

Haleigh E. Nyberg

NSF Graduate Research Fellow • Zonta Amelia Earhart Fellow

Ph.D. Candidate, Department of Earth, Atmospheric, and Planetary Sciences

Purdue University, West Lafayette, IN, USA

Note: Publications prior to 2025 may appear under Haleigh E. Brown.

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EDUCATION

Ph.D., Earth, Atmospheric, and Planetary Sciences 2023 – 2028 (expected)
Purdue University • Advisor: Dr. Stephanie Olson • GPA 3.93/4.0
Candidate (ABD) since April 2026
Research: Computational astrobiology – exoplanetary habitability and the origin of life

B.A., Physics (Computational Physics), Summa Cum Laude 2019 – 2023
University of Montana • Advisor: Dr. Jennifer Fowler • GPA 3.91/4.0
Minors: Computer Science, Mathematics
Thesis: Advanced High-Altitude Balloon Trajectory Prediction

ACADEMIC AWARDS AND FELLOWSHIPS

★ **Zonta Amelia Earhart Fellowship** 2026 – 2027
★ **National Science Foundation Graduate Research Fellowship** 2024 – 2029
★ **Ross Fellowship**, Purdue Department of Earth, Atmospheric, and Planetary Sciences 2023 – 2024
★ **Dean’s and President’s List**, University of Montana 2019 – 2023
★ **Montana University System Honors Scholarship** (Full Tuition Coverage) 2019 – 2023
★ **Shallenberger Physics Scholarship**, University of Montana 2019, 2021
★ **John Pohl Musician’s Scholarship**, University of Montana 2019
★ **Valedictorian**, Sentinel High School 2019
★ **Buddy DeFranco Improvisation Award** 2018

RESEARCH EXPERIENCE

Graduate Research Assistant Aug 2023 – Present
Purdue University, Department of Earth, Atmospheric, and Planetary Sciences
Advisor: **Dr. Stephanie Olson**

- Run three-dimensional ExoPlaSim climate simulations across planetary obliquity, rotation rate, and stellar host to find which worlds sustain wet-dry cycling, which is thought to concentrate prebiotic chemistry toward an origin of life.
- Build pixel-wise machine learning models in Python that predict ocean-current patterns from continental configuration, turning expensive circulation-model output into a fast surrogate for habitability screening.
- Presented the work as first author at 14 conferences (2024 to 2026), including an invited talk at the AGU Fall Meeting 2025.

Lead Data Science Researcher Jan 2025 – Dec 2025
Purdue University, The Data Mine
Corporate Partner: **Barrios Technology**

- Directed two 16-member, multi-university student teams as scrum master, building a dynamic Unreal Engine desktop and VR visualization tool for NASA’s Lunar Gateway.

Data Science Researcher Aug 2024 – Dec 2024
Purdue University, The Data Mine
Corporate Partner: **John Deere**

- Built multivariate time-series forecasting models in Python (ARIMA, LSTM) for John Deere demand planning, benchmarking methods to recommend a forecasting strategy they could put into production.

Undergraduate Research Intern and Peer Leader May 2021 – Aug 2022
NASA Montana Space Grant Consortium, University of Montana
Advisor: **Dr. Jennifer Fowler**

- Cut balloon-launch training costs by \$283 per launch by adding dynamic drag-coefficient calculations to the Python trajectory-prediction software and rebuilding the campaign training procedure around it.
- Returned in summer 2022 as peer leader for the intern cohort, running the launch training and bringing the new interns onto the trajectory code.

PUBLICATIONS

In preparation

[3] **Nyberg, H.E.**, Olson, S.L., Pearce, B.K.D., Bryant, R.N., Chavas, D.R. Planetary obliquity shapes wet-dry cycling and the origin-of-life potential of warm little ponds. *In preparation for submission* (2026).

Accepted and submitted

[2] Mingsuwan, C., Desano, L., Garcia, B., Agarwal, J., Ong, J., Sanchez, A., Xu, C., Cawthon, S., Lian, C., **Nyberg, H.E.** (2025). "Foundations of a Visualization Tool for NASA Gateway and Lunar Surface Operations." *The 6th Augmented, Virtual, and Mixed Realities (AR/VR) Workshop, IEEE Space Mission Challenges for Information Technology / Space Computing Conference (SMC-IT/SCC 2025)*. (Accepted and presented 2025; to appear in the IEEE SMC-IT 2026 proceedings).

