

Caleb Painter

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Education

Candidate Astrophysics PhD, Princeton University *Princeton, NJ* *Aug 2026 – Present*
NSF Graduate Research Fellow

Michael C. Rockefeller Fellow *Aotearoa, New Zealand* *Aug 2025 – Aug 2026*

BA, Harvard University *Cambridge, MA* *Aug 2021 – May 2025*

Majors: Astrophysics, Physics *Honors:* *summa cum laude*

Minor: History of Science

Relevant Coursework: General Relativity, Quantum Mechanics, Machine Learning for Astrophysicists, Advanced Scientific Computing, Statistical Inference

Research Experience

Center for Astrophysics | Harvard & Smithsonian *Cambridge, MA* *Aug 2024 – Sep 2025*
Protoplanetary Disks & Astrochemistry | Advisor: Sean Andrews

- Modeled low-frequency dust spectra of protoplanetary disks from VLA, NOEMA, and SMA observations to constrain dust population properties and disk masses

Exoplanets and Stellar Physics | Advisor: Dave Charbonneau *Sep 2023 – Jan 2024*

- Developed algorithms to detect faint stellar oscillations in M dwarfs from *TESS* data

High Energy Astrophysics | Advisor: Rosanne Di Stefano *Jun 2022 – Jan 2024*

- Analyzed archival *Chandra* data for evidence of exoplanets around X-ray binaries
- Synthesized *XMM-Newton*, *NICER*, *Suzaku*, and *RXTE* observations to verify planet candidates and test for periodicity

Institute for Astronomy | University of Hawaii *Manoa, HI* *Summer 2024*
Protoplanetary Disks & Astrochemistry | Advisor: Jonathan Williams

- Constrained protoplanetary disk masses by linking dust radial drift with disk gas radii
- Analyzed ALMA observations as part of the Disk Exoplanet C/Onnection (DECO) survey to determine disk geometries

Berkeley SETI Research Center | UC Berkeley *Berkeley, CA* *Summer 2023*
Breakthrough Listen Group | Advisor: Steve Croft

- Developed novel algorithms for technosignature searches and RFI filtration
- Carried out one of the most sensitive SETI searches to date on 500+ terabytes of GBT data

Honors, Awards, and Fellowships

NSF Graduate Research Fellowship Program, 2026

Michael C. Rockefeller Memorial Fellowship, 2025

Sophia Freund Prize, 2025

Finalist Hertz Fellowship, 2025

Phi Beta Kappa Senior 48, 2024

Detur Book Prize, 2023

John Harvard Scholar, 2022,2023,2024

Harvard College Research Program Fellow, 2022

Publications

refereed: 5 / first author: 3 / citations: 28 / h-index: 4 (2026-04-23)

- 5 **Painter, Caleb**; Andrews, Sean M.; Chandler, Claire J.; Ueda, Takahiro; et al., 2025, *Detailed Microwave Continuum Spectra from Bright Protoplanetary Disks in Taurus*, The Open Journal of Astrophysics, **8**, 134 (arXiv:2507.21268)
- 4 **Painter, Caleb**; Croft, Steve; Lebofsky, Matthew; Andersson, Alex; Choza, Carmen; et al., 2025, *A Novel Technosignature Search in the Breakthrough Listen Green Bank Telescope Archive*, The Astronomical Journal, **169**, 222 (arXiv:2412.05786)
- 3 Jacobson-Bell, Ben; Croft, Steve; Choza, Carmen; et al. (incl. **CP**), 2025, *Anomaly Detection and Radio-frequency Interference Classification with Unsupervised Learning in Narrowband Radio Technosignature Searches*, The Astronomical Journal, **169**, 206 (arXiv:2411.16556)
- 2 Williams, Jonathan P.; **Painter, Caleb**; Anderson, Alexa R.; & Ribas, Alvaro, 2024, *Dust Drift Timescales in Protoplanetary Disks at the Cusp of Gravitational Instability*, The Astrophysical Journal, **976**, 50 (arXiv:2410.06207)
- 1 **Painter, Caleb**; Di Stefano, Rosanne; Kashyap, Vinay L.; Soria, Roberto; et al., 2024, *A possible third body in the X-ray system GRS 1747–312 and models with higher order multiplicity*, Monthly Notices of the Royal Astronomical Society, **529**, 245 (arXiv:2310.11500)

Teaching & Mentorship

Teaching Assistant — Harvard Statistics 110: Introduction to Probability

Fall 2023

I have mentored several students on a variety of projects including:

High schoolers: Raymond Zhang, Cissy Kuang (Summer 2022, RSI @ CfA)

Undergraduates: Andrés Luengo (Summer 2025, Berkeley REU)

Talks & Presentations

Oral

- American Astronomical Society Meeting (Seattle, WA)
- GBT Community Science Webinar

Jan 2023

Feb 2025

Poster

- American Astronomical Society Meeting (National Harbor, MD)
- American Astronomical Society Meeting (New Orleans, LA)

Jan 2025

Jan 2024

Skills & Interests

Programming: (Expert) Python, Mathematica (Intermediate) R, C++, SQL (Familiar) Julia

Software: Git/GitHub, $\LaTeX$, Linux, Bash, SAOImage DS9, HEASoft, CASA

Languages: (Fluent) English, French (Proficient) Spanish (Beginner) Te Reo Māori

Miscellaneous: Creative writing, navigation, sailing, reading, photography, ceramics