

# Oliver H. E. Philcox, Ph.D.

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## CURRENT POSITIONS

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**Simons Society of Fellows, New York, USA**

Junior Fellow

2022 - Present

**Department of Physics, Columbia University, New York, USA**

Postdoctoral Research Scientist

2022 - Present

*Mentors:* Prof. J. Colin Hill & Prof. Lam Hui

**Department of Physics, Stanford University, Palo Alto, USA**

Acting Assistant Professor (Assistant Professor from Fall 2025)

2024 - Present

Stanford Institute for Theoretical Physics & Kavli Institute for Particle Astrophysics and Cosmology

## EDUCATION

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**Department of Astrophysical Sciences, Princeton University, USA**

Ph.D. in Astrophysics (2022)

2019 - 2022

**Thesis:** ‘Probing Fundamental Cosmology with Galaxy Surveys’

*Thesis Advisors:* David N. Spergel & Matias Zaldarriaga

M.A. in Astrophysics (2020)

**Center for Astrophysics | Harvard & Smithsonian, Cambridge, USA**

Pre-Doctoral Student, *Herchel-Smith Scholar*

2018 - 2019

*Advisor:* Daniel J. Eisenstein

**Institute of Astronomy, University of Cambridge, UK**

M.Sci. in Astrophysics

2017 - 2018

**Part III:** 1<sup>st</sup> Class (Rank 1/28, 97%)

**Thesis:** ‘Detection and Removal of B-mode CMB Dust Foregrounds with Signatures of Statistical Anisotropy’

*Thesis Advisor:* Dr. Blake D. Sherwin

**Emmanuel College, University of Cambridge, UK**

M.A. (Cantab.) in Natural Sciences, *Senior Scholar*

2014 - 2017

**Parts IA, IB, II:** 1<sup>st</sup> Class (Rank 1/20, 90%)

## LONG-TERM ACADEMIC VISITS

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**Center for Computational Astrophysics**

*Guest Researcher*

Jul. 2021 - Present

*New York, USA*

**Institute for Advanced Study**

*Visiting Graduate Student with Matias Zaldarriaga*

Sep. 2020 - Jul. 2022

*Princeton, USA*

**Max-Planck Institute for Astrophysics**

*Visiting Graduate Student with Eiichiro Komatsu*

Aug. - Sep. 2020

*Munich, Germany*

**Department of Applied Mathematics and Theoretical Physics**

*Visiting Graduate Student with Blake D. Sherwin*

May - Jul. 2020

*Cambridge, UK*

## PUBLICATION LIST

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\* = Author list alphabetized

