Liam Becker

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https://liamb27.github.io/

Education

2022 – 2025 **B.Sc. Astronomy (Honors) & Comprehensive Physics** | University of Washington
Cum. GPA: 3.75

2018 – 2022 **High School Diploma** | Woodinville High School
Cum. GPA: 3.99

Experience

Research

Mar 2025 – Present **Research Mentee**
Department of Astronomy | University of Washington
Advisors: Lauryn E. Williams, Prof. Emily M. Levesque
Analyzing moving-mesh hydrodynamical simulations of Thorne-Żytkow Objects (TŻO) from "natal kick" formation scenarios. Using `yt` to study the properties of the object during and after the merger to understand the affects of initial conditions. Planning to use the stellar evolution code `MESA` to better understand how TŻOs may change over time and shed light on any observational characteristics of TŻOs that may lead to their discovery.

Jun 2024 – Sep 2024 **Full-Time Research Intern**
Institut für Astroteilchenphysik | Karlsruhe Institut für Technologie
Advisors: Lukas Guelzow, Prof. Tim Huege
Introduced to cosmic ray physics, air showers, and radio detection. Studied radiation energy differences between GRAND@Auger and GrandProto300 sites. Compared fluence maps between two frequency bands for both sites. Studied the significance of polarization components for determination of radiation energy. Used Python to analyze data and worked with remote servers/SSH connections.

Sep 2023 – Jun 2024 **Research Mentee**
Department of Astronomy | University of Washington
Advisors: Dr. Yakov Faerman, Prof. Matthew McQuinn
Utilized Python visualizations to compare models of hot virialized gas in the Circumgalactic Medium (CGM) to new X-ray observations from eROSITA to constrain the understanding of the physics of the hot CGM.

Experience (continued)

Oct 2022 – Jun 2023

Research Mentee
Department of Astronomy | University of Washington
Advisors: Dr. Yakov Faerman, Prof. Matthew McQuinn
Using ionization data from the Hubble Space Telescope and models developed by Dr. Faerman, worked to model the effect of radiation on gas properties of cold clouds in the CGM and their role in galactic evolution. Extensively used Python to visualize and analyze cold gas models based on Star Formation Rate dependencies.

Leadership

Sep 2024 – Jun 2025

Treasurer
League of Astronomers | University of Washington
Managed club funds and produced club merchandise, organized and led undergraduate social and informational events, operated and instructed the use of amateur telescopes.

Sep 2023 – Jun 2025

Vice President & Treasurer
Chanoyu Club | University of Washington
Led and organized club meetings and events, taught and performed the art of Japanese tea ceremony, handled correspondence with off-campus advisor and other student organizations. Served as acting president in Autumn of 2023.

Dec 2022 – Jun 2023

Treasurer
Chanoyu Club | University of Washington
Managed club finances, helped with set-up and tear-down at club meetings, helped organize and perform at public tea ceremony events.

Presentations and Publications

Publications

2025

Becker, L & Faerman, Y "Understanding X-Ray Emission in the Hot CGM" *(prep)*.

Presentations

2024

AstroFest, University of Washington Department of Astronomy, Seattle, WA, October 2024. Becker, L "The Effect of Stellar Evolution on Sunburns" *(contributed talk)*.

Mary Gates Undergraduate Research Symposium, Seattle, WA, May 2024. Becker, L "Using X-Ray Observations to Constrain Models of the Hot Circumgalactic Medium" *(contributed talk)*.

2023

Mary Gates Undergraduate Research Symposium, Seattle, WA, May 2023. Becker, L "Modeling the Source of Ionizing Radiation in the Circumgalactic Medium" *(contributed talk)*.

Coursework

Astronomy

ASTR 531 — **Graduate Stellar Interiors:** Physical laws governing the temperature, pressure, and mass distribution in stars. Equation of state, opacity, nuclear energy generation, computational methods. Models of main sequence stars and star formation.

ASTR 561/423 — **High-Energy Astrophysics:** High-energy phenomena in the universe. Includes supernova, pulsars, neutron stars, x-ray and gamma-ray sources, black holes, cosmic rays, quasi stellar objects, active galactic nuclei, diffuse background radiations. Radiative emission, absorption processes, and models derived from observational data. ***(Combined Grad/Undergrad course)***

ASTR 500 (Audit) — **Practical Methods For Teaching Astronomy:** Seminar in the preparation of lecture and workshop materials with emphasis on demonstration, visual aids, and the evaluation of students' progress.

