Dr. Joshua D. Lothringer

Space Telescope Science Institute
3700 San Martin Drive
Baltimore, MD 21219
Email: jlothringer@stsci.edu — Web: `jlothringer.github.io`
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Research Interests

Observing, modeling, and retrieving planetary, exoplanetary, brown dwarf, and stellar atmospheres.

Positions

Assistant Astronomer 01/2024 - Present
Space Telescope Science Institute
Baltimore, MD

Assistant Professor 08/2021-12/2023
Department of Physics
Utah Valley University
Orem, UT

Postdoctoral Fellow 08/2019-08/2021
Department of Physics and Astronomy
Johns Hopkins University
Baltimore, MD

Graduate Assistant/Associate 08/2014-08/2019
Lunar and Planetary Laboratory
University of Arizona
Tucson, AZ

Command Controller 05/2012-08/2014
Mission Operations and Data Systems,
Laboratory for Atmospheric and Space Physics
University of Colorado at Boulder
Boulder, CO

Education

Doctor of Philosophy, Planetary Science 08/2014-08/2019
Master of Science, Planetary Science 12/2016
University of Arizona, Tucson, AZ
Advisor: Prof. Travis Barman
Dissertation: *Characterizing the Atmospheres of Planet Populations: From Sub-Jovian to Ultra-hot Jupiter Exoplanets*

Bachelor of Arts, Astronomy 08/2010-12/2013
University of Colorado, Boulder CO
Concentration: Astrophysics
Minor: Philosophy

Publications
incl. submitted

1. **Lothringer, J.D.**, Sing, D. K., Rustamkulov, Z., et al. UV absorption by silicate cloud precursors in ultra-hot Jupiter WASP-178b, 2022, *Nature*, 604, 49.
2. **Lothringer, J.D.**, Rustamkulov, Z., Sing, D. K., et al. A New Window into Planet Formation and Migration: Refractory-to-Volatile Elemental Ratios in Ultra-hot Jupiters, 2021, ApJ, 914, 12.
3. **Lothringer, J.D.**, & Casewell, S. L. Atmosphere Models of Brown Dwarfs Irradiated by White Dwarfs: Analogs for Hot and Ultrahot Jupiters, 2020, ApJ, 905, 163.
4. **Lothringer, J.D.**, Fu, G., Sing, D. K., & Barman, T. S. UV Exoplanet Transmission Spectral Features as Probes of Metals and Rainout, 2020, ApJL, 898, L14.
5. **Lothringer, J.D.**, & Barman, T. S. The PHOENIX Exoplanet Retrieval Algorithm and Using H^- Opacity as a Probe in Ultrahot Jupiters, 2020, AJ, 159, 289.
6. **Lothringer, J.D.**, & Barman, T. The Influence of Host Star Spectral Type on Ultra-hot Jupiter Atmospheres, 2019, ApJ, 876, 69.
7. **Lothringer, J.D.**, Barman, T., & Koskinen, T. Extremely Irradiated Hot Jupiters: Non-oxide Inversions, H^- Opacity, and Thermal Dissociation of Molecules, 2018, ApJ, 866, 27.
8. **Lothringer, J.D.**, Benneke, B., Crossfield, I. J. M., et al. An HST/STIS Optical Transmission Spectrum of Warm Neptune GJ 436b, 2018, AJ, 155, 66.
9. *Kirk, J., Stevenson, K. B., Fu, G. et al. JWST/NIRCam Transmission Spectroscopy of the Nearby Sub-Earth GJ 341b, 2024, arXiv e-prints, arXiv:2401.06043.*
10. *Brande, J., Crossfield, I. J. M., Kreidberg, L., et al. Clouds and Clarity: Revisiting Atmospheric Feature Trends in Neptune-size Exoplanets, 2023, arXiv e-prints, arXiv:2310.07714.*
11. Reggiani, H., Galarza, J. Y., Schlaufman, K. C., et al., "Insight into the Formation of β Pic b through the Composition of Its Parent Protoplanetary Disk as Revealed by the β Pic Moving Group Member HD 181327", 2024, AJ, 167, 45.
12. May, E. M., MacDonald, R. J., Bennett, K. A., et al., "Double Trouble: Two Transits of the Super-Earth GJ 1132 b Observed with JWST NIRSpec G395H", 2023, ApJL, 959, L9.
13. Lustig-Yaeger, J., Fu, G., May, E. M., et al., "A JWST transmission spectrum of the nearby Earth-sized exoplanet LHS 475 b", 2023, Nature Astronomy, 7, 1317.
14. Roy, P.-A., Benneke, B., Piaulet, C., et al. Water Absorption in the Transmission Spectrum of the Water World Candidate GJ 9827 d, 2023, ApJL, 954, L52.

