Aaron Hillman

Email: aaronjh@caltech.edu   Website: aaronjhf.github.io

EDUCATION

Princeton University   2018-2023
PhD, Theoretical Physics, advised by Prof. Nima Arkani-Hamed (Institute for Advanced Study)   *Princeton, NJ*
- Studied scattering amplitudes in particle physics and string theory as well as cosmological correlators
- Published individually and in large collaborations

Yale University   2014-2018
B.S. Physics Intensive—*magna cum laude*   *New Haven, CT*
- **Undergrad Coursework:** Mechanics, Scientific Programming, Partial Differential Equations, Abstract Algebra
- **Graduate Coursework:** General Relativity, Quantum Field Theory, Quantum Information, Statistical Physics

RESEARCH POSITIONS

Caltech – Postdoctoral Research   2023-
DuBridge Scholar, Walter Burke Institute for Theoretical Physics   *Pasadena, CA*
- Continued work on scattering amplitudes and uniqueness of string theory, publishing in Physical Review Letters (PRL)
- Research on machine learning and language models (latest work recorded on a blog)

Yale Summer Researcher – Theoretical Research   Summer 2017
Undergraduate Researcher   *New Haven, CT*
- Research on conformal field theory advised by Prof. David Poland culminating in a publication

Yale Summer Researcher – Experimental Group   Summer 2015
Freshman Summer Research Fellow   *New Haven, CT*
- Worked in the Harris Lab modeling whispering gallery modes in a superfluid helium drop

SELECTED PUBLICATIONS

For all my papers, see my Google Scholar.

Spectral Constraints on Theories of Colored Particles and Gravity   Nov 2024
A. Hillman, Y. Huang, L. Rodina, J. Rumbutis. arXiv.
- Derived a constraint requiring the existence of certain particles in weakly coupled UV completions of gravity with symmetry

A Bootstrap Principle for the Spectrum and Scattering of Strings   May 2024
C. Cheung, A. Hillman, G. Remmen. arXiv.
- Motivated a non-trivial bootstrap problem whose unique solution we demonstrated to be the string amplitude

Differential Equations for Cosmological Correlators   Dec 2023
N. Arkani-Hamed, D. Baumann, A. Joyce, A. Hillman, H. Lee, G. Pimentel. arXiv.
- Derived a system of graphical rules to produce the differential equations obeyed by cosmological correlators

A Subtraction Scheme for Feynman Integrals   Nov 2023
A. Hillman. arXiv.
- Used mathematics motivated by string theory to solve an unsolved problem in the calculation of loop amplitudes in quantum field theory, furnishing the first systematic expansion of divergent loop integrals in terms of finite integrals in dimensional regularization

SELECTED INVITED TALKS

LeCosPa Seminar – National University of Taiwan   2024
"Stringy Completions from the Bottom Up"   *Taipei, TW*

HET Seminar – Stanford Linear Accelerator (SLAC)   2024
"A Subtraction Scheme for Feynman Integrals"   *Menlo Park, CA*

Workshop on Tropical Geometry and IR Divergences – ETH Zurich   2024
"Feynman Polytopes and Tropical Geometry"   *Zurich, CH*

HONORS AND AWARDS

- **Ford Foundation Fellowship (honorable mention)** – Fellowship to support graduate study in the sciences   2019
- **Wohlenberg Prize in Science** – For an outstanding senior in the sciences, Berkeley College, Yale   2018
- **Howard L. Schultz Prize in Physics** – For outstanding seniors in physics at Yale   2018

SKILLS

Programming:	Python, Mathematica, LaTeX
Tools:	PyTorch, NumPy. Experience with data science & HPC.
Teaching:	Graduate: Topics in Quantum Mechanics and Gravity (Instructor: Edward Witten), High Energy Physics (Instructor: Isobel Ojalvo)
	Undergraduate: Modern Classical Dynamics (Instructor: Alexander Polyakov), Physics for Future Leaders (Instructor: Paul Steinhardt), Tutor at Yale's Center for Teaching and Learning
Languages:	English (native), Spanish (native)