# Natalie Allen

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## EDUCATION

**Johns Hopkins University**

- Ph.D. in Astrophysics — Expected Graduation: 2026
- M.A. in Physics — Graduation: May 2023

**University of Rochester** — Graduation: May 2020

- B.S. in Physics and Astronomy, Minor in Mathematics
  - *Cum Laude* with Highest Distinction (GPA: 3.86/4.0)
- Senior Thesis: *A Study of the Emission Line Structure of HH 7-11 with* Hubble *and* Spitzer
  - Advisor: Dan Watson

## RESEARCH INTERESTS

Exoplanets: observation, atmospheres, formation, stellar activity, habitability, biosignatures

## RESEARCH

**Johns Hopkins University**

*Research Assistant* (Advisor - Dr. Néstor Espinoza) — Fall 2020 - Present

- Disentangling stellar contamination from atmospheric signals for terrestrial planets orbiting M dwarfs through joint retrievals
- Searching for constraints on morning/evening terminator limb inhomogeneities for transiting exoplanets
- Precise ground-based transit spectroscopy of exoplanets

*Research Assistant* (Advisor - Dr. David Sing) — Fall 2020 - Present

- Comparative exoplanetology through a uniform reduction and analysis of all HST exoplanet atmosphere observations as part of the SHEL Archival Program
- Space-based UV to IR transit spectroscopy of giant planets as part of the PanCET Program

**University of Rochester**

*Research Assistant* (Advisor - Dr. Dan Watson) — Spring 2017 - Present

- Research in star formation and outflows, primarily in nearby region NGC 1333
- Ran shock simulations using MAPPINGS V and wrote code in Python to match observational data from both the Spitzer and Hubble Space Telescopes to simulated data
- Reduced data from Hubble Space Telescope observations

*Research Assistant* (Advisor - Dr. Miki Nakajima) — Spring 2019 - Summer 2022

- Research in terrestrial impact craters
- Ran simulations of the Vredefort crater impact in shock simulation iSALE

- Made comparisons of simulation results with geophysical evidence and compared to past studies

**NASA Jet Propulsion Lab** Summer 2019
*Research Intern* (Advisor - Dr. Karl Stapelfeldt)
- Analyzed data from a number of different telescopes to explore star formation feedback and shock physics
- Attended Sagan Summer Workshop on Astrobiology

**Space Telescope Science Institute** Summer 2018
*Visiting Scientist* (Guest of Dr. Joel Green)
- Shared star formation research results with collaborators at Johns Hopkins University and Space Telescope Science Institute
- Wrote python code to analyze data from extreme stellar outflows
- Continued collaboration after summer position finished

**PUBLICATIONS**

**N. H. Allen**, D. K. Sing, N. Espinoza, et al. HST SHEL: Enabling Comparative Exoplanetology with HST/STIS, submitted to AJ.

J.-B. Ruffio et al. incl. **N. H. Allen**. 2023. JWST-TST High Contrast: Achieving direct spectroscopy of faint substellar companions next to bright stars with the NIRSpec IFU, submitted to AJ.

D. Grant et al. incl. **N. H. Allen**. 2023. JWST-TST DREAMS: Quartz Clouds in the Atmosphere of WASP-17b, ApJL, 956, L32.

C. D. McGruder et al. incl. **N. H. Allen**. 2023. ACCESS, LRG-BEASTS, & MOPSS: Featureless Optical Transmission Spectra of WASP-25b and WASP-124b, AJ, 166, 120.

M. Libralato et al. incl. **N. H. Allen**. 2023. JWST-TST Proper Motions. I. High-precision NIRISS Calibration and Large Magellanic Cloud Kinematics, ApJ, 950, 101.

A. Feinstein et al. incl. **N. H. Allen**. 2023. Early Release Science of the exoplanet WASP-39b with JWST NIRISS, Nature, 614, 670.

L. Alderson et al. incl. **N. H. Allen**. 2023. Early Release Science of the exoplanet WASP-39b with JWST NIRSpec G395H, Nature, 614, 664.

Z. Rustamkulov et al. incl. **N. H. Allen**. 2023.Early Release Science of the exoplanet WASP-39b with JWST NIRSpec PRISM, Nature, 614, 659.

E.-M. Ahrer et al. incl. **N. H. Allen**. 2023. Early Release Science of the exoplanet WASP-39b with JWST NIRCam, Nature, 614, 653.

**JWST Transiting Exoplanet Community Early Release Science Team**, 2022. Identification of carbon dioxide in an exoplanet atmosphere, Nature, 614, 649.

**N. H. Allen**, N. Espinoza, A. Jordán, et al. 2022. ACCESS: Tentative detection of H2O in the ground-based optical transmission spectrum of the low-density hot Saturn HATS-5b, AJ, 164, 153.

