.
- [9] **Contributed talk** at the “NIRCam Team Meeting” in Tucson, AZ (March 2025). *JWST/NIRCam and JWST/MIRI at the Highest Redshifts*.
- [8] **Contributed talk** at the “MIRI Team Meeting” in Tucson, AZ (October 2024). *JWST/MIRI at the Highest Redshifts*.
- [7] **Invited talk** at the “Cosmic Dawn Revealed by JWST: The Physics of the First Stars, Galaxies, and Black Holes” Conference in Santa Barbara, CA (August 2024). *Identification of High-Redshift Galaxy Overdensities in GOODS-N and GOODS-S*.
- [6] **Invited outreach talk** at the Sun City Oro Valley Astronomy Club in Oro Valley, AZ (March 2024). *Understanding the Most Distant Galaxies and Galaxy Clusters with the James Webb Space Telescope (JWST)*.
- [5] **Contributed poster** at the “242th American Astronomical Society Meeting” in Albuquerque, NM (June 2023). *The JWST Advanced Deep Extragalactic Survey: Discovery of an Extreme Galaxy Overdensity at $z = 5.4$ with JWST/NIRCam in GOODS-S*.
- [4] **Contributed talk** at the “100 Years of Astronomy at the University of Arizona” Celebration in Tucson, AZ (April 2023). *The JWST Advanced Deep Extragalactic Survey: Discovery of an Extreme Galaxy Overdensity at $z = 5.4$ with JWST/NIRCam in GOODS-S*.
- [3] **Contributed talk** at the “Early Results from the James Webb Space Telescope” Conference in Cambridge, United Kingdom (March 2023). *The JWST Advanced Deep Extragalactic Survey: Discovery of an Extreme Galaxy Overdensity at $z = 5.4$ with JWST/NIRCam in GOODS-S*.
- [2] **Outreach talk** at the Canyon del Oro High School in Oro Valley, AZ (December 2022). *An Overview of the James Webb Space Telescope (JWST)*.
- [1] **Contributed poster** at the “International Astronomical Union Symposium 373” in Busan, South Korea (August 2022). *The Spatially Resolved Star-Formation Histories of Post-Starburst Galaxies in SDSS-IV MaNGA*.

TELESCOPE ALLOCATIONS

JWST/MIRI	62.8 Hours	(PID: 8544; PI)
JWST/NIRSpec	71.7 Hours	(PID: 8018; Co-I)
JWST/NIRSpec	36.3 Hours	(PID: 7935; Co-I)
JWST/NIRSpec	14.2 Hours	(PID: 7335; Co-I)
JWST/NIRCam & JWST/MIRI in parallel	19.6 Hours	(PID: 4549; Co-PI)
JWST/NIRCam & JWST/MIRI in parallel	37.2 Hours	(PID: 4540; Co-I)

JWST/NIRSpec	24.5 Hours (PID: 3659 ; Co-I)
JWST/NIRCam	27.6 Hours (PID: 3577 ; Co-I)
JWST/NIRCam & JWST/NIRSpec in parallel	135.6 Hours (PID: 3215 ; Co-I)
JWST/NIRSpec	24.3 Hours (PID: 2959 ; Co-I)
JWST/NIRCam & JWST/NIRISS in parallel	42.5 Hours (PID: 2883 ; Co-I)
MMT/Binospec	2.0 Nights (PI)
Keck/MOSFIRE	0.5 Nights (Co-I)
Magellan/IMACS	5.0 Nights (Co-I)
Magellan/FIRE	6.5 Nights (Co-I)
MMT/Binospec	3.0 Nights (Co-I)

EXTRA-CURRICULARS

University of Arizona	<i>June 2023 - June 2025</i>
Co-organizer for the Early Universe/REionization Conversations at Arizona (EURECA) at the Department of Astronomy and Steward Observatory.	
Carnegie Observatories	<i>June 2020 - June 2025</i>
Mentor for the Carnegie Astrophysics Summer Student Internship (CASSI) Program.	
Princeton University	<i>January 2018 - May 2021</i>
Head Tutor for Single-Variable Calculus, Multi-Variable Calculus, and Linear Algebra at the McGraw Center for Teaching and Learning.	
Princeton University	<i>January 2020 - August 2020</i>
Co-organizer for the Galactic/Extragalactic Reading Group (Galread) at the Department of Astrophysical Sciences.	
Princeton University	<i>January 2019 - January 2020</i>
Undergraduate Teaching Assistant for Introductory Mechanics and Electromagnetism at the Department of Physics.	

MISCELLANEOUS

Invited Peer Reviewer	A&A, ApJ, MNRAS, Astron. Comput.
Programming Languages	Python, IDL, Java, Javascript, HTML/CSS
Software & Tools	Unix, Excel, L ^A T _E X, TensorFlow, FIREHOSE
Observing	Keck/MOSFIRE, Magellan/IMACS, Magellan/LDSS3

REFERENCES

Prof. Marcia Rieke	University of Arizona	mrieke@gmail.com
Prof. Kevin Hainline	University of Arizona	kevinhainline@arizona.edu
Prof. Daniel Eisenstein	Harvard University	deisenstein@cfa.harvard.edu