### Major Author

1. Goldstein, S., **Philcox, O. H. E.**, Hill, J. C., Hui, L., “Massive-ish Particles from Small-ish Scales: Non-Perturbative Techniques for Cosmological Collider Physics from Large-Scale Structure Surveys”, *submitted to Phys. Rev. D* ([arXiv](#)).
2. \*Coulton, W. R., **Philcox, O. H. E.**, Villaescusa-Navarro, F. A., “The Impact of Non-Gaussian Primordial Tails on Cosmological Observables”, *submitted to Phys. Rev. D* ([arXiv](#)).
3. \*Chen, S.-F., Ivanov, M. M., **Philcox, O. H. E.**, Wenzl, L., “Suppression without Thawing: Constraining Structure Formation and Dark Energy with Galaxy Clustering”, *submitted to Phys. Rev. Lett.* ([arXiv](#)).
4. **Philcox, O. H. E.**, Kumar, S., Hill, J. C., “Too Hot to Handle: Searching for Inflationary Particle Production in Planck Data”, *submitted to Phys. Rev. D* ([arXiv](#)).
5. **Philcox, O. H. E.**, Flöss, T., “PolyBin3D: A Suite of Optimal and Efficient Power Spectrum and Bispectrum Estimators for Large-Scale Structure”, *submitted to Phys. Rev. D* ([arXiv](#)).
6. Cabass, G., **Philcox, O. H. E.**, Ivanov, M. M., Akitsu, K., Chen, S.-F., Simonović, M., Zaldarriaga, M., “BOSS Constraints on Massive Particles during Inflation: The Cosmological Collider in Action”, *submitted to Phys. Rev. D* ([arXiv](#)).
7. de Belsunce, R., **Philcox, O. H. E.**, Iršič, V., McDonald, P., Guy, J., Palanque-Delabrouille, N., “The 3D Lyman- $\alpha$  Forest Power Spectrum from eBOSS DR16”, *MNRAS* **533**, 3756 – 3770 (2024) ([arXiv](#)).
8. **Philcox, O. H. E.**, Ereza, J., “Could Sample Variance be Responsible for the Parity-Violating Signal Seen in the BOSS Galaxy Survey?”, *submitted to Phys. Rev. D* ([arXiv](#)).
9. **Philcox, O. H. E.**, Shiraishi, M., “Testing Graviton Parity and Gaussianity with Planck T-, E- and B-mode Bispectra”, *Phys. Rev. D* **109**, 063522 (2024) ([arXiv](#)).
10. Goldstein, S., **Philcox, O. H. E.**, Hill, J. C., Esposito, A., Hui, L., “Consistently Constraining  $f_{\text{NL}}$  with the Squeezed Lensing Bispectrum using Consistency Relations”, *Phys. Rev. D* **109**, 043515 (2024) ([arXiv](#)).
11. Modi, C., **Philcox, O. H. E.**, “Hybrid SBI or How I Learned to Stop Worrying and Learn the Likelihood” *submitted to Phys. Rev. Lett.* ([arXiv](#)).
12. **Philcox, O. H. E.**, König, M. J., Alexander, S., Spergel, D. N., “What Can Galaxy Shapes Tell Us About Physics Beyond the Standard Model?”, *Phys. Rev. D*, **109**, 063541 (2024) ([arXiv](#)).
13. **Philcox, O. H. E.**, Shiraishi, M., “Testing Parity Symmetry with the Polarized Cosmic Microwave Background”, *Phys. Rev. D*, **109**, 083514 (2024) ([arXiv](#)).
14. \*Coulton, W. R., **Philcox, O. H. E.**, Villaescusa-Navarro, F. A., “Signatures of a Parity-Violating Universe”, *Phys. Rev. D*, **109**, 023531 (2024) ([arXiv](#)).
15. **Philcox, O. H. E.**, “Optimal Estimation of the Binned Mask-Free Power Spectrum, Bispectrum, and Trispectrum on the Full Sky: Tensor Edition”, *Phys. Rev. D*, **108**, 063506 (2023) ([arXiv](#)).
16. \*Ivanov, M. M., **Philcox, O. H. E.**, “Measuring  $H_0$  with Spectroscopic Surveys”, *chapter in “Hubble Constant Tension”* (Eds. Di Valentino, E. and Brout, D., *Springer, Singapore*) ([arXiv](#)).
17. **Philcox, O. H. E.**, “Do the CMB Temperature Fluctuations Conserve Parity?”, *Phys. Rev. Lett.* **131**, 181001 (2023) ([arXiv](#)).
18. **Philcox, O. H. E.**, “Optimal Estimation of the Binned Mask-Free Power Spectrum, Bispectrum, and Trispectrum on the Full Sky: Scalar Edition”, *Phys. Rev. D* **107**, 123516 (2023) ([arXiv](#)).