C. D. McGruder et al. incl. **N. H. Allen**. 2022. ACCESS: Confirmation of a Clear Atmosphere for WASP-96b and a Comparison of Light Curve Detrending Techniques, AJ, 164, 134.

**N. H. Allen**, M. Nakajima, K. Wnnemann, et al. 2022. A Revision of the Formation Conditions of the Vredefort Crater, JGR: Planets, 127, 8.

**CONFERENCE TALKS/ POSTERS**

**N. H. Allen**, D. K. Sing, N. Espinoza, R. O'Steen, N. Nikolov, Z. Rustamkulov, L. Ramos-Rosado, K. Stevenson, H. Wakeford, M. López-Morales, M. Alam, E. May, T. Evans. HST SHEL: Enabling Comparative Exoplanetology with HST/STIS, Exeter, UK, June 26, 2023.

**N. H. Allen**, N. Espinoza. Towards Simultaneous Retrievals of Planetary Atmospheres and Stellar Surfaces, *STScI Spring Symposium 2023: Planetary Systems and the Origins of Life in the Era of JWST*, Baltimore, MD, May 18, 2023.

**N. H. Allen**, N. Espinoza, B. Rackham, J. de Wit. Towards the Simultaneous Retrieval of Planetary Atmospheres and Stellar Surfaces, *American Astronomical Society, AAS Meeting #241*, Seattle, WA, January 10, 2023.

**N. H. Allen**, N. Espinoza, A. Jordán, M. López-Morales, D. Apai, B. V. Rackham, D. J. Osip, I. C. Weaver, C. McGruder, H. Reggiani, R. Brahm, F. Rodler, N. K. Lewis, J. J. Fortney, J. Fraine, J. Kirk. ACCESS: Tentative detection of H2O in the ground-based optical transmission spectrum of the low density hot-Saturn HATS-5b, *Emerging Researchers in Exoplanet Science*, State College, PA, August 1, 2022.

**N. H. Allen**, N. Espinoza, A. Jordán, M. López-Morales, D. Apai, B. V. Rackham, D. J. Osip, I. C. Weaver, C. McGruder, H. Reggiani, R. Brahm, F. Rodler, N. K. Lewis, J. J. Fortney, J. Fraine, J. Kirk. ACCESS: Tentative detection of H2O in the ground-based optical transmission spectrum of the low density hot-Saturn HATS-5b, *Exoplanets IV*, Las Vegas, NV, May 1, 2022.

**N. H. Allen**, M. Nakajima, S. Helhoski, K. Wnnemann, D. Trail. Simulating the Formation of Earth's Largest Impact Crater. *52nd Lunar and Planetary Science Conference*, Virtual, March 17, 2021.

**N. H. Allen**, K. Stapelfeldt, D. Watson, T. Bergin, A. Frank, T.N. Gautier. J. Green, S.T. Megeath, G. Melnick, D. Neufeld, A. Rubinstein. A Study of the Infrared Emission Line Structure of HH 7-11 with *Hubble* and *Spitzer*. *American Astronomical Society, AAS Meeting #235*, Honolulu, HI, January 6, 2020.

**N. H. Allen**, T. Bergin, A. Frank, T.N. Gautier. J. Green, S.T. Megeath, G. Melnick, D. Neufeld, K. Stapelfeldt, D. Watson. Outflows and star-formation feedback from young stellar objects in NGC1333. *American Astronomical Society, AAS Meeting #233*, Seattle, WA, January 7, 2019.

**N. H. Allen**, D. Watson. Outflows and star-formation feedback from young stellar objects in NGC1333. *Maria Mitchell Women in Science Symposium*, Wellesley, MA, October 6, 2018.

**N. H. Allen**, T.P. Jacques. Outflows and star-formation feedback from young stellar objects in NGC1333. *Conference for Undergraduate Women in Physics*, Rochester, NY, January 13, 2018.

**OBSERVING**

**JWST**

- **PI** (Co-PI Néstor Espionza): Using stellar contamination proxy TRAPPIST-1 b to search for an atmosphere on TRAPPIST-1 e - 128.8 hours
- Co-I (PI David Sing): JWST's Exoplanet Grand Tour Spectroscopic Survey - 125.66 hours
- Co-I (PI Brett Morris): Spin doctor: unwinding stellar contamination from TRAPPIST-1 - Archival
- Co-I (PI Néstor Espionza, Co-PI Diana Powell): Hot Jupiter Atmospheric Forecast: Are mornings cloudier than evenings in other worlds? - 61.53 hours
- Co-I (PI Hannah Diamond-Lowe, Co-PI Joao Mendonca): The Hot Rocks Survey: Testing 9 Irradiated Terrestrial Exoplanets for Atmospheres - 115.11 hours
- Co-I (PI Chloe Fisher): TOI-125: Comparative Atmospheric Chemistry Within One System - 19.82 hours
- Co-I (PI Chloe Fisher): Constraining the Oxidation State of the Super-Earth TOI-1685 b - 24.72 hours

