# Abigail I. Hartley

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I am an NSF Graduate Fellow with research experience in computational and theoretical astrophysics, galaxy formation and evolution, and data analysis. Intellectual challenges excite me, and I thrive in fast-paced environments. Outside of work, I enjoy drawing and painting, reading science fiction, and attending concerts.

## Research Interests

Black Hole – Galaxy Co-evolution, Theoretical Astrophysics & Cosmology, Dark Matter, Active Galactic Nuclei, Simulation, Data Analysis

## Education

**Stanford University, Stanford, CA, USA** — Sep. 2024 - Present
Physics PhD Candidate — NSF Fellow, Stanford Graduate Fellow, EDGE Fellow, KIPAC Fellow

**University of Colorado Boulder, Boulder, CO, USA** — Aug. 2020 - Dec. 2023
Bachelor of Arts in Astronomy/Astrophysics — GPA: 3.97/4.00, Summa Cum Laude with distinction

**Plano East Sr. High School, Plano, TX, USA** — Aug. 2018 - May 2020
High School Diploma — Summa Cum Laude with honors

## Research Experience

**Research Assistant** — May 2022 - Aug. 2024
University of Colorado Boulder - Center for Astrophysics and Space Astronomy — 20 hours / week

- Studied quiescent galaxy populations in the IllustrisTNG cosmological simulation suite, resulting in a first author paper in MNRAS
- Served as PI on a Cycle 3 James Webb Space Telescope (JWST) proposal, collaborated with graduate students and postdoctoral researchers on three successful Cycle 2 JWST proposals
- Served as lead mentor for undergraduate and post-bacc students working on rotation curve fitting for galaxies from the FRESCO JWST survey

**Center for Space and Earth Science Student Intern** — Jun. 2023 - Sep. 2023
Los Alamos National Laboratory (LANL) - Computational Physics and Methods Group — 40 hours / week

- Simulated dynamic astrophysical phenomena using the LANL Smoothed Particle Hydrodynamics code FleCSPH, with a focus on neutron star research
- Ran neutron star binary merger simulations to investigate the effects of solid quark cores on gravitational wave signals
- Performed numerical studies of kilonovae following neutron star mergers to explore the effects of shocks on r-process nucleosynthesis

**Colorado Scholars of Astrophysics & Art (CSAA) Researcher** — Jun. 2023 - Dec. 2023
University of Colorado Boulder - Center for Astrophysics and Space Astronomy — 15 hours / week

- Designed an art project mentored by Dr. Zach Berta-Thompson to highlight the valuable contributions of gender minorities in astrophysics
- Illustrated collages to educate viewers on how diversity and inclusion lead to paradigm-shifting science. These illustrations are now displayed in the lobby of Duane Physics at CU Boulder.

## Research Publications

- **A. Hartley**; E. Nelson; K. Suess; A. Garcia; M. Park; L. Hernquist; R. Bezanson; R. Nevin; A. Pillepich; A. Schechter; B. Terrazas; P. Torrey; S. Wellons; K. Whitaker; C. Williams. **"The First Quiescent Galaxies in TNG300"**. arXiV, MNRAS DOI: 2023MNRAS.522.3138H, April 2023

- C. Benton; E. Nelson; T. Miller; R. Bezanson; J. Gibson; **A. Hartley**, et al. **"JWST Reveals Bulge-dominated Star-forming Galaxies at Cosmic Noon"**. arXiV, APJ DOI: 10.3847/2041-8213/ad7e27, Oct. 2024

- I. Sagert; O. Korobkin; I. Tews; B. Tsao; H. Lim; M. Falato; **A. Hartley**; J. Loiseau; C. Mauney. **"Modeling the Solid Neutron-Star Crust with SPH"**. ADS, April 2024

- E. Nelson; G. Brammer; C. Gimenez-Arteaga; P. Oesch; H. Ubler; A. de Graaff; J. Matharu; R. Naidu; A. Shapley; K. Whitaker; E. Wisnioski; N. Forster Schreiber; R. Smit; P. van Dokkum; J. Chisholm; R. Endsley; **A. Hartley**, et al. **"FRESCO: An extended, massive, rapidly rotating galaxy at $z = 5.3$"**. arXiV, Oct. 2023

- E. Nelson; K. Suess; R. Bezanson; S. Price; P. van Dokkum; J. Leja; B. Wang; K. Whitaker; I. Labbe; L. Barrufet; G. Brammer; D. Eisenstein; J. Gibson; **A. Hartley**, et al. **"JWST Reveals a Population of Ultrared, Flattened Galaxies at $2 \leq z \leq 6$ Previously Missed by HST"**. arXiv, APJ DOI: 10.3847/2041-8213/acc1e1, May 2023

