Oliver H. E. Philcox MSci MA

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EDUCATION

Department of Astrophysical Sciences, Princeton University, USA *2019 - Present*
PhD Candidate, *Expected Graduation Year: 2022*

Thesis: 'Large Scale Structure Cosmology from the Higher-Point Functions'
Thesis Advisors: Prof. David N. Spergel & Prof. Matias Zaldarriaga

M.A. in Astrophysics (2020)

Center for Astrophysics | Harvard & Smithsonian, Cambridge, USA *2018 - 2019*
Pre-Doctoral Student, *Herchel-Smith Scholar*

Advisor: Prof. Daniel J. Eisenstein

Institute of Astronomy, University of Cambridge *2017 - 2018*
MSci in Astrophysics

Part III: 1st 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

Institute of Astronomy Prize

Emmanuel College, University of Cambridge *2014 - 2017*
BA (Hons) in Natural Sciences, *Senior Scholar*

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

Holgate Pollard Memorial Prize

LONG-TERM ACADEMIC VISITS

Center for Computational Astrophysics Jul. 2021 - Present
Guest Researcher with Prof. David N. Spergel *New York, USA*

Institute for Advanced Study Sep. 2020 - Present
Visiting Graduate Student with Prof. Matias Zaldarriaga *Princeton, USA*

Max-Planck Institute for Astrophysics Aug. - Sep. 2020
Visiting Graduate Student with Prof. Eiichiro Komatsu *Munich, Germany*

Department of Applied Mathematics and Theoretical Physics May - Jul. 2020
Visiting Graduate Student with Dr. Blake D. Sherwin *Cambridge, UK*

Max-Planck-Institut für Astronomie Jul. - Sep. 2017
Summer Intern with Dr. Jan Rybizki *Heidelberg, Germany*

Center for Astrophysics | Harvard & Smithsonian Jun. - Aug. 2016
Undergraduate Research Fellow with Dr. Ákos Bogdán *Cambridge, USA*

PUBLICATION LIST

Major Author

1. **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).
2. **Philcox, O. H. E.** "Cosmology Without Windows: Cubic Estimators for the Galaxy Bispectrum", *submitted to Phys. Rev. D* (arXiv).
3. **Philcox, O. H. E.**, Slepian Z. "Efficient Computation of N-Point Correlation Functions in D Dimensions", *submitted to PNAS* (arXiv).
4. **Philcox, O. H. E.**, Slepian, Z., Hou, J., Warner, C., Cahn, R. N., Eisenstein, D. J. "ENCORE: Estimating Galaxy N-point Correlation Functions in $\mathcal{O}(N_{\rm g}^2)$ Time", *submitted to MNRAS* (arXiv).
5. **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).
6. **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).
7. Slepian, Z., **Philcox, O. H. E.** "A Uniform Spherical Goat (Problem): Explicit Solution for Homologous Collapse's Radial Evolution in Time" (arXiv).
8. **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).
9. **Philcox, O. H. E.** "Cosmology Without Windows: Quadratic Estimators for the Galaxy Power Spectrum", *Phys. Rev. D* **103**, 103504 (2021) (arXiv).
10. **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).
11. **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).
12. **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).
13. **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).
14. **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).
15. **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).
16. **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).
17. **Philcox, O. H. E.**, Rybizki, J. "Inferring Galactic Parameters from Chemical Abundances: A Multi-Star Approach", *ApJ* **887**, 9 (2019) (arXiv).
18. **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).
19. **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).
20. **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).
21. **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).

22. **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

23. Hou, J., Cahn, R. N., **Philcox, O. H. E.**, Slepian, Z., "Analytic Gaussian Covariance Matrices for Galaxy N-Point Correlation Functions", *submitted to MNRAS* (arXiv).

24. 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).

25. 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).

26. 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).

27. 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

2021	Theory Seminar, Columbia University (Virtual) COSMO'21 Conference (Virtual) Cosmology from Home Conference (Virtual) Gravity Group, Princeton University (Virtual) Southampton H_0 Workshop (Virtual, Invited Talk) Cosmology & Particle Physics Group, University of Geneva (Virtual)
2020	DESI Galaxy & Quasar Clustering Working Group (Virtual) Eisenstein Group, Center for Astrophysics | Harvard & Smithsonian (Virtual) UK Cosmology Meeting (Virtual) Joint Cosmology Group, Institute for Advanced Study (Virtual) Cosmology from Home Conference (Virtual) Joint Statistical Meeting, American Statistical Association (Virtual, Invited Talk) Cosmology Colloquium, Perimeter Institute for Theoretical Physics (Virtual) Journal Club, Berkeley Center for Cosmological Physics (Virtual) Cosmology X Data Science Group, Center for Computational Astrophysics (Virtual) Cosmology Group, Institute for Advanced Study
2019	Gravity Group, Princeton University JINA-CEE Nuclear Astrophysics Seminar (Virtual) Joint Cosmology Group, Center for Astrophysics | Harvard & Smithsonian
2017	Rix Group, Max-Planck-Institut für Astronomie Springel Group, Heidelberg Institute for Theoretical Studies

PROFESSIONAL ACTIVITIES

Referee	MNRAS (2020−), JCAP (2020−), MPLA (2021−)	
Coadvisor	*Jess Boyland*	Simons-NSBP Undergraduate Scholars Program (2020−2021)
	James Sunseri	University of Florida REU Program (2021)

MISCELLANEOUS

Computing Languages	PYTHON, C++, CUDA, MATHEMATICA, JULIA
Codes Developed	ENCORE, NPCFs.jl, EFFECTIVEHALOS, CLASS-PT, HIPSTER, RASCALC
Teaching	6 years of online tutoring (high-school to Masters level) Teaching assistant for Princeton introductory astronomy class (AST203) TEFL qualification in English teaching