15. Coria, D. R., Crossfield, I. J. M., **Lothringer, J.D.**, et al. The Missing Link: Testing Galactic Chemical Evolution Models with the First Multi-isotopic Abundances in Solar Twin Stars, 2023, ApJ, 954, 121.
16. Coulombe, L.-P., Benneke, B., Challener, R., et al. A broadband thermal emission spectrum of the ultra-hot Jupiter WASP-18b, 2023, *Nature*, 620, 292.
17. van Sluijs, L., Birkby, J. L., **Lothringer, J.D.**, et al., "Carbon monoxide emission lines reveal an inverted atmosphere in the ultra hot Jupiter WASP-33 b consistent with an eastward hot spot", 2023, MNRAS, 522, 2145.
18. Tsai, S.-M., Lee, E. K. H., Powell, D., et al., "Photochemically produced SO_2 in the atmosphere of WASP-39b", 2023, *Nature*, 617, 483.
19. Grant, D., **Lothringer, J.D.**, Wakeford, H. R., et al., "Detection of Carbon Monoxide's 4.6 Micron Fundamental Band Structure in WASP-39b's Atmosphere with JWST NIRSpec G395H", 2023, ApJL, 949, L15.
20. Moran, S. E., Stevenson, K. B., Sing, D. K., et al., "High Tide or Riptide on the Cosmic Shoreline? A Water-rich Atmosphere or Stellar Contamination for the Warm Super-Earth GJ 486b from JWST Observations", 2023, ApJL, 948, L11.
21. Amaro, R. C., Apai, D., Zhou, Y., et al., "Hotter than Expected: Hubble Space Telescope (HST)/WFC3 Phase-resolved Spectroscopy of a Rare Irradiated Brown Dwarf with Strong Internal Heat Flux", 2023, ApJ, 948, 129.
22. Gressier, A., Lecavelier des Etangs, A., Sing, D. K., et al., "The Hubble PanCET program: The near-ultraviolet transmission spectrum of WASP-79b", 2023, A&A, 672, A34.
23. Feinstein, A. D., Radica, M., Welbanks, L., (**Lothringer, J.D. 1st tier**) et al., "Early Release Science of the exoplanet WASP-39b with JWST NIRISS", 2023, *Nature*, 614, 670.
24. Alderson, L., Wakeford, H. R., Alam, M. K., (**Lothringer, J.D. 1st tier**) et al., "Early Release Science of the exoplanet WASP-39b with JWST NIRSpec G395H", 2023, *Nature*, 614, 664.
25. Rustamkulov, Z., Sing, D. K., Mukherjee, S., (**Lothringer, J.D. 1st tier**) et al., "Early Release Science of the exoplanet WASP-39b with JWST NIRSpec PRISM", 2023, *Nature*, 614, 659.
26. Ahrer, E.-M., Stevenson, K. B., Mansfield, M., et al., "Early Release Science of the exoplanet WASP-39b with JWST NIRCam", 2023, *Nature*, 614, 653.
27. JWST Transiting Exoplanet Community Early Release Science Team, Ahrer, E.-M., Alderson, L., (**Lothringer, J.D. 1st tier**) et al., "Identification of carbon dioxide in an exoplanet atmosphere", 2023, *Nature*, 614, 649.
28. Mikal-Evans, T., Sing, D. K., Dong, J., et al. A JWST NIRSpec Phase Curve for WASP-121b: Dayside Emission Strongest Eastward of the Substellar Point and Nightside Conditions Conducive to Cloud Formation", 2023, ApJL, 943, L17.