19. Creque-Sarbinowski, C., Alexander, S., Kamkonkowski, M., **Philcox, O. H. E.**, “Parity-Violating Trispectrum from Chern-Simons Gravity”, *JCAP* 11 029 (2023) ([arXiv](#)).
20. Surrao, K. M., **Philcox, O. H. E.**, Hill, J. C., “ReMASTERed: Accurate Estimation of Angular Power Spectra for Maps with Correlated Masks”, *Phys. Rev. D* **107**, 083521 (2023) ([arXiv](#)).
21. Ivanov, M. M., **Philcox, O. H. E.**, Cabass, G., Nishimichi, T., Simonović, M., Zaldarriaga, M., “Cosmology with the Galaxy Bispectrum Multipoles: Optimal Estimation and Application to BOSS Data”, *Phys. Rev. D* **107**, 083515 (2023) ([arXiv](#)).
22. \*Cabass, G., Ivanov, M. M., **Philcox, O. H. E.**, Simonović, M., Zaldarriaga, M., “Constraining Single-Field Inflation with MegaMapper”, *Phys. Lett. B* **841**, 137912 (2023) ([arXiv](#)).
23. \*Cabass, G., Ivanov, M. M., **Philcox, O. H. E.**, “Colliders and Ghosts: Constraining Inflation with the Parity-Odd Galaxy Four-Point Function”, *Phys. Rev. D* **107**, 023523 (2023) ([arXiv](#)).
24. Goldstein, S., Esposito, A., **Philcox, O. H. E.**, Hui, L., Hill, J. C., Scoccimarro, R., Abitbol, M. H., “Squeezing  $f_{\text{NL}}$  out of the matter bispectrum with consistency relations”, *Phys. Rev. D* **106**, 123525 (2023) ([arXiv](#)).
25. **Philcox, O. H. E.**, Torquato, S., “The Disordered Heterogeneous Universe: Galaxy Distribution and Clustering Across Length Scales”, *Phys. Rev. X* **13**, 011038 (2023) ([arXiv](#)).
26. **Philcox, O. H. E.**, Johnson, M. C., “Novel Cosmological Tests from Combining Galaxy Lensing and the Polarized Sunyaev-Zel’dovich Effect”, *Phys. Rev. D* **106**, 083501 (2022) ([arXiv](#)).
27. **Philcox, O. H. E.** “Probing Parity-Violation with the Four-Point Correlation Function of BOSS Galaxies”, *Phys. Rev. D* **106**, 063501 (2022) ([arXiv](#)).
28. **Philcox, O. H. E.**, Ivanov, M. M., Cabass, G., Simonović, M., Zaldarriaga, M., Nishimichi, T. “Cosmology with the Redshift-Space Galaxy Bispectrum Monopole at One-Loop Order”, *Phys. Rev. D* **106**, 043530 ([arXiv](#)).
29. **Philcox, O. H. E.**, Farren, G. S., Sherwin, B. D., Baxter, E. J., Brout, D. J., “Determining the Hubble Constant without the Sound Horizon: A 3.6% Constraint on  $H_0$  from Galaxy Surveys, CMB Lensing and Supernovae”, *Phys. Rev. D* **106**, 063530 (2022) ([arXiv](#)).
30. \*Cabass, G., Ivanov, M. M., **Philcox, O. H. E.**, Simonović, M., Zaldarriaga, M. “Constraints on Multi-Field Inflation from the BOSS Galaxy Survey”, *Phys. Rev. D* **106**, 043506 (2022) ([arXiv](#)).
31. \*Cabass, G., Ivanov, M. M., **Philcox, O. H. E.**, Simonović, M., Zaldarriaga, M. “Constraints on Single-Field Inflation from the BOSS Galaxy Survey”, *Phys. Rev. Lett.* **129**, 021301 (2022) ([arXiv](#)).
32. Farren, G. S., **Philcox, O. H. E.**, Sherwin, B. D. “Determining the Hubble Constant without the Sound Horizon: Perspectives with Future Galaxy Surveys”, *Phys. Rev. D* **105**, 063503 (2022) ([arXiv](#)).
33. **Philcox, O. H. E.**, Ivanov, M. M. “The BOSS DR12 Full-Shape Cosmology:  $\Lambda$ CDM Constraints from the Large-Scale Galaxy Power Spectrum and Bispectrum Monopole”, *Phys. Rev. D* **105**, 043517 (2022) ([arXiv](#)).
34. Ivanov, M. M., **Philcox, O. H. E.**, Nishimichi, T., Simonović, M., Takada, M., Zaldarriaga, M. “Precision Analysis of the Redshift-Space Galaxy Bispectrum”, *Phys. Rev. D* **105**, 063512 (2022) ([arXiv](#)).
35. Ivanov, M. M., **Philcox, O. H. E.**, Simonović, M., Zaldarriaga, M., Nishimichi, T., Takada, M. “Cosmological Constraints Without Non-linear Redshift-Space Distortions”, *Phys. Rev. D* **105**, 043531 (2022) ([arXiv](#)).
36. **Philcox, O. H. E.**, Hou J., Slepian, Z. “A First Detection of the Connected 4-Point Correlation Function of Galaxies using the BOSS CMASS Sample”, *submitted to Phys. Rev. D* ([arXiv](#)).
37. **Philcox, O. H. E.** “Cosmology Without Windows: Cubic Estimators for the Galaxy Bispectrum”, *Phys. Rev. D* **104**, 123529 (2021) ([arXiv](#)).
38. **Philcox, O. H. E.**, Slepian Z. “Efficient Computation of  $N$ -Point Correlation Functions in  $D$  Dimensions”, *PNAS* **119**, 33 (2022) ([arXiv](#)).
39. **Philcox, O. H. E.**, Slepian, Z., Hou, J., Warner, C., Cahn, R. N., Eisenstein, D. J. “ENCORE: Estimating Galaxy  $N$ -point Correlation Functions in  $\mathcal{O}(N_g^2)$  Time”, *MNRAS* **509**, 2457 – 2481 (2022) ([arXiv](#)).
40. **Philcox, O. H. E.**, Slepian, Z. “An Exact Integral-to-Sum Relation for Products of Bessel Functions”, *Proc. Roy. Soc. A* **477**, 2253 (2021) ([arXiv](#)).

