Lauren P. Miller

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Research Interests

Studying the interiors, surfaces, and atmospheres of exoplanets and solar system objects to understand the origin, formation, and evolution of planetary systems and their potential for habitability; observational searches for exoplanets using direct imaging, radial velocity, microlensing, and transit techniques; computational astrophysics

Education

Master of Science, Astronomy — Fall 2023
San Diego State University, San Diego, California
Thesis: "Modeling and Retrieval of Secondary Eclipse Spectra for Characterizing Cloudy or Hazy Exoplanet Atmospheres"
Advisors: Dr. Gael Roudier, Dr. Mark Swain, Dr. Jerome Orosz

Bachelor of Science, Astrophysics — Spring 2018
Lehigh University, Bethlehem, Pennsylvania

Research Experience

Space Telescope Science Institute, Baltimore, Maryland — 2021 to Present
Technical Staff Researcher, Instrument Division

- Advisor: Dr. Nestor Espinoza
- "Towards Constraints on Morning and Evening Terminators of Distant Worlds with TESS"

San Diego State University, San Diego, California — 2018 to 2023
Graduate Researcher, Department of Astronomy

- Advisors: Dr. Mark Swain, Dr. Gael Roudier, Dr. Jerome Orosz
- Collaboration between NASA JPL and San Diego State University
- Writing a multi-stream emission spectrum modeling code that accounts for scattering phase functions, a parametrized temperature-pressure profile, and atomic, molecular, and collision-induced absorption using a modified version of DISORT, a radiative transfer equation solver
- Using emission spectra from HST WFC3 to perform a full atmospheric content recovery for exoplanet targets

NASA Jet Propulsion Laboratory, Pasadena, California 2017 to 2019
Summer Research Intern, Astrophysics and Space Sciences

- Advisors: Dr. Mark Swain, Dr. Gael Roudier
- Three-year participant in the JPL Summer Internship Program (JPLSIP), a branch of the California Institute of Technology Student-Faculty Programs (SURF)
- Determined the effect of non-uniform vertical mixing ratios, aerosol particle size and density, scattering phase functions, and temperature profiles on forward atmospheric models to forecast transmission and emission spectra from the James Webb Space Telescope (JWST) and the Contribution to ARIEL Spectroscopy of Exoplanets (CASE), JPL's scientific instrument contribution to the Atmospheric Remote-Sensing Infrared Exoplanet Large-Survey (ARIEL)
- Contributed to the development of CERBERUS, a Bayesian retrieval scheme for efficiently applying high-dimensionality model spaces to the study of exoplanet atmospheres

Lehigh University, Bethlehem, Pennsylvania 2016 to 2017
Undergraduate Researcher, Department of Physics

- Advisor: Dr. Joshua Pepper
- Analysis of time-series photometry for ACV variable star HD 240121 using data from the Kilodegree Extremely Little Telescope (KELT)
- Calculated the abundance of atomic and ionic species in the stellar atmosphere of WASP-12 using equivalent width methods

University of Science and Technology of China, Hefei, China 2016
Lee Iacocca International Research Intern, School of Physical Sciences

- Advisor: Dr. Hongyan Zhou
- Chosen from a highly selective application process through the Lee Iacocca Summer International Research Internship to complete a fully-funded research internship abroad
- Reduced preliminary CCD images from the Antarctic Bright Star Survey Telescope, an optical telescope built by the University of Science and Technology of China and Nanjing Institute of Astronomical Optics & Technology, China Academy of Science
- Analysis of time-series photometry for HAT-P-12 and its companion exoplanet to confirm the viability of the instrument
- Edited and proof-read scientific manuscript titled "Photoionization-Driven Variability of Absorption Lines in Balmer BAL Quasar LBQS1206+1052"

Work Experience

Space Telescope Science Institute, Baltimore, Maryland Aug. 2020 to Present
Staff Scientist II, Science Support (2023-Present)
Science Support Analyst I (2020-2023)

- Part of the Hubble Space Telescope (HST) Cosmic Origins Spectrograph (COS) team
- Deputy lead of Pipeline Working Group
- Lead of the HST Help Desk
- Former deputy lead of the HST Help Desk and the lead of the COS Help Desk
- Support the development and operations of the CalCOS pipeline
- Responsible for the creation and delivery of new calibration files for COS
- Provide user support to researchers on various aspects of observation planning and data analysis

Zoellner Arts Center, Bethlehem, Pennsylvania Sept. 2015 to May 2018
Front-of-House Assistant/Ticket Sales Representative

