Alexa Bartlett

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Education

University of California, Berkeley — Berkeley, CA
PhD student in Physics — *Aug 2023 - Present*

Swarthmore College — Swarthmore, PA
Bachelor of Arts in Physics, Minors in Computer Science and Mathematics — *Sep 2019 – May 2023*

Honors and Awards

Carl Grossman Summer Opportunity Fund — *Mar 2022*
The fund is intended to support work, study, or research in physics during the summer

Frances Velay Women's Science Research Fellowship — *Mar 2021*
Granted to women in support of their full-time summer research in the Natural Sciences

Work and Research Experience

University of California, Berkeley — Berkeley, CA
Graduate Student Researcher; Advisor: Martin White — *May 2024 - Present*

- **Simulation Budgeting for Hybrid Effective Field Theories** — *Sep 2024 - Oct 2025*
  Calculated the type and number of N-body simulations required to create a hybrid effective field theory (HEFT) emulator of the nonlinear power spectrum in w_0w_aCDM cosmologies with massive neutrinos. This also entailed careful consideration of other sources of error in the power spectrum. I then assessed the train/test dataset sizes necessary for our accuracy requirements for several use cases.

- **Non-Gaussian Contributions to CMB Lensing Covariance in Perturbation Theory** — *Jun 2024 - Aug 2024*
  Computed the error in the CMB lensing power spectrum due to the matter and galaxy trispectra in tree-level cosmological perturbation theory.

Swarthmore College — Swarthmore, PA
Undergraduate Researcher; Advisor: Tristan L. Smith — *Jan 2021 - Present*

- **Perturbative Dynamics of Early Dark Energy** — *Jul 2021 - Nov 2024*
  I extensively modified and tested a code (AxiCLASS) that computes the physical predictions of the EDE model to examine how modifications to the EDE scalar field potential affect the perturbative dynamics of the model and change its physical predictions. I also conducted many Bayesian Markov chain Monte Carlo (MCMC) analyses on this model to compare its predictions against Cosmic Microwave Background data.

- **Profile Likelihood Analysis of Early Dark Energy** — *Jan 2022 - Jan 2024*
  Conducted frequentist profile likelihood analyses to explore the parameter space of the Early Dark Energy (EDE) cosmological model and the constraints of combinations of Cosmic Microwave Background data on Early Dark Energy. I also aided in developing and debugging an algorithm that streamlines this process.

- **Current Constraints on Interacting Dark Matter - Stepped Dark Radiation** — *Jun 2022 - Jun 2023*
  I extensively modified and tested a code (CLASS) that computes the physical predictions of a cosmological model in which stepped dark radiation interacts with the dark matter. I also conducted many Bayesian MCMC analyses to compare these predictions against Cosmic Microwave Background and large-scale structure data.

- **A Larger Hubble Constant without Late-Time Priors** — *Jan 2021 - June 2021*
  Examined the preference of various Cosmic Microwave Background data for EDE using Bayesian MCMC analyses.

Teaching Experience

University of California, Berkeley — Berkeley, CA
eaching Assistant

- Physics 7B: Physics for Scientists and Engineers (thermodynamics, E&M) — *Aug 2023 - Dec 2023, Jan 2024 - May 2024*

Swarthmore College — Swarthmore, PA
Peer Assistant

- PHYS 005: The World of Particles and Waves (optics, quantum mechanics) — *Aug 2022 - Dec 2022*
- PHYS 006: Foundations of Contemporary Physics (special relativity, thermodynamics) — *Jan 2023 - May 2023*

Publications and Presentations

Publications

- "Procoli: Profiles of Cosmological Likelihoods", Tanvi Karwal, Yashvi Patel, **Alexa Bartlett**, Vivian Poulin, Tristan L. Smith, Daniel N. Pfeffer, (2024), arXiv: 2306.12469
- "Comparative analysis of interacting stepped dark radiation", Nils Schöneberg, Guillermo Franco Abellán, Théo Simon, **Alexa Bartlett**, Yashvi Patel, Tristan L. Smith, Physical Review D 108 (2023) 12, 123513, arXiv: 2306.12469
- "Dark Energy at early times and ACT: a larger Hubble constant without late-time priors", Vivian Poulin, Tristan L. Smith, **Alexa Bartlett**, Physical Review D 104 (2021) 12, 123550, arXiv: 2109.06229

Conference Presentations

- **Alexa Bartlett**, Yashvi Patel, Guillermo Franco Abellán, Nils Schöneberg, Théo Simon, Tristan L. Smith. 2023. "Current Constraints on Interacting Dark Matter - Stepped Dark Radiation." Poster presentation delivered at the American Physical Society April Meeting, Minneapolis, MN.
- **Alexa Bartlett**, Yashvi Patel, Tristan L. Smith. 2023. "Dark Matter - Dark Radiation Interactions Can Alleviate both the Hubble and S8 Tensions." Poster presentation delivered at the Conference for Undergraduate Women in Physics Poster Session, Princeton, NJ.
- **Alexa Bartlett**, Shar Daniels, and Tristan L. Smith. 2022. "The Preferred Perturbative Dynamics of Early Dark Energy". Poster presentation delivered at the American Physical Society April Meeting, New York, NY.

Outreach

Splash at Berkeley — *Nov 2024*

Designed and gave a lecture introducing local high school students to dark matter and dark energy: what we know and what evidence we have for them

Memberships and Affiliations

- Dark Energy Spectroscopic Instrument (DESI): Member — *Apr 2024 - Present*
- Lawrence Berkeley National Lab: Affiliate — *Feb 2024 - Present*
- Sigma Xi Honors Research Society, Swarthmore Chapter: Associate Member — *Feb 2022 - May 2023*

Skills

Programming Languages: Python, Java, C, C++, Mathematica, Git, HTML, Javascript, CSS