[1] **Brown, H.E.**, Capirala, A., Fifer, L. M., Lafèche, É. A., Nyberg, D., Payne, R., Sneed, E., Wong, M. L. (2025). "Strengthening Community Across Artists and Scientists in Astrobiology." *NASA DARES Request for Information*. (Submitted response).

ABSTRACTS AND CONFERENCE PRESENTATIONS (22: 15 first-author, 1 invited talk)

[22] **Nyberg, H.E.**, Olson, S.L., Pearce, B.K.D., Bryant, R.N., Chavas, D.R. (2026). The Origin of Life Index (OLI): Quantifying the Impact of Planetary Obliquity on Prebiotic Chemistry in Freshwater Ponds. *Interdisciplinary Origin of Life Meeting for Early Career Researchers (IOoL) 2026*, Earth-Life Science Institute, Institute of Science Tokyo, Tokyo, Japan. (**Accepted**)

[21] **Nyberg, H.E.**, Olson, S.L., Pearce, B.K.D., Bryant, R.N. (2026). Effects of Planetary Obliquity on Wet-Dry Cycles, Pond Organics, and Urability. *The Astrobiology Science Conference (AbSciCon) 2026*, Madison, WI, USA. 213-09. (**eLightning**)

[20] **Nyberg, H.E.**, Capirala, A., Fifer, L. M., Lafèche, É. A., Nyberg, D., Payne, R., Sneed, E., Wong, M. L. (2026). PALLAS: Strengthening Community Across Artists and Scientists. *The Astrobiology Science Conference (AbSciCon) 2026*, Madison, WI, USA. 325-369. (**Poster Presentation**)

[19] **Nyberg, H.E.**, Nyberg, D., Capirala, A., Fifer, L. M., Lafèche, É. A., Payne, R., Sneed, E., Wong, M. L. (2025). Planetary Obliquity and Origin of Life Potential in Warm Little Ponds: Earth and Beyond. *AGU Fall Meeting 2025*, New Orleans, LA, USA. (**Invited Speaker**)

[18] **Nyberg, H.E.**, Nyberg, D., Capirala, A., Fifer, L. M., Lafèche, É. A., Payne, R., Sneed, E., Wong, M. L. (2025). PALLAS: Bridging the Art-Science Divide for Enhanced Scientific Communication. *AGU Fall Meeting 2025*, New Orleans, LA, USA. (**Poster Presentation**)

[17] **Nyberg, H.E.**, Olson, S.L., Pearce, B.K.D., Bryant, R.N. (2025). Quantifying Planetary Origin of Life Potential: Connecting Global Climate to Local Wet Dry Cycling on Volcanic Islands. *Midwestern Geobiology 2025 Conference*, West Lafayette, IN, USA. (**Oral Presentation**)

[16] Capirala, A., Fifer, L.M., Lafèche, É.A., Nyberg, D., **Nyberg, H.E.**, Payne, R.C., Sneed, E.L., Wong, M.L. (2025). PALLAS: Building a Network of Artists & Scientists. *Goldschmidt 2025 Conference*, Prague, Czech Republic.

[15] **Nyberg, H.E.**, Olson, S.L., Pearce, B.K.D., Bryant, R.N., Chavas, D.R. (2025). Planetary Obliquity Impacts Wet-Dry Cycling and the Potential for an Origin of Life in Warm Little Ponds. *Goldschmidt 2025 Conference*, Prague, Czech Republic. (**Oral Presentation**)

[14] Batra, K., Hammond, T., **Nyberg, H.E.** (2025). Climatic Impacts of Orbital and Surface Processes on Exoplanet Habitability. *Goldschmidt 2025 Conference*, Prague, Czech Republic.

[13] Sneed, E., Capirala, A., Fifer, L. M., Lafèche, É. A., Nyberg, D., **Nyberg, H.E.**, Payne, R., Wong, M. L. (2025). PALLAS: Integrating Art Within Astronomy and Astrobiology. *American Astronomical Society Meeting 246*, Anchorage, AK, USA. 404.08.

[12] **Brown, H.E.**, Olson, S.L., Pearce, B.K.D., Chavas, D.R. (2024). Elucidating Planetary Scenarios That May Lead to an Origin of Life in Warm Little Ponds. *AGU Fall Meeting 2024*, Washington D.C., USA. P11D-3004. (**Poster Presentation**)

[11] Calatayud, S., Capirala, A., **Brown, H.E.**, Jernigan, J., Olson, S.L. (2024). Exploring the Effects of Diverse Continental Configurations on Climate and Habitability. *AGU Fall Meeting 2024*, Washington D.C., USA. P11D-2999.

