Calder Lenhart

lenhart.106@osu.edu ✉
calder.zone 🌐
github.com/calderlen ⭘
0009-0001-1459-3738 ⓘD
Google Scholar 🎓

EDUCATION

2025–2026   **Graduate Non-Degree**; Ohio State University
Courses funded with the Faculty and Staff Tuition Assistance Plan – all courses taken for credit, concurrently with my full-time employment in the Department of Astronomy

Relevant Coursework: Quantum Mechanics 1-2 (Graduate-level), Electromagnetic Field Theory (Graduate-level), Analytic and Numeric Methods of Physics (Graduate-level), Classical & Statistical Physics I (Graduate-level), Differential Geometry (Graduate-level)

2020–2024   **B.S. Physics, Astronomy & Astrophysics**; Ohio State University
Minor in Mathematics, Minor in History
Magna cum laude, with Research Distinction in Astronomy & Astrophysics
Thesis: Phase-Resolved Cross-Correlation Transmission Spectroscopy of KELT-20b

Relevant Coursework: Elementary Particle Physics (Graduate-level), Honors Quantum Mechanics I-II, Honors Intermediate E&M I-II, Mathematical Methods of Relativity Theory, Cosmology, Real Analysis, Big Data Analytics in Physics

PUBLICATIONS

Journal Articles

[1] **C. Lenhart**, M. C. Johnson, J. Wang, A. P. Asnodkar, S. Petz, A. Duck, K. G. Strassmeier, and I. Ilyin. "PEPSI Investigation, Retrieval, and Atlas of Numerous Giant Atmospheres (PIRANGA). II. Phase-resolved Cross-correlation Transmission Spectroscopy of KELT-20b". In: *The Astronomical Journal* 171.2 (Jan. 2026), p. 81. DOI: 10.3847/1538-3881/ae2252.

[2] C. Basinger, M. C. Johnson, J. Wang, A. Duck, A. Pai Asnodkar, S. Petz, **C. Lenhart**, I. Ilyin, and K. Strassmeier. "PEPSI investigation, retrieval, and atlas of numerous giant atmospheres (PIRANGA) – III. Composition and winds in the atmosphere of TOI-1518 b". In: *Monthly Notices of the Royal Astronomical Society* 543.4 (Sept. 2025), pp. 4136–4143. DOI: 10.1093/mnras/staf1648.

[3] V. Bonidie, M. C. Johnson, J. Wang, S. Petz, J. Kamen, **C. Lenhart**, A. Duck, C. Badenes, K. Strassmeier, and I. Ilyin. "PEPSI Investigation, Retrieval, and Atlas of Numerous Giant Atmospheres (PIRANGA). IV. High-resolution Phased-resolved Spectroscopy of the Ultra-hot-Jupiter KELT-20 b". In: *The Astronomical Journal* 171.1 (Dec. 2025), p. 34. DOI: 10.3847/1538-3881/ae21be.

Conference Abstracts

[1] J. Kamen, M. C. Johnson, V. Bonidie, S. Petz, **C. Lenhart**, J. Wang, and K. Strassmeier. "Chemistry and dynamics from high-resolution emission spectra of the ultra-hot Jupiters KELT-20b and

TOI-1518b from the PIRANGA project". In: *American Astronomical Society Meeting Abstracts*. Vol. 247. Abstract 1669. Jan. 2026, 1669, p. 1669.

[2] **C. Lenhart**, M. Johnson, S. Petz, J. Wang, A. Pai Asnodkar, K. Strassmeier, and I. Ilyin. "Analysis of KELT-20b's Atmospheric Dynamics Using PEPSI: Line Profiles During Transit and Velocity Offsets". In: *American Astronomical Society Meeting Abstracts*. Vol. 243. American Astronomical Society Meeting Abstracts. Feb. 2024, 179.09, p. 179.09.

Theses

[1] **C. Lenhart**. "Phase-Resolved Cross-Correlation Transmission Spectroscopy of KELT-20b". Undergraduate Research Thesis. The Ohio State University, Dec. 2024.

PRESENTATIONS

Talks

[1] **C. Lenhart** and M. C. Johnson. *Analysis of an Ultra-Hot Jupiter's Atmosphere*. Ohio State Department of Astronomy Summer Undergraduate Research Program Symposium (Columbus, OH, USA). July 2023.

Posters

[1] **C. Lenhart**, M. C. Johnson, J. Wang, A. P. Asnodkar, S. Petz, K. G. Strassmeier, and I. Ilyin. *Analysis of KELT-20b's Atmospheric Dynamics Using PEPSI: Line Profiles During Transit and Velocity Offsets*. 243rd Meeting of the American Astronomical Society (New Orleans, LA, USA). Jan. 2024.