41. **Philcox, O. H. E.**, Goodman, J., Slepian Z. “Kepler’s Goat Herd: An Exact Solution to Kepler’s Equation for Elliptical Orbits”, *MNRAS* **506**, 6111 – 6116 (2021) ([arXiv](#)).
42. Slepian, Z., **Philcox, O. H. E.** “A Uniform Spherical Goat (Problem): Explicit Solution for Homologous Collapse’s Radial Evolution in Time”, *MNRAS* **522**, L42-L45 (2023) ([arXiv](#)).
43. **Philcox, O. H. E.**, Slepian, Z. “Beyond Yamamoto: Anisotropic Power Spectra and Correlation Functions with Pairwise Lines-of-Sight”, *Phys. Rev. D* **103**, 123509 (2021) ([arXiv](#)).
44. **Philcox, O. H. E.** “Cosmology Without Windows: Quadratic Estimators for the Galaxy Power Spectrum”, *Phys. Rev. D* **103**, 103504 (2021) ([arXiv](#)).
45. **Philcox, O. H. E.**, Aviles, A., Massara, E. “Modeling the Marked Spectra of Matter and Biased Tracers in Real and Redshift Space”, *JCAP* **03** 038 (2021) ([arXiv](#)).
46. **Philcox, O. H. E.**, Ivanov, M. M., Simonović, M., Zaldarriaga, M., Schmittfull, M. “Fewer Mocks and Less Noise: Reducing the Dimensionality of Cosmological Observables with Subspace Projections”, *Phys. Rev. D* **103**, 043508 (2021) ([arXiv](#)).
47. **Philcox, O. H. E.**, Sherwin, B. D., Farren, G. S., Baxter, E. J. “Determining the Hubble Constant without the Sound Horizon: Measurements from Galaxy Surveys”, *Phys. Rev. D* **103**, 023538 (2021) ([arXiv](#)).
48. **Philcox, O. H. E.**, Massara, E., Spergel, D. N. “What does the Marked Power Spectrum Measure? Insights from Perturbation Theory”, *Phys. Rev. D* **102**, 043516 (2020) ([arXiv](#)).
49. **Philcox, O. H. E.** “A Faster Fourier Transform? Computing Small-Scale Power Spectra and Bispectra for Cosmological Simulations in  $\mathcal{O}(N^2)$  Time”, *MNRAS* **501**, 4004 – 4034 (2021) ([arXiv](#)).
50. **Philcox, O. H. E.**, Spergel, D. N., Villaescusa-Navarro, F. “The Effective Halo Model: Creating a Physical and Accurate Model of the Matter Power Spectrum and Cluster Counts”, *Phys. Rev. D* **101**, 123520 (2020) ([arXiv](#)).
51. **Philcox, O. H. E.**, Ivanov, M. M., Simonović, M., Zaldarriaga, M. “Combining Full-Shape and BAO Analyses of Galaxy Power Spectra: A 1.6% CMB-Independent Constraint on  $H_0$ ”, *JCAP* **05** 032 (2020) ([arXiv](#)).
52. **Philcox, O. H. E.**, Rybizki, J. “Inferring Galactic Parameters from Chemical Abundances: A Multi-Star Approach”, *ApJ* **887**, 9 (2019) ([arXiv](#)).
53. **Philcox, O. H. E.**, Eisenstein, D. J., “Computing the Small-Scale Galaxy Power Spectrum and Bispectrum in Configuration-Space”, *MNRAS* **492** 1214 – 1242 (2019) ([arXiv](#)).
54. **Philcox, O. H. E.**, Eisenstein, D. J., “Estimating Covariance Matrices for Two- and Three-Point Correlation Function Moments in Arbitrary Survey Geometries”, *MNRAS* **490**, 5931 – 5951 (2019) ([arXiv](#)).
55. **Philcox, O. H. E.**, Eisenstein, D. J., O’Connell, R., Wiegand, A., “RASCALC: A Jackknife Approach to Estimating Single and Multi-Tracer Galaxy Covariance Matrices”, *MNRAS* **491**, 3290 – 3317 (2019) ([arXiv](#)).
56. **Philcox, O. H. E.**, Sherwin, B. D., van Engelen, A., “Detection and Removal of B-mode Dust Foregrounds with Signatures of Statistical Anisotropy”, *MNRAS* **479**, 5577 – 5595 (2018) ([arXiv](#)).
57. **Philcox, O. H. E.**, Rybizki, J., Gutcke, T., “On the Optimal Choice of Nucleosynthetic Yields, Initial Mass Function, and Number of SNe Ia for Chemical Evolution Modeling”, *ApJ* **861**, 40 (2018) ([arXiv](#)).

