

CONTACT
INFORMATION

Email: lzhao@flatironinstitute.org
Website: <https://lilylingzhao.github.io/>
ORCID: 0000-0002-3852-3590

Mailing Address
162 5th Avenue
New York, NY 10010

EDUCATION

Yale University

M.S., M.Phil., Astronomy May 2018
Ph.D., Astronomy Jun. 2021
Dissertation Title: *The Path to Extreme Precision Radial Velocity With EXPRES*

University of Chicago

B.S. Mathematics Jun. 2016
B.A. Physics
B.A. Biological Sciences

RESEARCH
POSITIONS

Center for Computational Astrophysics, Flatiron Institute

Flatiron Research Fellow New York, NY
Sep. 2021 - Present
Research Analyst, Pre-Doctoral Fellow Sep. 2019 - Jan. 2020

Yale Exoplanet Group

EXPRES Team Member New Haven, CT
Sep. 2016 - Jun. 2021

Bean Exoplanet Group

Hubble STIS Transit Spectroscopy Chicago, IL
Jun. 2015 - Jun. 2016

NASA Goddard Space Flight Center

Joint Polar Satellite System 2 Tracking Greenbelt, MD
Jun. 2014 - Aug. 2014

Argonne National Laboratory

South Pole Telescope Polarization Calibration Lemont, IL
Jun. 2013 - Jun. 2015

AWARDS

Third Place, Three Minute Thesis Competition, Yale University 2020
Sheldon Wise Pre-Doctoral Fellowship, Yale University 2018
Graduate Research Fellow, National Science Foundation 2016
Google Earth Engine Scholarship, Google 2015

PUBLICATIONS

First Author

7. **Zhao, L.L.**, Dumusque, X., Ford, E., et al. "The Extreme Stellar-Signals Project III. Combining Solar Data from HARPS, HARPS-N, EXPRES, and NEID" 2023, AJ, 166, 173
6. **Zhao, L.L.**, Kunovac-Hodzic, V., Brewer, J.M., et al. "Measured Spin-Orbit Alignment of Ultra-Short Period Super-Earth 55 Cnc e" 2023, Nature Astronomy, 7, 198
5. **Zhao, L.L.**, Fischer, D.A., Henry, G.W., et al. "The EXPRES Stellar-Signals Project II. State of the Field of Disentangling Photospheric Velocities" 2022, AJ, 163, 171
4. **Zhao, L.L.**, Hogg, D.W., Bedell, M., Fischer, D.A. "*Excalibur*: A Non-Parametric, Hierarchical Wavelength-Calibration Method for a Precision Spectrograph" 2021, AJ, 161, 80

3. **Zhao, L.L.**, Fischer, D.A., Ford, E., Henry, G.W., Rottenbacher, R.M., Brewer, J.M. “The EXPRES Stellar-Signals Project I. Description of Data” 2020, RNAAS, 4, 156
2. Petersburg, R.R., Ong, J.M.J., **Zhao, L.L.**, et al. “An Extreme-Precision Radial-Velocity Pipeline: First Radial Velocities from EXPRES” 2020, AJ, 159, 187
(Contributions were equally split among the first three authors)
1. **Zhao, L.L.**, Fischer, D., Brewer, J., Giguere, M., & Rojas-Ayala, B. “Planet Detectability in the Alpha Centauri System” 2018, AJ, 155, 24

