CAMILLE CHIU

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EDUCATION

Yale University, New Haven, CT — **Expected graduation:** Spring 2026
Major: Astrophysics — **Cumulative GPA:** 3.92/4.00

Current courses (Fall 2025): Thermodynamics and Statistical Mechanics, Astrostatistics and Data Mining, Painting Basics, Astrophysics Senior Thesis
Relevant courses: Fundamentals of Physics I, Fundamentals of Physics II, Classical Mechanics, Advanced Physics from Newton to Einstein, Quantum Mechanics and Natural Phenomena I, Modern Physical Measurement I, Physical Chemistry with Applications in the Physical Sciences II, Modern Physical Measurement II, Linear Algebra, Ordinary and Partial Differential Equations, Probability and Bayesian Statistics, The Anthropology of Outer Space, Research Methods in Astrophysics (final project: mock telescope proposal), Scientific Computing in Astrophysics, Stellar Dynamics, Exoplanets, Critical Data Visualization: History, Theory, and Practice

Graduated from **College Station High School** in May 2021 — **HS GPA:** 4.00/4.00

PUBLICATIONS

- **Chiu C.**, Chandra V., & Rix H.W., in prep. The Stellar Mass-Weighted Orbit and Metallicity Distribution of the Milky Way. *In preparation for submission.*
- **Chiu C.**, Li Y., Huber D., Ong J., van Saders J., & Crawford C., in prep. Constraining Mass Loss Across the Red Giant Branch Using Wide Binaries from Gaia EDR3. *In preparation for submission.*
- **Chiu C.**, Geha M., Cerny W., Garling C., Richstein H., & Kallivayalil N., in prep. Kinematics and Star-formation History of Willman 1: A Disrupting Dwarf Galaxy. *In preparation for submission.*
- **Chiu C.** & Strigari L. (2020). Testing the Accuracy of the Tangent Point Method for Determining the Milky Way's Inner Rotation Curve. *Research Notes of the American Astronomical Society*, 4, 165. DOI: 10.3847/2515-5172/abbad8.

RESEARCH EXPERIENCE

The Stellar Mass-Weighted Orbit and Metallicity Distribution of the Milky Way — Summer 2025-present
Summer Research Intern under the mentorship of Vedant Chandra & Prof. Hans-Walter Rix — *Heidelberg, Germany*

- We developed a new method for reconstructing the orbit and chemical stellar density distribution of the Milky Way in order to contextualize our Galaxy within the broader population of observed and simulated galaxies.
- I applied this method the precise 6D phase-space and chemical abundance measurements of red giant branch stars from *Gaia* DR3. I developed the tools to implement this method including writing orbit integration code, modeling the *Gaia* selection function, and modeling interstellar dust.
- I calculated fundamental structural properties of the Milky Way that have previously been difficult to measure such as the total Milky Way stellar mass, the global stellar metallicity distribution, and the radial stellar mass profile. This allows us to situate the Milky Way in the context of galactic formation and chemical evolution models as well as the local galaxy population.

Constraining Mass Loss on the Red Giant Branch Using Wide Binaries and Asteroseismology — Summer 2024-present
NSF REU Researcher under the mentorship of Dr. Yaguang Li & Prof. Dan Huber — *Honolulu, HI*

- We reviewed scientific literature on asteroseismic techniques and the contradictory results between previous studies of red giant branch mass loss using globular clusters and those using open clusters.
- I selected a sample of 9 red clump (RC) + subgiant (SG) wide binaries from the El-Badry+(2021) catalog. I extracted the oscillation frequencies of each RC star from TESS light curves using peakbagging and inferred the stellar properties of each star based on a set of observables.
- I fit the wide binary sample to `MESA` and `GYRE` stellar evolution models using observational, asteroseismic, and coevality constraints in order to estimate the stellar mass loss of the primary RC star in each binary.
- We concluded that the integrated stellar mass loss determined from our analyses are more consistent with the smaller values ($\leq 0.1\ M_\odot$) estimated from seismic studies of open clusters rather than the larger mass loss values inferred from globular clusters.

Kinematics and Star-formation History of Willman 1: A Disrupting Dwarf Galaxy — Spring 2023-present
Yale Undergraduate Researcher under the mentorship of Prof. Marla Geha — *New Haven, CT*

- We reviewed scientific literature on Willman 1 (W1), ultra-faint dwarf galaxies, and their significance for constraining dark matter, understanding Milky Way dynamics, and in testing cosmological theories.
- I used photometric and kinematic data from Keck/DEIMOS in conjunction with proper motion and parallax data from Gaia DR3 to develop an original probabilistic framework for membership selection. From the member sample, I analyzed properties such as velocity distribution, mass segregation, and metallicity distribution.
- I performed dynamical analyses to determine the orbital history of Willman 1, including its simulated 3D orbit, simulated stellar streams, and tidal radius calculations.
- We concluded that evidence points towards Willman 1's classification as a dwarf galaxy that is undergoing tidal disruption.