29. Chachan, Y., Knutson, H. A., **Lothringer, J.D.**, & Blake, G. A. Breaking Degeneracies in Formation Histories by Measuring Refractory Content in Gas Giants", 2023, ApJ, 943, 112.
30. Kasper, D., Bean, J. L., Line, M. R., et al., "Unifying High- and Low-resolution Observations to Constrain the Dayside Atmosphere of KELT-20b/MASCARA-2b", 2023, AJ, 165, 7.
31. Fu, G., Espinoza, N., Sing, D. K., et al., "Water and an Escaping Helium Tail Detected in the Hazy and Methane-depleted Atmosphere of HAT-P-18b from JWST NIRISS/SOSS", 2022, ApJL, 940, L35.
32. Brande, J., Crossfield, I. J. M., Kreidberg, L., et al., "A Mirage or an Oasis? Water Vapor in the Atmosphere of the Warm Neptune TOI-674 b", 2022, AJ, 164, 197.
33. Kreidberg, L., Mollière, P., Crossfield, I. J. M., et al., "Tentative Evidence for Water Vapor in the Atmosphere of the Neptune-sized Exoplanet HD 106315c", 2022, AJ, 164, 124.
34. Buzard, C., Casewell, S. L.,**Lothringer, J.D.**, & Blake, G. A., "Near-infrared Spectra of the Inflated Post-common Envelope Brown Dwarf NLTT 5306 B", 2022, AJ, 163, 262.
35. Gibson, N. P., Nugroho, S. K., **Lothringer, J.D.**, Maguire, C., & Sing, D. K., "Relative abundance constraints from high-resolution optical transmission spectroscopy of WASP-121b, and a fast model-filtering technique for accelerating retrievals", 2022, MNRAS, 512, 4618.
36. Fu, G., Sing, D. K., Deming, D., et al., "The Hubble PanCET Program: Emission Spectrum of Hot Jupiter HAT-P-41b", 2022, AJ, 163, 190.
37. Reggiani, H., Schlaufman, K. C., Healy, B. F., **Lothringer, J.D.**, & Sing, D. K., "Evidence that the Hot Jupiter WASP-77 A b Formed Beyond Its Parent Protoplanetary Disk's H2O Ice Line", 2022, AJ, 163, 159.
38. Bruno, G., Lewis, N. K., Valenti, J. A., et al., "Hiding in plain sight: observing planet-starspot crossings with the James Webb Space Telescope", 2022, MNRAS, 509, 5030.
39. Fu, G., Sing, D. K., **Lothringer, J.D.**, et al., "Strong H_2O and CO Emission Features in the Spectrum of KELT-20b Driven by Stellar UV Irradiation", 2022, ApJL, 925, L3.
40. Zhou, Y., Apai, D., Tan, X., et al., "HST/WFC3 Complete Phase-resolved Spectroscopy of White-dwarf-brown-dwarf Binaries WD 0137 and EPIC 2122", 2022, AJ, 163, 17.
41. Fu, G., Deming, D., May, E., et al., "The Hubble PanCET program: Transit and Eclipse Spectroscopy of the Hot-Jupiter WASP-74b", 2021, AJ, 162, 271.
42. Sainsbury-Martinez, F., Casewell, S. L., **Lothringer, J.D.**, Phillips, M. W., & Tremblin, P., "Exploring deep and hot adiabats as a potential solution to the radius inflation problem in brown dwarfs. Long-timescale models of the deep atmospheres of KELT-1b, Kepler-13Ab, and SDSS1411B", 2021, A&A, 656, A128.