- Serviced all incoming requests for seasonal, group, and individual ticket information and sales, and provided additional support to the ticketing and marketing departments when necessary
- Supported the House Manager in all front-of-house aspects of a performance

Glen Rock Medical Pharmacy, Glen Rock, New Jersey Feb. 2013 to Aug. 2017
Front Desk Sales Clerk

- Acted as a customer service representative for the pharmacy through the handling of the register, answering the phone, and putting together deliveries for local/national shipments of medication

Teaching Experience

San Diego State University, San Diego, California Aug. 2020
Graduate Assistant, SDSU Research Foundation

- Contributed to the updating of the lab manual that is used by the ASTR 109 classes (SDSU Department of Astronomy) to transition the course to be fully remote and virtual for the Fall 2020 Semester as a result of the COVID-19 public health crisis

San Diego State University, San Diego, California Aug. 2018 to Aug. 2020
Graduate Teaching Associate, Department of Astronomy

- Teaching "Introduction to Astronomy Laboratory" (ASTR 109), an undergraduate course averaging 50 students per semester, covering the following topics: measuring the sizes of, and distances to celestial objects; methods of astronomical observations; basic physics (mechanics, light, optics, etc.); the solar system; stars; exoplanets; galaxies; and cosmology
- Responsible for developing the syllabi, writing in-class quizzes, creating the structure of the lab, setting up lab materials, and grading lab reports
- Assisting in continually updating the lab manual
- Holding help-room hours each week for students in all undergraduate astronomy courses
- Leading and coordinating field trips to the 21" Visitors Telescope at Mount Laguna Observatory, an astronomical observatory owned and operated by SDSU located in Cleveland National Forest

- Experience in both in-person and remote teaching applications

San Diego State University, San Diego, California Jan. 2019 to June 2019
Academic Tutor, San Diego State University Athletics

- Tutored Introduction to Astronomy (ASTR 101), Fundamentals of Physics (PHYS 180A), and Mathematics for Life (MATH 110)
- Clarified and reviewed course concepts for groups of one to five SDSU student-athletes through advancing time management and studying skills, organizing notes, and addressing individual concerns about course material
- Assessed students for satisfactory progress in their courses to meet standards set by the NCAA and SDSU

Chegg Inc., Santa Clara, California Dec. 2017 to June 2019
Tutor, Chegg Tutors

- Tutored astronomy, math, and physics in-person and online
- Implemented lesson plans that accommodated the student's strategy for learning, while offering continuous support to make certain each student was able to grasp materials
- Certified as a tutor by Chegg Inc.

Honors and Awards

STScI BRAVO Award 2020, 2021, 2022, 2023, 2024
Space Telescope Science Institute

STScI Team Award 2021
Space Telescope Science Institute

STScI Staff Award 2021
Space Telescope Science Institute

Chambliss Astronomy Achievement Student Award Nominee 2020
American Astronomical Society

Funds for Astronomical Meetings: Outreach to Underrepresented Scientists (FAMOUS) Travel Grant 2020
American Astronomical Society

Reginald F. Buller Endowment Scholarship 2019
San Diego State University

Ruth and Clifford Smith Astronomy Fellowship 2019
San Diego State University

William F. Lucas/San Diego Astronomy Association Memorial Scholarship 2018
San Diego State University

Society of Physics Students Travel Award 2018
Society of Physics Students

Lehigh University C.A.S. Undergraduate Research Grant 2017
Lehigh University College of Arts and Sciences

Lehigh University Schaufeld Scholar 2017
Lehigh University College of Arts and Sciences

Lee Iacocca International Research Internship 2016
Lehigh University Iacocca International Research Program

Dean's List 2016
Lehigh University Dean of Students

Publications

Miller, L.P, Sankrit, R., Fischer, W.J.,. 2024, Instrument Science Report COS 2024-16

Hernandez, J., Ake, T., Debes, J,..., **Miller, L**., et al, "Updated Status and Performance of the Cosmic Origins Spectrograph", 2024, **Bulletin of the AAS, 332.07, 244**

Indriolo, N., Ake, T., Dos Santos, L.,..., **Miller, L**., et al, "Improvements to the Geometric Distortion and Walk Corrections", 2024, **Bulletin of the AAS, 360.07, 243**

Rowlands, K., Ake, T., Debes, J,..., **Miller, L**., et al, "Updated Status and Performance of the Cosmic Origins Spectrograph", 2024, **Bulletin of the AAS, 360.31, 243**