Contributing Author

13. Savel, A.B., Bedell, M., Kempton, E.M-R., et al. [incl. **Zhao, L.L.**] “Peering into the black box: forward-modeling the uncertainty budget of high-resolution spectroscopy of exoplanet atmospheres” submitted
12. Eisner, N.L., Grunblat, S.K., Barragán, O., et al. [incl. **Zhao, L.L.**] “Planet Hunters TESS V: a planetary system around a binary star, including a mini-Neptune in the habitable zone” accepted
11. Korolik, M., Rottenbacher, R.M., Fischer, D.A., et al. [incl. **Zhao, L.L.**] “Refining the Stellar Parameters of τ Ceti: a Pole-on Solar Analog ” 2023, AJ, 166, 123
10. Brewer, J.M., **Zhao, L.L.**, Fischer, D.A., et al. “EXPRES IV. Two Additional Planets Orbiting ρ Corona Borealis Reveal Uncommon System Architecture” 2023, AJ, 166, 46
9. Rottenbacher, R.M., Cabot, S.H.C., Fischer, D.A., et al. [incl. **Zhao, L.L.**] “EXPRES. III. Revealing the Stellar Activity Radial Velocity Signature of ϵ Eridani with Photometry and Interferometry” 2021, AJ, 163, 19
8. Luger, R., Bedell, M., Foreman-Mackey, D., et al. [incl. **Zhao, L.L.**] “Mapping Stellar Surfaces III: An Efficient, Scalable, and Open-Source Doppler Imaging Model” 2021, arXiv:2110.06271
7. Holzer, P., Cisewski-Keke, J., Fischer, D.A., **Zhao, L.L.** “A Hermite-Gaussian Based Radial Velocity Estimation Method” 2021, AnApS, 15, 527
6. Holzer, P.H., Cisewski-Keke, J., **Zhao, L.L.**, Fischer, D.A., Ford, E.B. “A Stellar Activity F-statistic for Exoplanet Surveys (SAFE)” 2021, AJ, 161, 272
5. Cabot, S.H.C., Rottenbacher, R.M., Henry, G.W., **Zhao, L.L.**, et al. “EXPRES. II. Searching for Planets Around Active Stars: A Case Study of HD 101501” 2020, AJ, 161, 26
4. Hoeijmakers, H.J., Cabot, S.H.C., **Zhao, L.L.**, et al. “High-Resolution Transmission Spectroscopy of MASCARA-2 b with EXPRES” 2020, A&A, 641, A120
3. Brewer, J.M., Fischer, D.A., Blackman, R.T., et al. [incl. **Zhao, L.L.**] “EXPRES I. HD 3651 an Ideal RV Benchmark” 2020, AJ, 160, 67
2. Blackman, R.T., Fischer, D.A., Jurgenson, C.A., et al. [incl. **Zhao, L.L.**] “Performance Verification of the EXtreme PREcision Spectrograph” 2020, AJ, 159, 238
1. Gaudi, S., Blackwood, G., Howard, A., et al. [incl. **Zhao, L.L.**] “Extreme Precision Radial Velocity Working Group” 2019, BAAS 51, 232

Textbooks

- | | |
|---|------------------|
| <i>Astrobiology</i> (Pressbooks)
Co-author | target Feb. 2024 |
| <i>Handbook of Exoplanets</i> (Springer)
55 Cancri (Copernicus): A Multi-planet System with a Hot Super-Earth and a Jupiter Analogue | 2023 |
| <i>Origins and the Search for Life in the Universe</i> (CK-12)
Chapter 6: The Complexification of Chemistry
Chapter 7: The Emergence of Life on Earth | 2017 |

SELECTED TALKS

○: INVITED

Seminars & Colloquia

- *Observers Lunch*, CIERA (Jan. 2024)
- *Colloquium*, University of Maryland (Apr. 2023)
- *Exocoffee*, Max Planck Institute for Astronomy (Apr. 2023)
- *Astro Seminar*, Carnegie Earth and Planets Laboratory (Dec. 2022)
- *Colloquium*, Jet Propulsion Laboratory (Nov. 2022)
- *Colloquium*, EPRV Research Coordination Network (May. 2022)
- *Exo-Cam Seminar*, University of Cambridge (Nov. 2021)
- *Summer Seminar*, the Ohio State University (Jun. 2021)
- *Fall Seminar*, Columbia University (Nov. 2020)
- *Exoplanet Journal Club*, University of Chicago (Nov. 2020)
- *Center for Exoplanets and Habitable Worlds Seminar*, Pennsylvania State University (Nov. 2020)
- *Galaxies, Cosmology, Stars & Planets Seminar*, Harvard University (Oct. 2020)
- *ORIGINS Seminar*, University of Arizona (Sep. 2020)
- *Tuesday Seminar*, University of Delaware (Apr. 2020)