Mapping the Habitability of the Milky Way with Gaia and Stellar Kinematics Fall 2019-Spring 2021
High school researcher under the mentorship of Katelyn Stringer (PhD candidate at TAMU) *College Station, TX*

- We reviewed scientific literature on the Galactic Habitable Zone (GHZ), the regions of the Milky Way that would be most suitable for life, and the effect of various galactic hazards on the potential for life.
- I developed a new model for the GHZ that incorporates stellar kinematics and applied it to stellar data from the Gaia satellite on over 6 million stars, including almost 1,500 confirmed exoplanet systems.
- I performed kinematics analyses by calculating the 3D orbit of each star backwards in time over the last four billion years using the Milky Way's calculated gravitational potential and each star's current 6D phase space.
- We concluded that, in contrast to previous studies, there is a potential for habitable planets in most regions of our galaxy, indicating that accounting for stellar kinematics is an essential piece in our search for life in the Universe.

Testing the Accuracy of the Tangent Point Method for Determining the Milky Way's Inner Rotation Curve Fall 2018-Fall 2020
High school researcher under the mentorship of Prof. Louis Strigari at TAMU *College Station, TX*

- We reviewed scientific literature on galactic rotation curves, which provide evidence for the existence of dark matter.
- We formulated hypothesis that the tangent point method (TPM), which has been used since 1954 to calculate the rotation curve of the inner portion of the Milky Way using neutral hydrogen radio telescope data, is inaccurate.
- We designed and executed analyses testing the accuracy of the TPM by comparing the rotation curve derived from the TPM with that derived from direct measurements of the motions of stars from the Gaia satellite.
- We found a statistically significant difference, providing evidence that the TPM is inaccurate and implying that the Milky Way's rotation curve is shallower than previously thought.

AWARDS/FELLOWSHIPS

National Goldwater Scholarship March 2025

Best Poster Presentation Award (University of Connecticut Conference for Women in Physics) January 2025

Chambliss Astronomy Achievement Student Award (245th AAS Meeting) January 2025

University of Hawai'i Institute for Astronomy REU Fellow ($7,000) Summer 2024

Yale First-Year Summer Research Fellowship in Science & Engineering ($4,300) Summer 2023

International Science and Engineering Fair (ISEF)

- Finalist, selected as one of six best in fair projects to represent the Austin district May 2019, 2020, 2021
- Honorable Mention from the National Aeronautics Space Administration (NASA) May 2019
- 4th place in Astronomy/Physics May 2021

Texas Junior Academy of Science (TJAS)

- 1st place Physics/Earth & Space Science October 2020
- 2nd place Natural Sciences, selected as one of 10 students to represent Texas at the **American Junior Academy of Science (AJAS)** Conference February 2021

CONFERENCES/TALKS

- Yale University Undergraduate Kick-off Event (expected) September 2025
  Talk: The Stellar Mass-Weighted Orbit and Metallicity Distribution of the Milky Way
- MPIA Milky Way Group Meeting August 2025
  Talk: The Stellar Mass-Weighted Orbit and Metallicity Distribution of the Milky Way
- Attendee at APS Conference for Undergraduate Women in Physics at the University of Connecticut January 2025
  Poster: The Kinematics of Willman 1: A Disrupting Dwarf Galaxy

- Attendee at the 245th Meeting for the American Astronomical Society at National Harbor, MD — January 2025
  Poster: Constraining Mass Loss on the Red Giant Branch Using Wide Binaries and Asteroseismology
- Yale University Undergraduate Kick-off Event — September 2024
  Talk: Constraining Mass Loss on the Red Giant Branch Using Wide Binaries and Asteroseismology
- University of Hawai'i REU Final Presentations — August 2024
  Talk: Constraining Mass Loss on the Red Giant Branch Using Wide Binaries and Asteroseismology
- Attendee at APS Conference for Undergraduate Women in Physics at CUNY — January 2024
  Poster: Re-assessing Milky Way Dwarf Galaxy Willman 1
- Invited attendee at Dwarfs in the Local Group and Beyond Regional Conference at the Flatiron CCA — July 2023

OUTREACH

- Yale Astronomy Department AstroSibs Undergraduate Coordinator — Spring 2025-present
- President the Yale chapter of Women and Gender Minorities in Physics (WiP+) — Fall 2025-present
- Regular volunteer for Yale Pathways events (e.g. Girls' Science Investigations) — Fall 2022-present
- Independent project: Khroma website — Spring 2024
  - created a website that guides the user through the creation of astronomical RGB color images from JWST data
- High school tutoring (physics) — Spring 2024
- Yale Prison Education Initiative (YPEI) volunteer for the Research Request Network — Summer 2023
- Invited speaker at the Austin Astronomical Society, *Talk: Galactic Habitability* — August 2020

SKILLS

- **Computer skills:** Proficient in Microsoft Word, Excel, PowerPoint; Typing (90 WPM)
- **Data Science/Programming:** advanced Python; intermediate LaTeX, R; basic Mathematica, C++
- **Foreign languages:** French (C1 level, spent gap year between high school and college as an exchange student in France, attending French lycée and living with a host family)
- **Memberships:** Society for Physics Students (2022-present), American Astronomical Society (2024-present)

OTHER INTERESTS

- **Ballet**, current board member of the Yale Ballet Company
- **Music**, play piano as background music, as an accompanist, and for personal enjoyment; currently teach local elementary schooler piano basics; member of the Yale Handbells Ensemble (former co-president)
- **Reading**, science fiction, philosophy, social sciences (Ted Chiang, Elena Ferrante, Kurt Vonnegut, Albert Camus)