Debes, J., Sankrit, R.,…, **Miller, L.**, 2024, Instrument Science Report COS 2024-01

Miller, L.P. , "Modeling and Retrieval of Secondary Eclipse Spectra for Characterizing Cloudy Or Hazy Exoplanet Atmospheres", San Diego State University Master Thesis, 2023

Fischer, W., Frazer, E.,…, **Miller, L.P.**, 2023, Instrument Science Report COS 2023-28

Sankrit, R., Fischer, W.,…, **Miller, L.**., 2023, Instrument Science Report COS 2023-25

Gomez, S., Debes, J., Dietrich, S,..., **Miller, L**., et al, "Updated Status and Performance of the Cosmic Origins Spectrograph", 2023, **Bulletin of the AAS, 230.08, 242**

Indriolo, N., Fischer, W.,…, **Miller, L.P**., 2023, Instrument Science Report COS 2023-9

Miller, L.P. & Sankrit, R., 2023, Instrument Science Report COS 2023-5

Rafelski, M., Debes, J., Dietrich, S,...,**Miller, L**., et al, "Science with the Cosmic Origins Spectrograph into the 2030's", 2023, **Bulletin of the AAS, 462.02, 241**

Fischer, T., Debes, J., Dietrich, S,...,**Miller, L**., et al, "Updated Status and Performance of the Cosmic Origins Spectrograph", 2023, **Bulletin of the AAS, 462.01, 241**

Fischer, W.J.., Ake, T., Dashtamirova, D.,..., **Miller, L**.**P**., et al, "COS 2030: New Lifetime Positions for FUV Spectroscopy with the Cosmic Origins Spectrograph", 2022, **Bulletin of the AAS, 304.02, 240**

Miller, L.**P**., Espinoza, N., Baeyens, R.,..., et al, "Towards Constraints on Morning and Evening Terminators of Distant Worlds with TESS ", 2022, **Bulletin of the AAS, 234.03, 240**

Kerman, N.E.B., Ahmad, F., Ake, T.,..., **Miller, L.P.**, et al, "Updated Status and Performance of the Cosmic Origins Spectrograph", 2022, **Bulletin of the AAS, 304.03, 240**

Fischer, W.J.., Ake, T., Dashtamirova, D.,..., **Miller, L.P**., et al, "COS 2030: New Lifetime Positions for FUV Spectroscopy with the Cosmic Origins Spectrograph", 2022, **Bulletin of the AAS, 373.04, 239**

Miller, L.**P**., Espinoza, N., Baeyens, R.,..., et al, "Towards Constraints on Morning and Evening Terminators of Distant Worlds with TESS ", 2022, **Bulletin of the AAS, 233.08, 239**

Kerman, N.E.B., Ahmad, F., Ake, T.,..., **Miller, L**.**P**., et al, "Updated Status and Performance of the Cosmic Origins Spectrograph", 2022, **Bulletin of the AAS, 377.01, 239**

Sanhow, D.J., Ake, T., Dashtamirova, D., …, **Miller, L**., et al, "Extending the life of the Cosmic Origins Spectrograph (COS) with new lifetime positions", 2021, **Proceedings of the SPIE, 11821**

Plesha, R., Ahmad, F., Ake, T., …, **Miller, L**.**P**., et al, "Updated Status and Performance of the Cosmic Origins Spectrograph ", 2021, **Bulletin of the AAS, 216.03, 238**

Rafelski, M., James B., …, **Miller, L**., et al, "Enabling Ultraviolet Science into the 2030's with the Cosmic Origins Spectrograph ", 2021, **Bulletin of the AAS, 326.08 , 237**

Fischer, T., Rafelski, M., James B., …, **Miller, L**., et al, "Updated Status and Performance of the Cosmic Origins Spectrograph ", 2021, **Bulletin of the AAS, 350.01, 237**

Miller, L.**P.**, Roudier G., Swain M., Orosz, J., Welsh, W., "Emission Spectra Modeling and Parameter Retrieval for Exoplanet Atmospheres", 2020, **Bulletin of the AAS, 173.6 , 235**

Sun, L., Zhou, H., …, **Miller, L.P**., et al, "Photoionization-driven Absorption-line Variability in Balmer Absorption Line Quasar LBQS 1206+1052", **2017, ApJ, 838, 88**

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"CERBERUS: a Bayesian retrieval scheme for efficiently applying high dimensionality model spaces to the study of exoplanet atmospheres", Gael M. Roudier, Mark R. Swain, Albert F. Niessner, Gabriela Hernandez, **Lauren Miller**, **2018** (NPO 50770-CP, NASA JPL/California Institute of Technology)

Presentations and Invited Lectures

Oral Presentation, **"Evaluating HASP Flux Calibration Using CALSPEC Models to Enable High-quality Spectral Data from HST"**, Accurate Flux Calibration in the Era of Space Astronomy and All-Sky Surveys, October 2024.