Conferences

- "Solar to Stellar Observations" *Cool Stars* (Jun. 2024)
- "The Extreme Stellar Signals Project" *Extreme Solar Systems V* (Mar. 2024)
- "Excalibur" *Spectral Fidelity* (Sep. 2023)
- "The Extreme Stellar Signals Project" *EPRV V* (Mar. 2023)
- "Comparing Solar Data across Four Precision Instruments" *PoET* (Feb. 2023)
- "Improving Exoplanet Detection with Discriminative Linear Regression" *Flatiron-wide Algorithms and Mathematics* (Oct. 2022)
- "The EXPRES Stellar Signals Project (ESSP): Establishing the State of the Field in Disentangling Photospheric Velocities" *Exoplanets IV* (May 2022)
- "Discussion of the EXPRES Stellar Signals Project" *Gaussian Process Radial Velocities* (Apr. 2022)
- "The EXPRES Stellar Signals Project (ESSP): Establishing the State of the Field in Disentangling Photospheric Velocities" *The Star-Planet Connection* (Oct. 2021)
- "Machine Learning for Extreme Precision Spectrographs" *AAS 238; Machine Learning in Astronomy (MiM)* (Jun. 2021)
- "Planet Detectability with Next-Generation Spectrographs" *Exoplanets III* (Jul. 2020)
- "EXPRES" *Extreme Precision Radial Velocity IV* (Mar. 2019)
- "EXPRES, the Extreme Precision Spectrograph" *HoRSE: High Resolution Spectroscopy for Exoplanet atmospheres* (Oct. 2018)
- "EXPRES Precision and First Light Results" *Exoplanets II* (Jul. 2018)
- "EXPRES Precision and First Light Results" *Emerging Researchers in Exoplanet Science IV* (Jun. 2018)
- "Planet Detectability in the Alpha Centauri System" *European Week of Astronomy and Space Science* (Apr. 2018)
- "Observational Constraints on Planets in the Alpha Centauri Star System" *Emerging Researchers in Exoplanet Science III* (Jun. 2017)

WORKSHOPS

- Sun-as-a-Star (Mar. 2023)
- Future of Astrophysical Data Infrastructure (Feb. 2023)
- Gaia DR3 Fête (Jun. 2022)
- Sagan Exoplanet Summer School: EPRV (Jul. 2019)
- Building Early Science with TESS (Mar. 2019)

