

Samuel Goldstein

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EDUCATION

Columbia University

New York, NY

Ph.D. Physics (expected May 2027) | Advisor: J. Colin Hill

Sep. 2022-Present

M.Phil. Physics

M.A. Physics | GPA: 4.00/4.00

University of Pennsylvania

Philadelphia, PA

M.S. Physics & Astronomy | GPA: 4.00/4.00

Sep. 2017-May 2021

B.A. Physics, Mathematics | Thesis Advisor: Bhuvnesh Jain, Summa cum Laude, GPA: 3.99/4.00

LONG TERM RESEARCH VISITS

Lawrence Berkeley National Lab

Berkeley, CA

DOE SCGSR Fellow, Cosmology Group (Advisor: Simone Ferraro)

June 2026-Present

Max Planck Institute for Astrophysics

Garching, Germany

Fulbright Scholar, Cosmology Group (Advisor: Fabian Schmidt)

Sep. 2021-Aug. 2022

Brookhaven National Laboratory

Upton, NY

DOE SULI Intern, Cosmology Group (Advisor: Anže Slosar)

June 2018-Aug. 2018

AWARDS AND HONORS

US Department of Energy SCGSR Fellowship	2026
Jane Street Graduate Research Fellowship Finalist	2025
Buchalter Cosmology Prize (First Prize)	2023
Fulbright Scholar	2021
William E. Stephens Memorial Prize	2021
Goldwater Scholar	2020
Phi Beta Kappa	2020
Dean's List	2017-2021
US Department of Energy SULI Fellowship	2019
Penn Undergraduate Research Mentorship Fellowship	2018
Eagle Scout	2016

PUBLICATIONS

Main author

1. **S. Goldstein**, K. M. Smith, U. Giri, M. Münchmeyer, “If at first you don’t succeed, trispectrum: I. Estimating the matter power spectrum covariance with higher-order statistics” (2026). *Phys. Rev. D*, (submitted), [arXiv:2604.18581](https://arxiv.org/abs/2604.18581)
2. **S. Goldstein**, J. C. Hill “A 2% determination of N_{eff} from primordial element abundance, CMB, and BAO measurements” (2026). *Phys. Rev. D*, 114, L021305, [arXiv:2603.13226](https://arxiv.org/abs/2603.13226)
3. **S. Goldstein**, J. C. Hill “Evidence of galaxy cluster rotation and intrahalo gas motions in the cosmic microwave background” (2025). *Phys. Rev. Lett.*, (in press), [arXiv:2512.10951](https://arxiv.org/abs/2512.10951)
– Highlighted as *Phys. Rev. Lett.* Editors’ Suggestion
4. **S. Goldstein**, M. Celoria, F. Schmidt “Observational constraints on monodromic dark energy” (2025). *Phys. Rev. D*, 113, 023532, [arXiv:2507.16970](https://arxiv.org/abs/2507.16970)
5. **S. Goldstein**, O. H. E. Philcox, E. Fondi, W. R. Coulton “Wonderings on wiggly bispectra: non-linear evolution and reconstruction of oscillations in the squeezed bispectrum” (2025). *Phys. Rev. D*, 112, 083503, [arXiv:2505.13443](https://arxiv.org/abs/2505.13443)

6. **S. Goldstein**, F. McCarthy, C. Mondino, J. C. Hill, J. Huang, and M. Johnson. “Constraints on axions from patchy screening of the cosmic microwave background” (2024). *Phys. Rev. Lett.*, 134, 081001, [arXiv:2409.10514](#).
7. **S. Goldstein**, O. H. E. Philcox, J. C. Hill, and L. Hui. “Massive-ish particles from small-ish scales: non-perturbative techniques for cosmological collider physics from large-scale structure surveys” (2024). *Phys. Rev. D*, 110, 083516, [arXiv:2407.08731](#)
8. **S. Goldstein**, O. H. E. Philcox, J. C. Hill, A. Esposito, and L. Hui. “Consistently constraining f_{NL} with the squeezed lensing bispectrum using consistency relations” (2023). *Phys. Rev. D*, 109, 043515, [arXiv:2310.12959](#)
9. **S. Goldstein**, J. C. Hill, V. Iršič, and B. D. Sherwin. “Canonical Hubble-Tension-Resolving Early Dark Energy Cosmologies are inconsistent with the Lyman- α forest” (2023). *Phys. Rev. Lett.*, 131, 201001, [arXiv:2303.00746](#).
 - Highlighted as *Phys. Rev. Lett.* Editors’ Suggestion
10. **S. Goldstein**, A. Esposito, O. H. E. Philcox, L. Hui, J. C. Hill, R. Scoccimarro, and M. H. Abitbol. “Squeezing f_{NL} out of the matter bispectrum with consistency relations” (2022). *Phys. Rev. D*, 106, 123525, [arXiv:2209.06228](#)
 - Awarded First Prize in the 2023 Buchalter Cosmology Prize Competition
11. **S. Goldstein**, M. Park, M. Raveri, B. Jain, L. Samushia. “Beyond dark energy Fisher forecasts: how DESI will constrain Λ CDM and quintessence models” (2022). *Phys. Rev. D*, 107, 063530 [arXiv:2207.01612](#)
12. **S. Goldstein**, S. Pandey, A. Slosar, J. Blazek, B. Jain. “Perturbation theory models for LSST-era galaxy clustering: tests with sub-percent mock catalog measurements in Fourier and configuration space” (2022). *Phys. Rev. D*, 105, 123518, [arXiv:2111.00501](#)