43. Merritt, S. R., Gibson, N. P., Nugroho, S. K., et al., "An inventory of atomic species in the atmosphere of WASP-121b using UVES high-resolution spectroscopy", 2021, MNRAS, 506, 3853.

44. Fu, G., Deming, D., **Lothringer, J.D.**, et al., "The Hubble PanCET Program: Transit and Eclipse Spectroscopy of the Strongly Irradiated Giant Exoplanet WASP-76b", 2021, AJ, 162, 108.

45. Wilson, J., Gibson, N. P., **Lothringer, J.D.**, et al., "Gemini/GMOS optical transmission spectroscopy of WASP-121b: signs of variability in an ultra-hot Jupiter?", 2021, MNRAS, 503, 4787.

46. Mikal-Evans, T., Crossfield, I. J. M., Benneke, B., et al., "Transmission Spectroscopy for the Warm Sub-Neptune HD 3167c: Evidence for Molecular Absorption and a Possible High-metallicity Atmosphere", 2021, AJ, 161, 18.

47. Guo, X., Crossfield, I. J. M., Dragomir, D., et al., "Updated Parameters and a New Transmission Spectrum of HD 97658b", 2020, AJ, 159, 239.

48. Gibson, N. P., Merritt, S., Nugroho, S. K., et al., "Detection of Fe I in the atmosphere of the ultra-hot Jupiter WASP-121b, and a new likelihood-based approach for Doppler-resolved spectroscopy", 2020, MNRAS, 493, 2215.

49. Turner, J. D., de Mooij, E. J. W., Jayawardhana, R., et al., "Detection of Ionized Calcium in the Atmosphere of the Ultra-hot Jupiter KELT-9b", 2020, ApJL, 888, L13.

50. Benneke, B., Wong, I., Piaulet, C., et al., "Water Vapor and Clouds on the Habitable-zone Sub-Neptune Exoplanet K2-18b", 2019, ApJL, 887, L14.

51. Benneke, B., Knutson, H. A., **Lothringer, J.D.**, et al., "A sub-Neptune exoplanet with a low-metallicity methane-depleted atmosphere and Mie-scattering clouds", 2019, Nature Astronomy, 3, 813.

52. Steinrueck, M. E., Parmentier, V., Showman, A. P., **Lothringer, J.D.**, & Lupu, R. E., "The Effect of 3D Transport-induced Disequilibrium Carbon Chemistry on the Atmospheric Structure, Phase Curves, and Emission Spectra of Hot Jupiter HD 189733b", 2019, ApJ, 880, 14.

53. Crossfield, I. J. M., **Lothringer, J.D.**, Flores, B., et al., "Unusual Isotopic Abundances in a Fully Convective Stellar Binary", 2019, ApJL, 871, L3.

54. Fossati, L., Koskinen, T., **Lothringer, J.D.**, et al., "Extreme-ultraviolet Radiation from A-stars: Implications for Ultra-hot Jupiters", 2018, ApJL, 868, L30.

55. Bean, J. L., Stevenson, K. B., Batalha, N. M., et al., "The Transiting Exoplanet Community Early Release Science Program for JWST", 2018, PASP, 130, 114402.

56. Kilpatrick, B. M., Cubillos, P. E., Stevenson, K. B., et al., "Community Targets of JWST's Early Release Science Program: Evaluation of WASP-63b", 2018, AJ, 156, 103.

57. Bell, T. J., Nikolov, N., Cowan, N. B., et al., "The Very Low Albedo of WASP-12b from Spectral Eclipse Observations with Hubble, 2017, ApJL, 847, L2.
58. Stevenson, K. B., Lewis, N. K., Bean, J. L., et al., "Transiting Exoplanet Studies and Community Targets for JWST's Early Release Science Program", 2016, PASP, 128, 094401.
59. Crossfield, I. J. M., Ciardi, D. R., Petigura, E. A., et al., "197 Candidates and 104 Validated Planets in K2's First Five Fields", 2016, ApJS, 226, 7.