**Hubble Space Telescope**

- Co-I (PI David Sing): The HST/JWST synergy: A deep dive into the NUV with WASP-39b to answer key formation questions - 24 orbits
- Co-I (PI David Sing): Sculpting Hubble's Exoplanet Legacy: A Comprehensive Uniform Dataset of Exoplanet Transmission Spectra - Archival
- Co-I (PI David Sing): A Comparative Study of Planetary Atmospheres in Low-Metallicity Environments - 27 orbits

**Las Cumbres Observatory**

- Co-I (PI Néstor Espinoza): Photometric Monitoring of TRAPPIST-1 To Enable Precision Spectroscopy of TRAPPIST-1e

**Apache Point Observatory**

- PI: Confirmation of an Optical Slope in the Atmosphere of WASP-69b
  - First transit spectroscopy with APO
  - One of the first uses of the KOSMOS Instrument
- PI: Reanalysis of the Atmosphere of XO-2b in a New Epoch of KOSMOS

**LEADERSHIP POSITIONS**

**Johns Hopkins University**

*Exoplanet No-PhDs Journal Club* Spring 2023-Present

- Co-founder and organizer

*Physics and Astronomy Graduate Students association* Fall 2020 - Spring 2023

- Fall 2022 - Spring 2023: No-PhDs Journal Club/Wine & Cheese talks co-chair
- Fall 2021 - Spring 2022: Second-year graduate student representative, Undergraduate liaison, No-PhDs Journal Club co-chair
  - Organized "Reading Program" undergraduate/graduate mentorship program
- Fall 2020 - Spring 2021: First-year graduate student representative, Undergraduate liaison co-chair
  - Helped to plan prospective graduate student open house

**University of Rochester**
*Society of Physics Students* Fall 2017 - Spring 2020
(Secretary Fall 2017 - Spring 2018, President Fall 2018 - Spring 2019)

- Coordinated physics and astronomy intro level class tutoring
- Delegated executive board chairs and committees
- Helped plan outreach, social, and professional development events

*Society of Women in Astronomy and Physics* Fall 2017 - Spring 2020
(President, Fall 2017 - Spring 2019, Secretary Fall 2019 - Spring 2020)

- Co-founder, successfully proposed and accepted as official student organization
- Held social and professional development events to create a community for an underrepresented group in physics and astronomy
- Created outreach events to promote the development of women in STEM

## HONORS AND AWARDS

National Science Foundation Graduate Research Fellowship 2020-2023
Stoddard Senior Thesis Prize, U. of Rochester Physics and Astronomy 2020
Janet Fogg Prize, U. of Rochester Physics and Astronomy 2020
Undergraduate Teaching Award, U. of Rochester Physics and Astronomy 2020
Barry M. Goldwater Scholarship 2019-20
USRA Distinguished Undergraduate Award – Frederick A. Tarantino Scholarship 2019
Outstanding Chapter Award - Society of Physics Students National 2017-18, 2018-19
Blake Lily Prize, Society of Physics Students National 2017-18, 2018-19
Women in Physics Grant, American Physical Society 2018
Excellence in Cosponsorship - Society of Physics Students, U. of Rochester 2018
Whipple Science & Research Scholarship, U. of Rochester 2016-2020

## SERVICE

STScI Spring Symposium 2023, Workshop Organizing Committee 2022-2023
Executive Secretary for NASA Panel 2022

## TEACHING EXPERIENCE

**University of Rochester**
*Department of Physics and Astronomy - Peer Advisor* Fall 2019 - Spring 2020
College Center for Advising Services

- Advise Physics and Astronomy students on classes, research opportunities, etc.

*Department of Physics and Astronomy - Teaching Assistant* Fall 2017 - Spring 2020

- Astronomy 142: Elementary Astrophysics (Honors) Spring 2019, 2020
- Astronomy 111: The Solar System & Its Origin Fall 2017, 2018, 2019
- Astronomy 102: Relativity, Black Holes, and the Big Bang Spring 2018

*Society of Physics Students Workshops* Fall 2017 - Spring 2020

- Taught workshops on Mathematica and Python to college students
- Gave talks on research and college to high school students at Brighton High School

**MEMBERSHIPS**

Hot Rocks Survey
Pandora Mission Team
AEThER Collaboration
JWST Telescope Scientist Team
JWST Transiting Exoplanet Community Early Release Science Team
STARGATE Collaboration
Phi Beta Kappa (ΦBK)
Sigma Pi Sigma (ΣΠΣ)
American Physical Society (APS)
American Astronomical Society (AAS)
Society of Physics Students (SPS)

**COMPUTER SKILLS**

Python
UNIX shell scripting (Bash)
SAOImage DS9
Mathematica
LaTeX
Igor Pro
TheSky6
CCDSoft
CCDStack
Microsoft Office Suite