Contributing author

13. Beringue et al. “The Atacama Cosmology Telescope: DR6 Power Spectrum Foreground Model and Validation” (2025). *JCAP*, 10, 082, [arXiv:2506.06274](#)
14. Calabrese et al. “The Atacama Cosmology Telescope: DR6 Constraints on Extended Cosmological Models” (2025). *JCAP*, 11, 063 [arXiv:2503.14454](#)
 - Led isocurvature and modified recombination analyses. Significant contribution to interpretation and presentation of results.
15. Louis et al. “The Atacama Cosmology Telescope: DR6 Power Spectra, Likelihoods and Λ CDM Parameters” (2025). *JCAP*, 11, 062 [arXiv:2503.14452](#)
16. T. Dacunha, M. Belyakov, S. Adhikari, T. Shin, **S. Goldstein**, B. Jain. “Connecting galaxy evolution in clusters with their radial profiles and phase space distribution: results from the IllustrisTNG hydrodynamical simulations” (2022). *MNRAS* 512, 3, 4378, [arXiv:2111.06499](#)
17. T. Shin et al. “The mass and galaxy distribution around SZ-selected clusters” (2021). *MNRAS*, 504, 4, 5758 [arXiv:2105.05914](#)

Collaboration papers

18. The Simons Observatory Collaboration. “The Simons Observatory: forecasted constraints on primordial gravitational waves with the expanded array of Small Aperture Telescopes” (2025). *JCAP*, 04, 051 [arXiv:2512.15833](#)

PRESENTATIONS

Talks

- New Frontiers in Cosmology**, “Can we measure oscillatory bispectra with large-scale structure?” August 2026
- Simons Observatory Meeting**, “Component-separated maps with early Simons Observatory data,” July 2026
- Penn Astronomy Seminar**, “New probes of astrophysics and the dark sector with CMB secondary anisotropies,” May 2026; (*Invited*)
- New Synergies in Multi-Probe Cosmology**, “New probes of astrophysics and the dark sector with CMB secondary anisotropies,” February 2026;
- New Physics from Galaxy Clustering**, “Reconstructing wiggly signatures of the cosmological collider,” October 2025;
- Conference on the Intersections of Particle and Nuclear Physics**, “Probing the dark sector with CMB secondary anisotropies,” June 2025; (*Invited*)
- Conference on the Intersections of Particle and Nuclear Physics**, “New Cosmology Maps and Results from ACT DR6,” June 2025; (*Invited; Plenary*)
- Institute for Advanced Study Cosmology Seminar**, “Constraining primordial non-Gaussianity with large-scale structure data at slightly smaller scales,” May 2025; (*Invited*)
- Cosmological Probes of New Physics Workshop**, “Constraining primordial non-Gaussianity with large-scale structure data at slightly smaller scales,” April 2025; (*Invited*)
- Perimeter Institute for Theoretical Physics Cosmology and Gravitation Seminar**, “Squeezing primordial non-Gaussianity out of the matter bispectrum (and trispectrum) with consistency relations,” September 2024; (*Invited*)
- Cosmology in the Adriatic**, “Axing away axions with CMB $\times$ LSS,” July 2024
- Max Planck Institute for Astrophysics Cosmology Seminar**, “Non-perturbative techniques to search for massive-ish particles with large-scale structure surveys,” May 2024; (*Invited*)
- Fundamental Physics from Future Spectroscopic Surveys Workshop**, “Non-perturbative techniques to search for massive-ish particles with large-scale structure surveys,” May 2024
- Yale Cosmology Seminar**, “Squeezing f_{NL} out of matter bispectrum with consistency relations,” March 2024; (*Invited*)
- Berkeley Center for Cosmological Physics Colloquium**, “Squeezing f_{NL} out of matter bispectrum with consistency relations,” March 2024
- Stanford Cosmology Seminar**, “Squeezing f_{NL} out of matter bispectrum with consistency relations,” March 2024; (*Invited*)
- Center for Computational Astrophysics PACMAN**, “Squeezing f_{NL} out of matter bispectrum with consistency relations,” November 2023
- Penn Cosmology Meeting**, “Squeezing f_{NL} out of matter bispectrum with consistency relations,” March 2023; (*Invited*)
- Berkeley Center for Cosmological Physics Vipolže Workshop**, “Reconstructing quintessence with DESI,” July 2022
- Max Planck Institute for Astrophysics Institute Seminar**, “Constraining quintessence and k-essence models of dark energy,” June 2022
- Galaxy-Halo Connection Across Cosmic Time Reunion Conference**, “Analyzing baryonic effects on halo density profiles in IllustrisTNG,” August 2020
- LSST DESC Collaboration Meeting**, “Modeling non-linear galaxy bias in LSST,” July 2020
- Brookhaven National Lab Physics Department Selected Intern Presentations**, “Modeling non-linear galaxy bias in preparation for the LSST,” August 2019