Proceedings and Other Publications

1. Ardila, D. R.; et al. "The UV-SCOPE Mission: Ultraviolet Spectroscopic Characterization Of Planets and their Environments", Proceedings of the SPIE. id. 1218104. arXiv:2208.09547.
2. **Lothringer, J. D.** "Stellar specific intensity models used in 'Hiding in plain sight: observing planet-starspot crossings with the James Webb Space Telescope', 2021, Zenodo Software package, id. 5609421.

Invited Talks and Seminars

1. "Talk with Tuminez", University-wide Town Hall with University President Astrid Tuminez, Utah Valley University, Orem, UT. Sept. 2023.
2. Convocation Lecture Series & Science Division Seminar, Snow College, Ephriam, UT. Aug. 2023.
3. Astronomy Colloquium, Anton Pannekoek Institute for Astronomy, University of Amsterdam. Nov. 2022.
4. Physics and Astronomy Colloquium, Brigham Young University, Provo, UT. Oct. 2022.
5. The Brown Dwarf to Exoplanet Connection in the Era of JWST Splinter Session at Exoplanets IV. Las Vegas. May 2022.
6. Physics Colloquium. Department of Physics, Utah Valley University, Orem, UT. Sep. 2021.
7. HotSci. Space Telescope Science Institute. Virtual. Jul. 2021.
8. Exoplanet Lunch. Center for Astrophysics, Harvard University. Virtual. Jan. 2021.
9. Exoplanet Journal Club. Jet Propulsion Laboratory. Virtual. Jan. 2021.
10. Star and Planet Seminar. Imperial College London. Virtual. Oct. 2020.
11. Exocoffee. Max Planck Institute for Astronomy. Virtual. May. 2020.
12. Exoplanet Tea. Massachusetts Institute of Technology. Cambridge, MA. Oct. 2019.
13. Exoplanet Lunch. Center for Astrophysics, Harvard University. Cambridge, MA. Oct. 2019.
14. Wine & Cheese Seminar. Center for Astrophysical Sciences, Johns Hopkins University, Baltimore, MD. Sep. 2019.
15. Theoretical Astrophysics Program Graduate Research Prize Talk. University of Arizona. Tucson, AZ. Apr. 2019.

16. Exoplanet Seminar. DTU Space. Lyngby, Denmark. Feb. 2019.
17. Star and Planet Formation Seminar. Max Planck Institute for Astronomy. Heidelberg, Germany. Jul. 2016.

Select Conference Presentations

1. "The UV Transmission Spectrum of Ultra-hot Jupiter WASP-178b." Exoplanets IV. Las Vegas. May 2022.
2. "The Importance of UV Opacity in Extremely Irradiated Objects." Stars and Planets in the UV. Virtual. May. 2021.
3. "Re-Interpreting UV-Optical Transmission Spectra of Hot and Ultra-Hot Jupiters." 237th AAS Winter Meeting. Virtual. Jan. 2021.
4. "Understanding Ultra-hot Jupiters Through Irradiated Brown Dwarfs." 235th AAS Winter Meeting. Honolulu, HI. Jan. 2020.
5. "Highly Irradiated Brown Dwarfs as High-mass Ultra-hot Jupiters." BDExoCon. University of Delaware. Newark, DE. Oct. 2019.
6. "Characterizing the Atmospheres of Exoplanet Populations: From Sub-Jovian to Ultra-hot Jupiter Exoplanets." American Astronomical Society Winter Meeting. Seattle, WA. Jan. 2019. Oral Presentation.
7. "Modeling the Most Extreme Jovian Atmospheres." Exoplanets Around Hot Stars. Vanderbilt University, Nashville, TN. Jun. 2018. Oral Presentation.
8. "Self-Consistent Atmosphere Models of the Most Extreme Hot Jupiters." American Astronomical Society Winter Meeting. Washington D.C. Jan. 2018. Oral Presentation.
9. "HST/STIS Observations of GJ 436b: A Warm-Neptune JWST GTO Target."Enabling Transiting Exoplanet Science with JWST. Space Telescope Science Institute, Baltimore, MD. Jul. 2017. Poster Presentation.
10. "Characterizing Four Sub-Jovian Exoplanets with HST-STIS." Exoplanets I. Davos, Switzerland. Jul. 2016. Poster Presentation.