[10] **Brown, H.E.**, Olson, S.L., Pearce, B.K.D., Bryant, R.N., Chavas, D.R. (2024). Planetary features of Earth-Like Exoplanets: Implications for an Origin of Life in Warm Little Ponds. *Exoplanets In Our Backyard III*, New Haven, CT, USA. (**Poster Presentation**)

[9] **Brown, H.E.**, Olson, S.L., Pearce, B.K.D., Bryant, R.N., Chavas, D.R. (2024). Planetary Features and a Wet-Dry Cycling Origin of Life. *Astrobiology Graduate Conference (AbGradCon) 2024*, Ithaca, NY, USA. (**Oral Presentation**)

[8] Olson, S.L., Capirala, A., **Brown, H.E.** (2024). Continents Shape the Spatiotemporal Patterns of Marine Oxygen. *The Astrobiology Science Conference (AbSciCon) 2024*, Providence, RI, USA. 224-031.

[7] **Brown, H.E.**, Chavas, D.R., Pearce, B.K.D., Olson, S.L. (2024). Impacts of Planetary Obliquity on Wet-Dry Cycling: Early Earth and Beyond. *The Astrobiology Science Conference (AbSciCon) 2024*, Providence, RI, USA. 325-035. (**Poster Presentation**)

[6] Olson, S.L., Jernigan, J., Lafèche, É.A., **Brown, H.E.** (2024). Exploring Origin of Life Chemistry and Exoplanet Biosignatures with GCMs. *EGU General Assembly 2024*, Vienna, Austria. EGU24-14161.

[5] **Brown, H.E.** (2023). Balloon Trajectory Prediction: Improving Calculation-based Techniques. *Senior Seminar (PHSX 499)*, University of Montana Department of Physics and Astronomy, Missoula, MT, USA. (**Oral Presentation**)

[4] **Brown, H.E.**, Jetton, S., Hovenkotter, R., Rugg, H., Spangrude, C. (2022). Improving Calculation-based Balloon Trajectory Prediction. *Montana Space Grant Consortium Summer Research Symposium, Missoula Public Library*, Missoula, MT, USA. (**Seminar**)

[3] Jetton, S., **Brown, H.E.**, Hovenkotter, R., Rugg, H., Spangrude, C. (2022). Balloon Trajectory Prediction: Improving Calculation-based Techniques. *AGU Fall Meeting 2022*, Chicago, IL, USA. P55D-1604. (**Poster Presentation**)

[2] **Brown, H.E.**, Jetton, S., Hovenkotter, R., Rugg, H., Spangrude, C. (2021). Eclipse Campaign Simulation: Affordable Radiosonde Launches Using the Phantom 4. *Montana Space Grant Consortium Summer Research Symposium, Missoula Public Library*, Missoula, MT, USA. (**Seminar**)

[1] **Brown, H.E.**, Reece, K., Spangrude, C., Covitt, B., Bernards, M., Fowler, J. (2021). Radiosonde Eclipse Campaign Education: Increasing Accessibility Through Adaptability and Affordability. *AGU Fall Meeting 2021*, New Orleans, LA, USA. ED15E-0558. (**Poster Presentation**)

TEACHING AND MENTORING EXPERIENCE

Graduate Mentor, Amelia Earhart Leadership for Space Careers Aug 2024 – Jul 2025
Purdue University, Honors College

- Led discussions between senior space-industry professionals and undergraduate students on women’s leadership in space exploration and science, both remotely and in person through visits to NASA sites including Johnson Space Center.

Fellowship Writing Coach Aug 2024 – Present
Purdue University, Office of the Vice Provost for Graduate Students and Postdoctoral Scholars (OGSPS)

- Coach graduate and postdoctoral researchers across disciplines in securing fellowship funding (NSF GRFP, NDSEG, Hertz, Google PhD, Apple Scholars, NVIDIA, Schmidt Science Fellows, NIH F31), advising more than 40 applicants one-on-one on application strategy and grant writing.
- Advise advisee a 2026 NSF Graduate Research Fellowship recipient, along with nominees for the Apple Scholars and Google PhD Fellowship programs.
- Trained and onboarded an incoming fellowship writing coach, shadowing her first review sessions to expand the program’s coaching capacity.