PROFESSIONAL ACTIVITIES	<p><i>Referee:</i> AAS Journals, A&A, MNRAS, PASP, PASJ <i>Proposal Reviewer:</i> NASA, NSF</p> <p>Community Organizing & Collaborations</p> <p>Exoplanet Exploration Program Analysis Group (ExoPAG) Executive Committee 2023 - 2026</p> <p>EPRV Research Coordination Network Steering Committee 2022 - Present</p> <p>Extreme Stellar Signals Project (ESSP) Founder and Lead 2021 - Present</p> <p>The Terra-Hunting Experiment Member 2021 - Present</p> <p>Extreme Precision Spectrograph (EXPRES) Team Project Scientist 2021 - Present</p> <p>Scientific Organizing Committees</p> <p>Extreme Precision Radial Velocity V 2023</p> <p>Sun-as-a-Star Workshop 2023</p> <p>Emerging Researchers in Exoplanet Science (ERES)</p> <p style="padding-left: 20px;">ERES III, Yale 2017</p> <p style="padding-left: 20px;">ERES V, Cornell 2019</p> <p style="padding-left: 20px;">ERES VI, Princeton 2021</p> <p>Diversity, Inclusion, & Equity</p> <p><i>Executive Board:</i> Yale Astronomy Climate and Diversity Committee 2020 - 2021</p> <p><i>Fellow:</i> Yale Office of Graduate Student Diversity and Development 2018 - 2021</p> <p><i>Founding Member:</i> Yale Astronomy Student Council 2018 - 2021</p>
MENTORING	<p><i>Co-Mentor:</i> Chris Lam Fall 2022</p> <p style="padding-left: 20px;">Graduate Student, University of Florida</p> <p style="padding-left: 20px;">Publication in prep., Poster presentation at EPRV V</p> <p><i>Mentor:</i> Nusrat Jahan Summer 2022</p> <p style="padding-left: 20px;">Undergraduate Student, Hunter College</p> <p style="padding-left: 20px;">Poster presentation at AAS 241 and CUWiP</p> <p><i>Mentor:</i> Lianys Feliciano Summer 2022</p> <p style="padding-left: 20px;">Undergraduate Student, New York City College of Technology</p> <p style="padding-left: 20px;">Poster presentation at SACNAS and AAS 241</p>
TEACHING	<p><i>Guest Lecture:</i> Another Earth Fall 2022</p> <p style="padding-left: 20px;">Columbia University</p> <p><i>Research Project Lead:</i> Exoplanets Summer 2021</p> <p style="padding-left: 20px;">Warrior Scholars Project</p> <p><i>Certificate of College Teaching Preparedness</i> Awarded 2018</p> <p style="padding-left: 20px;">Granted by the Yale Center for Teaching and Learning</p> <p><i>Co-Instructor:</i> Origins and the Search for Life in the Universe Fall 2017</p> <p style="padding-left: 20px;">Yale University</p>

Teaching Fellow: Frontiers and Controversies in Astrophysics Spring 2017
Yale University

Teaching Fellow: Origins and the Search for Life in the Universe Fall 2016
Yale University

SELECT
OUTREACH

Speaker: Skype a Scientist 2019 - 2021
Docent: the Peabody Museum 2018 - 2019
Demonstrations, Group Leader: Girls Science Investigation 2017 - 2019
Guest Author: Scientific American, Observations 2017
Invited Speaker, Public Relations Committee: Open Labs 2016 - 2020
Observatory Volunteer: Franklin Institute 2012 - 2016

PROPOSALS

Observing Proposals

PI: NEID, Awarded 5.8 hours of P2 time 2022B
"Measuring the Shortest Timescale Stellar Signals for a Range of Spectral Types"

PI: Gemini, Awarded 29.8 hours of Band 1 time 2022B
"Unveiling the Signatures of Starspots in MAROON-X Spectra with Simultaneous Interferometric Stellar Surface Mapping"

Grant Proposals

While fully funded from 2021-2024, I contributed to the following successful proposals.

Co-I: NASA Extreme Precision Radial Velocity Foundation Science 2023
Awarded
"New Strategies for Combining EPRV Observations from Multiple Instruments"
(PI: Eric Ford, Pennsylvania State University)

Co-I: NASA Extreme Precision Radial Velocity Foundation Science 2023
Awarded
"A community driven, modular data-pipeline architecture to push EPRV into the 1 cm/s era" (PI: Jennifer Burt, California Institute of Technology)

Collaborator: NSF Astronomical Sciences 2023 - 2025
Awarded \$510,000
"Unmasking Stellar Variability: Hierarchical Bayesian methods for characterization of low-mass planets with EPRV spectroscopy" (PI: Jessica Kehe, University of Wisconsin-Madison)

Co-I: NASA Exoplanets Research Program (XRP) 2023 - 2025
Awarded \$575,000
"Turn down the noise! Disentangling planetary and stellar signals by observing the Sun with EXPRES" (PI: Joe Llama, Lowell Observatory)

Co-I: Heising-Simons Foundation 2022 - 2025
Awarded \$950,000
"EXPRES 100 Earths Survey" (PI: Joe Llama, Lowell Observatory)

REFERENCES

Debra A. Fischer: debra.fischer@yale.edu
David W. Hogg: david.hogg@nyu.edu
Eric B. Ford: eford@psu.edu