Oral Presentation, **"Modeling and Retrieval of Secondary Eclipse Spectra for Characterizing Cloudy Or Hazy Exoplanet Atmospheres"**, Master Thesis Defense, San Diego State University, September 2023.

Oral Presentation, **"Towards Constraints on Morning and Evening Terminators of Distant Worlds with TESS"**, 240th Meeting of the American Astronomical Society, June 2022.

Oral Presentation, **"Towards Constraints on Morning and Evening Terminators of Distant Worlds with TESS"**, 239th Meeting of the American Astronomical Society, January 2022. (**Canceled due to COVID-19 pandemic**)

Oral Presentation, **"A Novel Approach to Modeling and Parameter Retrieval of Secondary Eclipse Spectra for Characterizing Cloudy Exoplanet Atmospheres"**, STScI INS ITsMoRE Meeting, April 2021.

Poster Presentation, **"Emission Spectra Modeling and Parameter Retrieval for Exoplanet Atmospheres"**, 235th Meeting of the American Astronomical Society, January 2020.

Workshop, **"Research Internship at the NASA Jet Propulsion Laboratory "**, Society of Women in Space Exploration at SDSU NASA Internships Talk, November 2019.

Oral Presentation, "**Emission Spectra Modeling and Parameter Retrieval for Exoplanet Atmospheres**", NASA Jet Propulsion Laboratory Summer Internship Program Final Talk, August 2019.

Oral Presentation, "**Exoplanet Secondary Eclipse Spectra in the Near IR: The Contribution of Scattered Light through Aerosols**", NASA Jet Propulsion Laboratory Summer Internship Program Final Talk, August 2018.

Poster Presentation, "**Exoplanetary Atmospheres in the Near I.R. Spectrum: Departures from a Homogeneously Distributed Gas Assumption**", Lehigh University Expo, May 2018.

Oral Presentation, "**Atmospheric Studies of Exoplanets**", Lehigh University Astronomy-Particle-Nuclear Undergraduate Research Symposium, April 2018.

Poster Presentation, "**Exoplanetary Atmospheres in the Near I.R. Spectrum: Departures from a Homogeneously Distributed Gas Assumption**", American Physical Society March Meeting, March 2018.

Oral Presentation, "**Exoplanetary Atmospheres in the Near I.R. Spectrum: Departures from a Homogeneously Distributed Gas Assumption**", NASA Jet Propulsion Laboratory Summer Internship Program Final Talk, August 2017.

Poster Presentation, "**Light Curve Analysis of Alpha Canum Venaticorum Variable Star HD 240121**", American Physical Society Conference for Undergraduate Women in Physics, January 2017.

Oral Presentation, "**Data Reduction and Light Curve Analysis for HAT-P-12b from the Antarctic Bright Star Survey Telescope**", University of Science and Technology of China Iacocca International Internship Final Talk, August 2016.

Attended Conferences and Workshops

Accurate Flux Calibration in Era of Space Astronomy and All-Sky Surveys 2024
Baltimore, MD

STScI Spring Symposium 2023
Baltimore, MD

240th Meeting of the American Astronomical Society 2022
Pasadena, CA

239th Meeting of the American Astronomical Society 2022
Salt Lake City, UT (**Canceled due to COVID-19**)

STScI Spring Symposium 2021
Virtual Event

SAG 2021 Community Symposium 2021
Virtual Event

Sagan Exoplanet Workshop 2020
Virtual Event

235th Meeting of the American Astronomical Society 2020
Honolulu, Hawaii

Lehigh University EXPO 2018
Bethlehem, Pennsylvania

American Physical Society March Meeting 2018
Los Angeles, California

American Physical Society Conference for Undergraduate Women in Physics 2017
Princeton, New Jersey

American Physical Society Conference for Undergraduate Women in Physics 2016
Syracuse, New York

Professional Affiliations

American Astronomical Society
Division of Planetary Science

American Physical Society (2014-2018)