Funding Workshop Instructor Aug 2024 – Present
Purdue University, Office of the Vice Provost for Graduate Students and Postdoctoral Scholars (OGSPS)

- Designed more than a dozen distinct fellowship and funding workshops, including a three-part NSF GRFP series alongside dedicated NDSEG, NIH, SROP, Bridge, and computational-sciences funding sessions, and delivered them more than 80 times across six Purdue trainee and fellowship programs since 2024.

Research Mentor for Silene Calatayud (Undergraduate) Jan 2024 – May 2025
Purdue University, Department of Earth, Atmospheric, and Planetary Sciences

- Mentored in astrobiology research methodologies, co-authoring an AGU 2024 abstract with my mentee.

Physics Lab Instructor (PHSX 206N, College Physics I Laboratory) Jan 2022 – May 2023
University of Montana, Department of Physics and Astronomy

- Taught the weekly College Physics I lab sections for up to 24 undergraduate students each, co-instructing in spring 2022 and running the sections on my own from fall 2022.

LEADERSHIP AND SERVICE

Session Co-convenor, Goldschmidt 2026 Conference Jul 2026
Session 01b: *Exoplanet Geochemistry and Climate* (the 2025 session, below, merged into it).

Executive Secretary, NASA Review Panels 2024 – 2026
Habitable Worlds (2024, 2025) and Exoplanets Research Program (2026). Recorded panel discussions and synthesized reviewer consensus for each proposal.

Peer Reviewer, Planetary Science Journal (AAS) 2026

Application Reviewer, Purdue Graduate Grant Competitions 2026
A.H. Ismail Interdisciplinary Graduate Grant and Frederick N. Andrews Environmental Travel Grant.

Application Reviewer, Google PhD Fellowship Program 2025, 2026
Purdue nominee selection, reviewing alongside faculty panelists.

Founded Treasurer, Purdue Golden Z Club Aug 2025 – Present
Co-founded Pursurde’s chapter of Zonta International’s student service organization (chartered Dec 2025).
Co-organized the Zonta Says NO! to Violence Against Women awareness walk (Nov 2025).

Primary Session Convener, Goldschmidt 2025 Conference Jul 2025
Session: *Chemistry and Climate of Exoplanets*.

Reviewer, Purdue Postdoctoral Travel Awards 2025
Scored applicant submissions across two funding cycles.

Co-Founder / Website Developer, PALLAS May 2024 – Present
PortAL Linking Artists and Scientists. pallas.gallery

- Designed and built the organization’s website and visual identity.
- Contributor on the funded AAS Education and Professional Development mini-grant (2025, PI M. L. Wong) for a two-speaker pilot program.
- Co-organized “Envisioning Joint Futures in Art and Astronomy” (Apr 2026) and the AbSciCon 2026 Art and Science Mixer (May 2026).

Solar Eclipse Outreach Volunteer Apr 2024
Purdue University, Department of Earth, Atmospheric, and Planetary Sciences

Instructor, Montana American Indians in Math and Science May 2021, May 2022
University of Montana, Department of Physics and Astronomy

PROFESSIONAL MEMBERSHIPS

Student Member, American Geophysical Union (AGU) 2021, 2022, 2024 – 2026
Student Member, American Association for the Advancement of Science (AAAS) 2026 – 2027
Supporting Member, Zonta International 2026 – Present

HIGHLIGHTED SKILLS

★ **Programming Languages:** Python (NumPy, SciPy, Pandas, Matplotlib, Seaborn, TensorFlow, PyTorch, Keras, scikit-learn, xarray), R, Java, MATLAB, Fortran

★ **Data Science and Machine Learning:** General Circulation Model Analysis, Convolutional Neural Networks, Bayesian Statistics, Multivariate Time Series Forecasting (ARIMA, LSTM), Principal Component Analysis, Logistic/Linear Regression, Random Forest, k-means Clustering, Data Mining, Data Visualization.

★ **Climate and Planetary Modeling:** ExoPlaSim, WRF, PlaSim; GCM data analysis (NetCDF), atmospheric dynamics, radiative transfer.

★ **Software and Technologies:** Git/GitHub, Linux/Unix, Jupyter Notebooks/Lab, Overleaf (LaTeX), SLURM/HPC, Unreal Engine, AutoCAD.

★ **Professional Skills:** Agile/Sprint Project Management, Scientific Writing and Presentation, Grant Proposal Writing, Interdisciplinary Collaboration, Peer Review, Public Speaking, Curriculum Development, Mentoring.

★ **Training:** Responsible Conduct of Research (RCR), CITI Program, 2024; Research Security (NSPM-33), Purdue, 2025.