Honors, Awards, and Grants
+$2,000,000

PI of NSF S-STEM Program 2022-2023
-6-year UVU scholarship, mentorship, and research program ($1,499,862)
"Promoting Engagement in Chemistry, Physics, and Earth Sciences"

Co-I of NASA XRP Program 2022-2025
-PI: Prof. Kevin Schlaufmann (JHU)
"Exploring Planet Formation with Exoplanet Atmospheric Abundances"

PI/Co-PI of 2 *James Webb Space Telescope* Programs
-Program 2055 ($100,211) *9.1 hours*
"Tracing Hot Jupiter Formation and Migration with Volatile and Refractory Elements Ratios"
-Program 2288 ($113,998) *7.4 hours*
"Formation and Impact of Silicate Clouds on L Dwarfs"

Co-I on 4 *James Webb Space Telescope* Programs *150.3 hours*

PI of 4 *Hubble Space Telescope* Programs
-Program 16086 ($86,995) *10 orbits*

"Comparing Escaping Metals and Heat Deposition in Ultra-hot Jupiters"
-Program 16142 ($99,319) *AR Theory*
"The First Grid of White-Dwarf-Irradiated Brown Dwarf Atmosphere Models"
-Program 16270 ($63,530) *20 orbits*
"Heavy Metal Bands: A Study of Escaping Ions from the Hottest Jovian Atmospheres"
-Program 16450 ($45,465) *10 orbits*
"Measuring the Rock-to-Ice Ratio in an Exoplanet"

Co-I on 13 *Hubble Space Telescope* Programs *300+ orbits*
Co-I on 1 *Spitzer Space Telescope* Program *61 hours*
College of Science Dean's Award of Excellence for Scholarship ($2,750) 2023
Scholarly Activities Committee Dissemination Grant ($1,344) 2022
Theoretical Astrophysics Program Graduate Research Prize ($500) 2019
Galileo Circle Scholar ($3,000) 2016, 2019
1st Place - The Art of Planetary Science - Data Art Category 2015
Graduate and Professional Student Council Travel Grant ($250) 2015
2015 Sagan Workshop Travel Grant ($700) 2015
Science Phoenix Award - SORCE Mission Operations 2014

Observing Experience

James Webb Space Telescope - NIRSpec, NIRCam, and MIRI 150+ hours
Hubble Space Telescope - STIS and WFC3 300+ orbits
MMT - SWIRC and ARIES 12 nights
Sommers-Bausch Observatory (CU-Boulder) - Optical CCD 9 nights
W.M. Keck Observatory - OSIRIS 2 nights
Large Binocular Telescope - LMIRCam 1 night
Morris W. Offit Telescope (JHU) - Optical CCD 1 night

Teaching and Mentorship

Undergraduate Research Mentor:

- **Austin Baldwin** - Utah Valley University 2021-Present
  -UVU URSCA Grant Recipient -Utah Space Grant Recipient
- **Audrey Elison** - Utah Valley University 2023-Present
- **Brayden Roberts** - Utah Valley University 2022-Present
  -Utah Space Grant Recipient
- **Brian Seamons** - Utah Valley University 2022-Present
  -Utah Space Grant Recipient
- **Autumn Winch** - Bryn Mawr College 2020-2022
  -Senior Thesis -Co-Author on Lothringer et al. 2022
  -Clinical Research Coordinator, University of Pennsylvania