MEDIA

2025	Columbus Underground, Exposure: Featuring Local Artists Sabrina Mathues Manygoats and Calder Lenhart at Wild Goose Creative

AWARDS & GRANTS

2025	Artist Grant, Greater Columbus Arts Council
2024	Ann Slusher Tuttle Undergraduate Scholarship, Ohio State University Department of Astronomy
2023	Undergraduate Research Scholarship, Ohio State University College of Arts and Sciences
2023	1st Place, MakeOHI/O 2023
2020	Eagle Scout, Boy Scouts of America
2019	Youngstown CityScape Beautification Watch Award

RESEARCH EXPERIENCE

2025–   **ASAS-SN Analyst**, Department of Astronomy, Ohio State University
(Advisors: Prof. Christopher Kochanek, Prof. Krzysztof Stanek)

- Built a parallelized processing pipeline for > 17 million ASAS-SN light curves; searched for dimming events due to circumstellar dust obscuration and brightening events due to gravitational microlensing with configurable filtering to reduce false positives.
- Implemented Gaussian Process modeling to characterize instrumental systematics and define the quiescent baseline required to detect rare anomalies.
- Developed a detection framework utilizing Bayes factors to flag significant excursions and BIC model selection to distinguish gravitational microlensing from dust obscuration.
- Manuscript in progress.

2023–   **Exoplanet Researcher**, Department of Astronomy, Ohio State University
(Advisor: Dr. Marshall C. Johnson, Co-advisor: Prof. Ji Wang)

- Led a first-author study using high-resolution spectroscopic time-series data to extract Doppler-shifted atmospheric absorption from thousands of weak lines in the ultra-hot Jupiter KELT-20b.
- Built an end-to-end pipeline to correct spectral contamination from systematics and Earth's atmosphere, then cross-correlate observations with forward-modeled template spectra.
- Detected atmospheric absorption at high significance, including Fe and Fe^+, and time-resolved the strongest signals to map winds across the transit.
- Identified statistically significant start/end-of-transit asymmetries, supporting the scale height effect, differences between ions vs. neutrals, and evidence for multiple atmospheric altitudes (distinct wind patterns).
- Showed prior KELT-20b analyses could bias measured velocities by adopting literature system parameters; defined and recommended a standardized measurement procedure that improved consistency across observations.

2022–2023   **Undergraduate Research Assistant**, Department of Materials Science and Engineering, Ohio State University
(Advisor: Prof. Sheikh Akbar)

- Performed hydrothermal synthesis of metal-oxide nanostructures for gas sensors; characterized resistivity, response time, and selectivity of analytes.
- Cleanroom trained at Nanotech West Lab; managed safe handling of hazardous gases and materials.

WORK EXPERIENCE

2025–   **Research Technician I**, The Ohio State University, On-site
               Prof. Christopher Kochanek, Prof. Krzysztof Stanek (Department of Astronomy)

   - Perform daily quality control of data obtained by 5 ASAS-SN telescopes; verify supernova and other transient candidates; release confirmed discoveries to the public.

2025   **Physics AI Trainer**, Mercor Intelligence

   - Trained a top AI research organization's LLM in advanced physics and mathematics concepts.

2022–2023   **Private Tutor**, Grade Potential Tutoring

   - Tutored middle school, high school, and college students in-person in STEM.

2022–2023   **Private Tutor**, Wyzant

   - Maintained a 5.0/5.0 rating across 30+ reviews and earned recognition as a top tutor in Columbus, OH.
   - Created customized study plans for students ranging from middle school to college level in math, physics, and standardized test prep.

2021–2022   **Math Tutor**, Ohio State University Mathematics and Statistics Learning Center

   - Tutored Calculus I–III students, managing scheduling, lesson planning, and teaching of more than 20 students per week.

PROJECTS

2023   **Machine Learning: Linking Writing Processes to Writing Quality**, GitHub

   - Developed a Histogram-based Gradient Boosting Regression Tree with Scikit-learn to predict writing quality of mock SAT essays using keystroke logs.
   - Engineered features proposed in computational linguistics literature and tuned hyperparameters.
   - Placed in the 63rd percentile in Kaggle competition efficiency leaderboard.

2023   **Make OHI/O Makeathon (Intel Challenge)**
   - 1st Place Winner: Prototyped an updated cleanroom garment with tear sensors, improved boot covers, and redesigned masks for use in Intel's semiconductor fabrication plants.
   - Designed prototype using Arduino boards and authentic cleanroom garment materials.

2021–2022   **Buckeye Solar Racing**, Aerodynamics Team

- Researched solar car geometries and designed canopy/aeroshell components in SolidWorks.
- Ran CFD simulations with STAR-CCM+ and meshed existing canopy with photogrammetry software to validate physical prototypes.

2021   **NASA L'SPACE Mission Concept Academy**, Engineering Team Lead

- Collaborated with a 10-person interdisciplinary team to conceptualize a mission to drill water-ice from the lunar south pole.
- Modeled entry, descent, and landing of a lunar rover; designed a compact lunar regolith drill with SolidWorks; and formulated the CONOPS.
- Performed risk analysis, integration and test, verification and validation.

SKILLS

Programming & Software Python, Julia, C++, HTML, CSS, LaTeX, Bash/Shell, Linux, Git, SolidWorks, Darktable

Research Methods: Atmospheric Retrieval, Bayesian Inference, MCMC, Gaussian Processes, Forward Modeling, High-Resolution Spectroscopy, Photometry, Parallel Computing

INTERESTS

Fine Art Photography: Recent exhibitions in Columbus, OH include *Exposure*, a two-person show at Wild Gallery in Oct. 2025; *ImageOHIO*, a group show at ROY G BIV in Oct. 2025

Activities: Biking, backpacking, printmaking, website design

Groups: Epsilon Tau Pi (Eagle Scout Service Organization), Ohio Art League, OSU Mountaineers, AROUSE Student Radio