Posters

- Cosmology in the Adriatic**, Split, Croatia. “Massive-ish particles from small-ish scales: non-perturbative techniques for cosmological collider physics from large-scale structure surveys” July 2024
- Brookhaven National Lab SULI Research Fair**, Upton, NY. “Modeling non-linear galaxy bias in preparation for the LSST,” August 2019
- Ivy League Undergraduate Research Symposium**, Philadelphia, PA. “Identifying jets from boosted particles using center of mass reconstruction techniques,” April 2019
- University of Pennsylvania Fall Research Expo**, Philadelphia, PA. “Identifying jets from boosted particles using center of mass reconstruction techniques,” August 2018

MEDIA RESEARCH HIGHLIGHTS

- “Clashing Cosmic Numbers Challenge Our Best Theory of the Universe,” *Quanta*, Jan. 19, 2024
- “Early dark energy fails to solve mystery of cosmic expansion,” *Nature*, Nov. 24, 2023
- “Tension for a Hubble-tension solution,” *Physics Magazine*, Nov. 17, 2023
- “The Universe’s puzzlingly fast expansion may defy explanation,” *Science*, Nov. 1, 2023

PROFESSIONAL ACTIVITIES

Referee

MNRAS (2023–), *JHEP* (2025–), *JCAP* (2025–), *PRD* (2025–), *PRL* (2026–)

Collaborative Memberships

Atacama Cosmology Telescope (ACT), Dark Energy Spectroscopic Instrument (DESI), Simons Observatory (SO)

TEACHING AND OUTREACH

Reading Team Math

Volunteer weekly to teach math to elementary school students in Harlem

Columbia University

Sep. 2022 - Present

Physics Colloquium Committee

Volunteer to help organize Columbia’s Physics Colloquium

Columbia University

May 2024 - Present

Physics Scholars Program

Volunteer to teach research skills to undergraduates from underrepresented backgrounds

Columbia University

Jan. 2024 - May 2024

Physics Graduate Council

Served as social chair/treasurer. Organized events/merchandise for graduate students

Columbia University

May 2023 - May 2024

Graduate Teaching Assistant

Courses: Graduate Physical Cosmology, General Physics I/II Lab

Columbia University

Sep. 2022 - May 2024

College Tutor

Tutor at the University of Pennsylvania Tutoring Center

University of Pennsylvania

Jan. 2019 - May 2021

Courses: Multivariable calculus, linear algebra, ODEs, PDEs, mathematical foundations of computer science

Research Peer Advisor

Advisor at Penn’s Center for Undergraduate Research and Fellowships.

University of Pennsylvania

Aug. 2018 - May 2021

TECHNICAL SKILLS

Programming/HPC: Python, C, OCaml, Mathematica, MPI, L^AT_EX

Codes Developed: *AARDVARKSZ*, *AXIOTL*, *PNGOLIN*.

Cosmology Codes: CLASS, CAMB, GADGET, Cobaya, MontePython, CosmoMC

ADDITIONAL TRAINING

Cosmology Summer School at the International Center for Theoretical Physics: Trieste, Italy. July 2022