

# Hayley Williams

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## Employment

**Beus Prize Postdoctoral Research Fellow** Sept 2025 - Present  
 Beus Center for Cosmic Foundations  
 Arizona State University – School of Earth and Space Exploration

## Education

**Ph.D.** University of Minnesota Sept 2019 - June 2025  
 Astrophysics  
 Thesis title: *The high-redshift Universe as seen through galaxy-cluster gravitational lenses*

**B.A.** University of California, Berkeley Aug 2015 - May 2019  
 Astrophysics and Spanish Linguistics

## First-Author Publications

**A Magnified Compact Galaxy at Redshift 9.51 with Strong Nebular Emission Lines** April 2023  
*Hayley Williams, Patrick Kelly, Wenlei Chen, et al. Science, Volume 380, Issue 6643, pp. 416-420*  
[10.1126/science.adf5307](https://doi.org/10.1126/science.adf5307)

**Sp1149. I. Constraints on the Balmer  $L - \sigma$  Relation for H II Regions in a Spiral Galaxy at Redshift 1.49 Strongly Lensed by the MACS J1149 Cluster** July 2024  
*Hayley Williams, Patrick Kelly, Wenlei Chen, et al. The Astrophysical Journal, Volume 969, Issue 1, id.54*  
[10.3847/1538-4357/ad4464](https://doi.org/10.3847/1538-4357/ad4464)

**Sp1149. II. Spectroscopy of HII Regions near the Critical Curve of MACS J1149 and Cluster Lens Models** July 2024  
*Hayley Williams, Patrick Kelly, Wenlei Chen, et al. The Astrophysical Journal, Volume 967, Issue 2, id.92*  
[10.3847/1538-4357/ad4354](https://doi.org/10.3847/1538-4357/ad4354)

**JWST's PEARLS: Temperatures of Nine Highly Magnified Stars in a Galaxy at Redshift 0.94 and Simulated Stellar Population Dependence on Stellar Metallicity and the Initial Mass Function** January 2026  
*Hayley Williams, Patrick Kelly, et al. The Astrophysical Journal, Volume 996, Issue 1, id.105*  
[10.3847/1538-4357/ae1966](https://doi.org/10.3847/1538-4357/ae1966)

**JWST's PEARLS: A Candidate Massive Binary Star System in a Lensed Galaxy at Redshift 0.94** February 2026  
*Hayley Williams, Patrick Kelly, et al. The Astrophysical Journal, Volume 997, Issue 2, id.292*  
[10.3847/1538-4357/ae2003](https://doi.org/10.3847/1538-4357/ae2003)

## Selected Talks

**Highly magnified individual stars at cosmological distances: nine massive stars detected as transient events in the Warhol galaxy at  $z = 0.94$**  Sept 2025  
 Tucson, AZ  
 Invited colloquium presentation at Steward Observatory, University of Arizona

**Highly magnified stars in the Warhol arc** April 2025  
 Cambridge, MA  
 Invited talk at "Strong Lensing in the Next Decade"  
 Center for Astrophysics, Harvard & Smithsonian

**Constraints on the Balmer  $L - \sigma$  relation for H II regions in a lensed spiral galaxy at  $z = 1.49$**  June 2024  
 Madison, WI  
 Contributed Talk at the 244th meeting of the American Astronomical Society

**An extremely compact yet highly star-forming magnified galaxy at  $z = 9.51$**  May 2024  
 Reykjavik, Iceland  
 Contributed talk at "Extreme galaxies in their extreme environments at extremely early epochs"

## A highly magnified and extremely compact galaxy at $z = 9.51$ with strong emission lines

Contributed talk at "The James Webb Space Telescope turns one: the birth and growth of galaxies"  
Sixten Center for Astrophysics

July 2023  
Sesto, Italy

## Accepted Proposals

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<b>HST</b>	<b>Stellar Initial Mass Function and Dark Matter from [OII] and Paschen-alpha Emission Maps Of the Giant Dragon Arc in the Hubble Frontier Fields Galaxy Cluster Abell 370</b> <a href="#">GO 18106</a>  , PI Patrick Kelly, <i>Co-I Hayley Williams</i>	July 2025 Cycle 33
<b>Keck</b>	<b>Interpretation of HST and JWST Imaging of Individual Magnified Stars at <math>z=0.725</math> using OSIRIS AO Near-Infrared Spectroscopy</b> 2025B U232 , PI Alex Filippenko, <i>Co-I Hayley Williams</i>	June 2025 2025B
<b>JWST</b>	<b>The Dragon survey: A Direct Probe of the Early Stellar Luminosity Function and Dark Matter through Multi-cycle Multi-cadence Microlensing at <math>z=0.73</math></b> <a href="#">GO 7345</a>  , PI Yoshinobu Fudamoto, <i>Co-I Hayley Williams</i>	March 2025 Cycle 4
<b>JWST</b>	<b>JWST as a time machine: weighting the carbon produced exclusively by massive stars</b> <a href="#">GO 6073</a>  , PI Annalisa Citro, <i>Co-I Hayley Williams</i>	Feb 2024 Cycle 3
<b>JWST</b>	<b>Early stars – Properties of lensed stars at <math>z \sim 7</math></b> <a href="#">GO 5058</a>  , PI Lucas Furtak, <i>Co-I Hayley Williams</i>	Feb 2024 Cycle 3
<b>Keck</b>	<b>Flashlights: Many Extremely Magnified Individual Stars as Probes of Dark Matter and Stellar Populations to Redshift <math>z = 2</math></b> PID 75/2022B N181, PI Patrick Kelly, <i>Co-I Hayley Williams</i>	June 2022 2022B
<b>JWST</b>	<b>Imaging and Spectroscopy of Three Highly Magnified Images of a Supernova at <math>z=1.5</math></b> <a href="#">DD 2767</a>  , PI Patrick Kelly, <i>Co-I Hayley Williams</i>	Oct 2022 Cycle 1
<b>JWST</b>	<b>Imaging and Spectroscopic Follow-up of a Supernova at Redshift <math>z=3.47</math></b> <a href="#">DD 2756</a>  , PI Wenlei Chen, <i>Co-PI Hayley Williams</i>	Oct 2022 Cycle 1

## Awards

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<b>Beus Prize Postdoctoral Fellowship</b> Beus Center for Cosmic Foundations Arizona State University – School of Earth and Space Exploration	Sept 2025
<b>Robert O. Pepin Fellowship</b> University of Minnesota – School of Physics and Astronomy	May 2024

## Outreach

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<b>Our Expanding Universe</b>  Bell Museum Planetarium Show <i>Assisted with script writing and show production</i>	June 2025 Minneapolis, MN
<b>Interpreting the Invisible Universe</b>  A Project Space Grant Art Exhibition <i>Science consultant for artist Holly Streekstra</i>	August 2024 Minneapolis, MN
<b>Universe in the Park</b>  Minnesota Institute for Astrophysics Public Outreach Event <i>Gave a public astronomy presentation and led a public observing night</i>	August 2024 Minneapolis, MN

## Leadership and Service

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<b>Beus Seminar Committee</b> Arizona State University	Sept 2025 - Present
<b>Journal Club Organizer</b> University of Minnesota	Sept 2023 - May 2025