#### *Contributing Author*

58. Krause, E., Kobayashi, Y., Salcedo, A., *et al.* (inc. **Philcox, O. H. E.**) “A Parameter-Masked Mock Data Challenge for Beyond-Two-Point Galaxy Clustering Statistics”, *accepted by ApJ* ([arXiv](#)).
59. Rogers, K. K., Hložek, R., Laguë, A., Ivanov, M. M., **Philcox, O. H. E.**, *et al.* “Ultra-Light Axions and the  $S_8$  Tension: Joint Constraints from the Cosmic Microwave Background and Galaxy Clustering”, *JCAP* **06** 023 (2023) ([arXiv](#)).
60. \*Abdalla, E., *et al.* (inc. **Philcox, O. H. E.**) “Cosmology Intertwined: A Review of the Particle Physics, Astrophysics, and Cosmology Associated with the Cosmological Tensions and Anomalies” *Snowmass 2021 report*, *JHEA* **34**, 49 – 221 (2022) ([arXiv](#)).
61. Villaescusa-Navarro, F., Anglés-Alcázar, D., Genel, S., *et al.* (inc. **Philcox, O. H. E.**) “The CAMELS project: public data release”, *ApJS* **265** 54 (2023) ([arXiv](#)).

62. Hou, J., Cahn, R. N., **Philcox, O. H. E.**, Slepian, Z., “Analytic Gaussian Covariance Matrices for Galaxy  $N$ -Point Correlation Functions”, *Phys. Rev. D* **106**, 043515 (2022) ([arXiv](#)).
63. Schmittfull, M., Simonović, M., Ivanov, M. M., **Philcox, O. H. E.**, Zaldarriaga, M. “Modeling Galaxies in Redshift Space at the Field Level”, *JCAP* **05** 059 (2021) ([arXiv](#)).
64. Villaescusa-Navarro, F., Anglés-Alcázar, D., Genel, S., *et al.* (inc. **Philcox, O. H. E.**) “The CAMELS project: Cosmology and Astrophysics with MachinE Learning Simulations”, *ApJ* **915**, 1 (2018) ([arXiv](#)).
65. Wang, Y., Zhao, G-B., Zhao, C., **Philcox, O. H. E.**, *et al.* “The clustering of the SDSS-IV extended Baryon Oscillation Spectroscopic Survey DR16 luminous red galaxy and emission line galaxy samples: cosmic distance and structure growth measurements using multiple tracers in configuration space”, *MNRAS* **498**, 3470 – 3483 (2020) ([arXiv](#)).
66. \*Chudaykin, A., Ivanov, M. M., **Philcox, O. H. E.**, Simonović, M., “CLASS-PT: non-linear perturbation theory extension of the Boltzmann code CLASS”, *Phys. Rev. D* **102**, 063533 (2020) ([arXiv](#)).