Instructor - ASTR-4100 - Exoplanets and Brown Dwarfs Fall 2023
Instructor - ASTR-1080 - Life in the Universe (3 sections) 2022-2023
Instructor - PHSC-1000 - Survey of Physical Science Spring 2022
Instructor - PHYS-489R - Undergraduate Research (6 sections) 2022-2023
Instructor - ASTR-1040 - Elementary Astronomy (12 Sections) 2021-2023
Guest Instructor - Planets, Life, and the Universe 2020
Co-Instructor - Exoplanets & Their Atmospheres 2020
JHU Teaching Academy Certificate 2020
JHU Summer Teaching Institute Workshop 2020

LPL Incoming Graduate Student Mentor 2017-2019
Pima Community College GED Prep Math Tutor 2015-2016
Graduate Teaching Assistant and Guest Lecturer — PTYS 170B2 Fall 2014

Service and Other Experience

AAS Journals Reviewer
Astronomy & Astrophysics Reviewer
Nature Astronomy Reviewer
Hubble Space Telescope Proposal Reviewer
Canadian Time Allocation Committee Reviewer
NSF Review Panelist
NASA Review Panel Executive Secretary
UVU Physics Department Advisory Board 2023-Present
STARGATE Collaboration Executive Committee 2023-Present
UV-SCOPE MIDEX Mission Concept Science Team 2020-Present
JWST ERS Working Group 2017-Present
JHU/STScI Undergraduate Summer Program Organizer 2020, 2021
AAS Chambliss Poster Award Judge 2019, 2020
LPL Men's Diversity and Inclusion Auxiliary 2016-2019
LPL Conference Organizing Committee 2015-2017
Visiting Student - Max Planck Institute for Astronomy, Germany 06-07/2016
Graduate and Professional Student Council Travel Grant Judge 2015

Select Press Coverage & Interviews

JWST Transiting Exoplanet Community Early Release Science
- UVU Press Release
- Fox 31 News Good Day Utah at 6AM
- KUER 90.1, Utah NPR

Lothringer & Sing et al. 2022
- NASA/Hubble Press Release
- Sky & Telescope
- The Bad Astronomer, SyFy Wire
- The Miami Herald

Benneke et al. 2019
- SkyMania
- IndiaTV News

In the Community
- UVU Wins $1.5M NSF S-STEM Scholarship Program
- Hutchings Museum Institute JWST First Images Event
- Hutchings Museum Institute JWST Launch Celebration
- MAVEN Mission to Mars Launch
- No Man's Sky Video Game

Outreach

Guest Consultant - Ranger Rick Magazine
Latinos of Tomorrow Panelist
JWST Subject Matter Expert

- Salt Lake County Library Lecture Series (x2)
- UVU Colloquium (x2)
- Clarke Planetarium JWST Program
- Utah Valley Astronomy Club (x2)
- Hutchings Museum Institute First Image Event
- Hutchings Museum Institute Launch Celebration

STScI Outreach Program 2019-2021
-Space Astronomy Summer Program Presenter and Organizer
-Easy as Pi - Society of American Military Engineers

Reddit /r/AskScience Panel Member 2015-Present

LPL Outreach Program 2014-2019
-Summer Science Saturdays
-Tucson Festival of Books
-Art of Planetary Science
-Bennuval: An Evening of Space, Art, and Music

"What Can We Learn from Exoplanet Atmospheres?" Apr. 2018.
-Exoplanet Lecture Series, Flandrau Planetarium, Tucson, AZ

"Exoplanet Atmospheres on the Cutting Edge of Astronomy" Mar. 2018
-Tucson Amateur Astronomy Association, Tucson, AZ

The American International School of Muscat Science Expert 2018, 2019

Chaparral High School Career Expert 2018

"Going to Mars" Jan. 2014
-The American International School of Muscat, Muscat, Oman

LASP MAVEN Launch Outreach 2014

Professional Affiliations

American Astronomical Society Since 2014
Phi Beta Kappa Member Since 2014
Planetary Society Member Since 2011

Skills

IDL, Python, Fortran, Perl, Bash, Matlab, and Mathematica