ASTR 482 — **Scientific Writing:** Principles of organizing, developing, and writing resumes, scientific research papers for journals, and astronomy articles for general public interest. Includes *final paper* in the style of a journal article, based on students' prior research.

ASTR 481 — **Introduction to Astronomical Observation:** Theory and practice of obtaining optical data at a telescope. Topics include observing preparation and execution, and the subsequent data analysis required for completion of a research project.

ASTR 480 — **Introduction to Astronomical Data Analysis:** Hands-on experience with electronic imaging devices (CCDs) and software for image reduction and analysis. Introduction to operating systems, reduction software, and statistical analysis with applications to CCD photometry.

ASTR 421 — **Stellar Interiors:** Observations and theory of the atmospheres, chemical composition, internal structure, energy sources, and evolutionary history of stars.

ASTR 300 — **Introduction to Programming for Astronomical Applications:** Introduction to programming needed for astronomical applications: Linux operating systems, PERL, IDL.

ASTR 302 — **Python for Astronomy:** Teaches how to effectively use Python for research and astronomical data analysis. Introduction to key tools and libraries used in astronomy and how to use these to analyze data, visualize datasets, automate analyses, and apply this knowledge to reproducing results of some key astronomy papers.

ASTR 321 — **The Solar System:** Solar system; planetary atmospheres, surfaces and interiors, the moon, comets. The solar wind and interplanetary medium. Formation of the solar system.

ASTR 322 — **The Contents of Our Galaxy:** Introduction to astronomy. Basic properties of stars, stellar systems, interstellar dust and gas, and the structure of our galaxy.

ASTR 323 — **Extragalactic Astronomy and Cosmology:** Galaxies, optical and radio morphology and properties. Clusters of galaxies, radio sources, and quasars. Observational cosmology.

ASTR 324 — **Introduction to Astrostatistics and Machine Learning in Astronomy:** Introduces students to data science tools and techniques commonly used in data driven astronomy and astrophysics. Combines introductory theoretical background with hands-on work on examples of data analysis with modern astronomical datasets.

Physics

PHYS 321 & 322 — **Electromagnetism I & II:** First two parts of a three-quarter sequence. Charges at rest and in motion; dielectric and magnetic media; electromagnetic waves.

Coursework (continued)

PHYS 324 — **Quantum Mechanics I:** First part of a two-quarter sequence. Introduction to non-relativistic quantum mechanics: need for quantum theory, Schrodinger equation, operators, angular momentum, the hydrogen atom.

PHYS 329 — **Mathematical Methods and Classical Mechanics:** Mathematical methods applied to classical mechanics, including Lagrangian mechanics.

PHYS 331 — **Advanced Laboratory—Optics:** Measurements of interference and diffraction, optical properties of matter, image processing, interferometry, holography. Includes *final paper* on independent experimentation and exploration of students' choice of optical phenomenon.

PHYS 334 — **Advanced Laboratory—Analog Electronics:** Basic principles of circuit design and analysis; DC, AC, equivalent circuits, analog devices such as transistors, op-amps, and circuits made from them.

PHYS 224 — **Thermal Physics:** Introduces heat, thermodynamics, elementary kinetic theory, and statistical physics.

PHYS 226 — **Particles & Symmetries:** Introduction to the fundamental constituents of matter and the symmetries which characterize their interactions. Topics include special relativity; strong, weak, and electromagnetic interactions; quarks and leptons; baryons and mesons; and neutrinos and nuclei.

PHYS 227 & 228 — **Mathematical Physics I & II:** A two-quarter sequence. Applications of mathematics in physics with emphasis on the mechanics of particles and continuous systems. Develops and applies computational methods, both analytic and numerical.

Skills

Languages — Native fluency in **English**; Intermediate reading, writing, and speaking comprehension in **German**; Conversational in **Japanese**.

Computing — Python, LaTeX, SSH, Windows, Unix, HTML, CSS, Java

Hands-On — Experience operating research and amateur telescopes, familiar with optical lab equipment, basic knowledge of electronics

Misc. — Poetry, cooking, baking, music, tea ceremony, abnormally deep knowledge of Nintendo games and the Avatar the Last Airbender series.

Miscellaneous Experience

Awards

2024 — **2024 Baer Prize:** Awarded to UW Astronomy undergraduates for excellence in Academics, Research, and Outreach

DAAD RISE Germany Scholarship: Research Internships in Science and Engineering awarded by the German Academic Exchange Service (DAAD)

Certifications

2025 — **Official Student of Omotesenke:** Recognized by the Eastern Domonkai as an official student of the Omotesenke School of Japanese Tea Ceremony