## SELECTED TALKS

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\* = *Virtual Talk*

- |      |   |
|------|---|
| 2024 | 21 <sup>st</sup> Century Cosmology, Ashoka University, <i>Conference</i> (Invited Plenary)<br>Cosmology in the Adriatic, <i>Conference</i><br>Beijing Shengtao Education Development and Innovation Research Institute (Invited Talk)<br>University of Edinburgh, <i>Conference</i><br>Lawrence Berkeley National Laboratory, <i>Workshop</i> (Invited Plenary)<br>University of Cambridge, <i>Astronomy Colloquium</i><br>Royal Society, London, <i>Discussion Meeting</i> (Invited Talk)<br>Harvard University, <i>Cosmology Seminar</i><br>Massachusetts Institute of Technology, <i>Cosmology Seminar</i><br>58 <sup>th</sup> Rencontres de Moriond, <i>Conference</i><br>Stanford University, <i>Physics Colloquium</i><br>Perimeter Institute for Theoretical Physics, <i>Colloquium</i>  |
| 2023 | Taipei Institute of Astronomy & Astrophysics, <i>Conference</i> (Invited Talk)<br>Max-Planck-Institute for Nuclear Physics, Heidelberg, <i>Particle Physics Seminar</i><br>ICTP Trieste, <i>Workshop</i><br>University of Montreal, <i>Astrophysics Seminar</i><br>*Parity-Violation from Home, <i>Conference</i><br>Ohio State University, <i>Cosmology and Astro-Particle Physics Seminar</i><br>*Early Universe / AliCPT Forum, University of Science and Technology of China, <i>Webinar</i><br>Sexton Center for Astrophysics, <i>Workshop</i> (Invited Plenary)<br>Donostia International Physics Center, <i>Workshop</i> (Invited Talk)<br>University of Pennsylvania, <i>PDT Partners Retreat</i> (Invited Talk)<br>Yukawa Institute for Theoretical Physics, Kyoto, <i>Conference</i> (Invited Talk)<br>Kavli IPMU, Tokyo, <i>Astronomy Seminar</i><br>Stony Brook, <i>Cosmology Seminar</i><br>*Newcastle University, <i>Astronomy Seminar</i><br>Cosmology on Safari, <i>Conference</i><br>Johns Hopkins University, <i>Particle Physics Seminar</i><br>University of Maryland, <i>Particle Physics Seminar</i><br>*Copernicus Series, <i>Cosmology Webinar</i><br>*University of Oxford, <i>Cosmology Seminar</i> |
| 2022 | Essential Cosmology for the Next Generation, Mexico, <i>Conference</i> (Invited Plenary)<br>LSS $\times$ Inflation, UCSD, <i>Workshop</i><br>*HEP / Astro Results Forum, Texas, <i>Seminar</i><br>PNG 2022 Workshop, Madrid, <i>Conference</i><br>ICTP Trieste, <i>Workshop</i><br>BCCP Conference, Vipolže, Slovenia, <i>Conference</i><br>*L’Action Dark Energy, <i>Webinar</i><br>*Simons Modern Inflationary Cosmology Group, <i>Seminar</i>  |



## PRIZES & GRANTS

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2024	New Horizons in Physics Prize, <i>Breakthrough Prize Foundation</i>
2023	Buchalter Cosmology Prize (First Prize)
2022	Simons Society of Fellows (Junior Fellowship, \$450 000) NHFP Einstein Fellowship, <i>declined</i> LBL Chamberlain Fellowship, <i>declined</i> Cambridge Kavli Fellowship, <i>declined</i>
2018	Herchel-Smith Scholarship (\$70 000), <i>Cambridge</i> → <i>Harvard</i> Institute of Astronomy Prize, <i>Cambridge</i>
2017	Holgate Pollard Memorial Prize, <i>Cambridge</i>

## PROFESSIONAL ACTIVITIES

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<b>Referee</b>	MNRAS (2020–), JCAP (2020–), MPLA (2021–), Phys. Rev. Lett. (2022–) Phys. Rev. D (2022–), ApJS (2022–), Phys. Dark Univ. (2023–)
<b>Conferences</b>	Large-Scale Parity Violation (Taiwan 2023, SOC)
<b>Review Panels</b>	NASA Astrophysics Theory Program (2023)
<b>Advisor</b>	<i>John Moynihan</i> Columbia Undergraduate Student (2023) <i>Sam Goldstein</i> Columbia Graduate Student (2022–)
<b>Coadvisor</b>	<i>Gemma Zhang</i> Harvard Graduate Student (2023–) <i>Kristen Surrao</i> Columbia Graduate Student (2022–2023) <i>Gerrit Farren</i> Cambridge Graduate Student (2020–2022) <i>Jess Boyland</i> Simons-NSBP Undergraduate Scholar (2020–2021)

## MISCELLANEOUS

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<b>Computing Languages</b>	PYTHON, C++, JULIA, MATHEMATICA, CUDA
<b>Codes Developed</b>	POLYBIN3D, POLYBIN, ENCORE, NPCFs.jl, CLASS-PT, SPECTRA-WITHOUT-WINDOWS, EFFECTIVEHALOS, HIPSTER, RASCALC
<b>Teaching</b>	6 years of online tutoring (high-school to Masters level) Teaching assistant for Princeton introductory astronomy class (AST203) TEFL qualification in English teaching
<b>Other</b>	DipABRSM in Music Performance (Distinction)

## REFERENCES

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