## Research Presentations

- **A. Hartley**. The First Quiescent Galaxies in IllustrisTNG. *Talk Presented at: Extreme Galaxies Conference, 2024 May 2, Reykjavik, Iceland*
- **A. Hartley**, M. Falato, I. Sagert, O. Korobkin, C. Mauney. SPH Simulations of Neutron Stars with Crystalline Quark Matter. *Talk Presented at: Particle Methods and Applications Conference, 2024 Jan. 22, Santa Fe, NM*
- **A. Hartley**. The First Quiescent Galaxies in TNG300. *Honors Thesis Defense, 2023 Oct. 31, Boulder, CO*
- **A. Hartley**. How Did the First Galaxies Stop Forming Stars? *Chalk Art and Talk Presented at: CU Boulder's UROP Sidewalk Symposium, 2023 Oct. 17, Boulder, CO*
- **A. Hartley**. The First Quiescent Galaxies in TNG300. *Talk Presented at: Harvard-Smithsonian Center for Astrophysics, 2023 Sep. 22, Cambridge, MA*
- **A. Hartley**, M. Falato, O. Korobkin, I. Sagert. Simulating Neutron Stars with Solid Quark Cores. *Poster Presented at: CU Boulder's Sandia Day, 2023 Sep. 15, Boulder, CO*
- **A. Hartley**, M. Falato, O. Korobkin, I. Sagert. Simulating Neutron Stars with Solid Quark Cores. *Poster Presented at: LANL Student Symposium, 2023 Aug. 1, Los Alamos, NM*
- **A. Hartley**, M. Falato, O. Korobkin, I. Sagert. Simulating Neutron Star Mergers with Solid Quark Cores. *Talk Presented at: LANL CTA Lightning Talk Series, 2023 July 17, Los Alamos, NM*
- **A. Hartley**. The First Quiescent Galaxies in TNG300. *Talk Presented at: LANL Center for Theoretical Astrophysics (CTA) Journal Club, 2023 June 16, Los Alamos, NM*

## Awards & Grants

**Outstanding Graduate of the College of Arts & Sciences** Fall 2023
University of Colorado Boulder

- Of the thousands of students in the College of Arts & Sciences, ∼7% defend an Honors Thesis to graduate with Latin honors. Of that 7%, one student from each of CU's 39 Arts & Sciences departments is nominated, and one finalist is selected by CU faculty as the Outstanding Graduate of the College.
- Requires a GPA of 3.75 or higher, high quality Honors Thesis defense, and outstanding contributions to the Boulder community. Recipients deliver a speech at their College's graduation ceremony.

**Jacob Van Ek Scholars Award** Spring 2023
University of Colorado Boulder, College of Arts & Sciences

- Awarded to 26 undergraduates who were nominated by faculty for their superior academic achievement and positive community involvement. Considered one of the College of Arts & Sciences' highest honors.

**Undergraduate Research Opportunities Program (UROP) Individual Grants** Summer 2022, Fall 2023
University of Colorado Boulder

- $3k stipend for astrophysics research Summer 2022, $750 stipend for Honors Thesis research Fall 2023

**Dean's List** Fall 2020 - Fall 2023
University of Colorado Boulder, College of Arts & Sciences

- Attained a term GPA of 3.750 or better every semester of my undergraduate career as a full-time student

**CU Esteemed Scholars-Sewall Scholarship** Fall 2020 - Fall 2023
University of Colorado Boulder

- Awarded to a select group of new Colorado resident first-year students based on GPA, difficulty of high school coursework, and community involvement

## Technical Skills

**Programming languages:** Python, C++, Mathematica, Bash, Git, TeX, Linux
**HPC Experience:** Los Alamos National Laboratory clusters, Sherlock (Stanford University clusters)
**Simulation/Visualization:** IllustrisTNG, UniverseMachine, QGIS, FleCSPH, Paraview, Modules for Experiments in Stellar Astrophysics (MESA)

## Relevant Workshops

**C++ Workshop** Jul. 2023
LANL Co-Design Summer School (CDSS)

- "How to write respectable C++ without really trying", Dr. Davis Herring of LANL, Applied Computer Science division

**Python Training** Jul. 2023
LANL Information Science and Technology Institute (ISTI) Deep Learning Python Training

- "Introduction to Deep Learning in Python", Dr. Wesley Reinhart and Dr. Rebecca Napolitano of Penn State University

## Leadership Activities

**CU Astronomy Club (CUAC)** Aug. 2021 - Dec. 2023
University of Colorado Boulder

- Secretary, May 2022 - May 2023
- Promoted club stability and organization with weekly meeting notes and brainstorm sessions for future events
- Recruited historically underrepresented students to CUAC at Fall Welcome events, advocating for more diversity and inclusion in astrophysics
- Organized events such as planetarium shows and dark sky trips to make astrophysics accessible and appealing to students outside of the physics department

**Community of Support for Marginalized Students (COSMOS) in Physics** Aug. 2022 - Dec. 2023
University of Colorado Boulder

- Administrative Advisor, Feb. 2023 - Dec. 2023
- Served as a panelist in a panel discussion on women and gender minorities in physics
- Assisted in the establishment of a department-funded travel grant to send historically marginalized students to academic conferences
- Provided career development resources for marginalized groups in STEM, including undergraduate research opportunities and poster workshops

**International Society of Non-Binary Scientists (ISNBS)** Jul. 2023 - Present

- Facilitated group discussions regarding methods to achieve a more diverse and inclusive future in STEM

## Non-Research Employment

**Animal Shelter Worker & Barista** Aug. 2022 - Mar. 2023
Purrfect Pause Cat Cafe

- Handled customer transactions and resolved disputes with friendly service
- Monitored animals' well-being and administered medication when needed
- Organized and hosted events like Trivia Night and a "Paint Your Pet" class, helped paint a space- and cat-themed mural

**Astrophysical & Planetary Sciences Grader** Aug. 2021 - Dec. 2021
University of Colorado Boulder

- Graded all Fall semester assignments for Accelerated Introductory Astronomy I, a course of over 100 students
- Communicated with students and course instructor to improve students' understanding of material