Computer Skills

Programming: Python (Advanced), C/C++(Beginner), LaTeX (Intermediate), MATLAB (Beginner), Maple (Beginner), SQL (Beginner), Mathematica (Beginner), Bash (Intermediate), Git (Intermediate), Fortran (Beginner), IDL (Beginner)

Applications/Software: AstroImage**J,** SExtractor, SAOImage DS9, LabVIEW, Arduino, Astrometry.net, Shell, Microsoft OS/Suite, Eclipsing Light Curve (ELC) Code, GitHub, Mikulski Archive for Space Telescopes (MAST), Hubble Space Telescope/ James Webb Space Telescope Exposure Time Calculator (ETC), Astronomer's Proposal Tool (APT), SDSS MaNGA Marvin Ecosystem, CalCOS Pipeline

Technical Skills

Experience in the calibration and operation of remote sensors, astronomical observatories, and astronomical instrumentation; experience in reducing and analyzing images and spectroscopic data; proficiency in several programming languages; experience in modeling and statistical analysis; ability to conduct independent research; experience in the development and implementation of astronomical software packages; experience giving colloquia or technical presentations; technical writing experience demonstrated through a publication record

Observing Experience

Hubble Space Telescope
Proposal ID. 16906, “COS FUV LP6 Calibration: Profiles, Traces, Sensitivities, Flat Fields, and Spatial Resolution”, PI: E. Frazer

CHEOPS
CHEOPS AO-3, “Constraining the morning and evening limbs of the Hot Jupiters WASP-79b and WASP-101b”, PI: J. Patel

Mount Laguna Observatory 40” Reflector and Spectrograph
Mount Laguna, CA

Mount Laguna Observatory 21” Reflector
Mount Laguna, CA

Community Service

Maryland Science Center 2023-Present
Science Engagement Catalyst, Baltimore, MD

STScI Spring Symposium Workshop 2023
Workshop Organization Committee, Baltimore, MD

San Diego State University Department of Astronomy 2018 to 2020
Community Outreach Volunteer, San Diego, CA

235th Meeting of the American Astronomical Society 2020
AAS Volunteer, Honolulu, HI

Lindsey Meyer Teen Institute 2015
Staff Member, Secaucus, NJ

Buehler Challenger and Science Center 2014
Camp Counselor, Paramus, NJ

Extracurricular Activities

Phi Sigma Pi National Honors Fraternity

Society of Physics Students

Alpha Phi Omega National Community Service Fraternity

National Alliance on Mental Illness at Lehigh University

Lehigh University Mustard and Cheese Drama Society

San Diego State University Schwartz Astronomical Society

San Diego State University Women of Aeronautics and Astronautics/Students for Exploration and Development of Space

Languages

English: Native Language
French: Elementary Proficiency

Other

U.S. Citizen
Certified Operator for San Diego State University Planetarium

References

Dr. Nestor Espinoza, Assistant Astronomer
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Instrument Division
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Baltimore, MD 21218
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Email: : nespinoza@stsci.edu

Dr. Aparna Maybhate, Branch Manager
Space Telescope Science Institute
Instrument and Science Support Branch
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Baltimore, MD 21218
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Email: maybhate@stsci.edu

Dr. Marc Rafelski, Branch Manager
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Cosmic Origins Spectrograph
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Baltimore, MD 21211
Phone: (410) 338-6740
Email: mrafelski@stsci.edu

Dr. Mark Swain, Group Supervisor and Research Scientist
NASA Jet Propulsion Laboratory
Exoplanet Discovery and Science (3262)
M/S 169-506
4800 Oak Grove Drive
Pasadena, CA 91109
Phone: (818) 455-2396
Email: mark.r.swain@jpl.nasa.gov

Dr. Gael Roudier, Research Scientist
NASA Jet Propulsion Laboratory
Exoplanet Discovery and Science (3262)
M/S 169-327
4800 Oak Grove Drive
Pasadena, CA 91109
Phone: (818) 393-7252
Email: gael.m.roudier@jpl.nasa.gov

Dr. Jerome Orosz, Professor
San Diego State University
Department of Astronomy
5500 Campanile Drive
San Diego, CA 92182
Phone: (619) 594-7118
Email: jorosz@mail.sdsu.edu

Dr. Joshua Pepper, Associate Professor
Lehigh University
Department of Physics
413 Deming Lewis Lab
16 Memorial Drive East
Bethlehem, PA 18015
Phone: (610) 758-3649
Email: joshua.pepper@lehigh.edu