# Oliver H. E. Philcox MSci MA

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## EDUCATION

**Department of Astrophysical Sciences, Princeton University, USA** *2019 - Present*
PhD Candidate

**Thesis**: 'Cosmology from the bispectrum and $N$-point correlation functions (TBC)'
*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 for Part II Examination Results, 2017
College & Rowley Mainhood Prizes for Achievement, 2015-8

## ADDITIONAL RESEARCH EXPERIENCE

**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*

## PUBLICATIONS

***Major Author***

1. Slepian, Z., **Philcox, O. H. E.** "A Uniform Spherical Goat (Problem): Explicit Solution for Homologous Collapse's Radial Evolution in Time", *submitted to MNRAS* (arXiv).
2. **Philcox, O. H. E.**, Slepian, Z. "Beyond Yamamoto: Anisotropic Power Spectra and Correlation Functions with Pairwise Lines-of-Sight", *submitted to Phys. Rev. D* (arXiv).

3. **Philcox, O. H. E.** "Cosmology Without Windows: Quadratic Estimators for the Galaxy Power Spectrum", *submitted to Phys. Rev. D* (arXiv).

4. **Philcox, O. H. E.**, Aviles, A., Massara, E. "Modeling the Marked Spectra of Matter and Biased Tracers in Real and Redshift Space", *accepted by JCAP* (arXiv).

5. **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).

6. **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).

7. **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).

8. **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).

9. **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).

10. **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).

11. **Philcox, O. H. E.**, Rybizki, J. "Inferring Galactic Parameters from Chemical Abundances: A Multi-Star Approach", *ApJ* **887**, 9 (2019) (arXiv).

12. **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).

13. **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).

14. **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).

15. **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).

16. **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***

17. Schmittfull, M., Simonović, M., Ivanov, M. M, **Philcox, O. H. E.**, Zaldarriaga, M. "Modeling Galaxies in Redshift Space at the Field Level", *submitted to JCAP* (arXiv).

18. 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", *submitted to ApJ* (arXiv).

19. 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).

20. 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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| Mar. 2021 | Southampton $H_0$ Workshop (Invited talk & panel discussion)<br>*$H_0$ from Galaxy Surveys: With and Without the Sound Horizon* |
| Jan. 2021 | University of Geneva (Cosmology & Particle Physics Group)<br>*Have We Exhausted the Galaxy Two-Point Function?* |
| Nov. 2020 | Institute for Advanced Study (Cosmology Group)<br>*Tutorial on `CLASS-PT` and Large Scale Structure Parameter Inference* |
| Oct. 2020<br>. | DESI Galaxy & Quasar Clustering Working Group<br>*Compressing Cosmological Observables via Subspace Projections* |
| Oct. 2020 | Center for Astrophysics \| Harvard & Smithsonian (Eisenstein Group)<br>*Modeling and Interpreting Marked Power Spectra of Matter and Halos* |
| Sep. 2020 | UK Cosmology Meeting<br>*What's Next for the Effective Field Theory of Large Scale Structure?* |
| Sep. 2020 | Institute for Advanced Study (Cosmology Group)<br>*Data Compression via Subspace Projections & $H_0$ Without the Sound Horizon* |
| Aug. 2020 | Cosmology from Home Conference<br>*Measuring $H_0$ from Galaxy Surveys: With and Without the Sound Horizon* |
| Aug. 2020 | American Statistical Association (Joint Statistical Meeting, invited talk)<br>*Inferring Galactic Parameters from Stellar Chemical Abundances* |
| Jun. 2020 | Perimeter Institute for Theoretical Physics (Cosmology Colloquium)<br>*What's Next for the Effective Field Theory of Large Scale Structure?* |
| May 2020 | Berkeley Center for Cosmological Physics (Journal Club)<br>*The Effective Halo Model: Accurate Models for the Power Spectrum and Cluster Counts* |
| Apr. 2020 | NYU / CCA (Cosmology X Data Science Group)<br>*The Effective Halo Model: Accurate Models for the Power Spectrum and Cluster Counts* |
| Mar. 2020 | Institute for Advanced Study (Cosmology Group)<br>*Constraining Cosmology from Galaxy Surveys: Combining Full Shape and BAO Analyses* |
| Dec. 2019 | Princeton University (Gravity Group)<br>*Detection and Removal of CMB B-mode Dust via Statistical Anisotropy* |
| Nov. 2019 | JINA-CEE Nuclear Astrophysics Seminar<br>*Inferring the Milky Way Stellar Initial Mass Function using Chemical Evolution Modelling* |
| Jul. 2019 | Center for Astrophysics \| Harvard & Smithsonian (Eisenstein Group)<br>*Computing Clustering Statistics and Covariances in Configuration Space* |
| Apr. 2019 | Center for Astrophysics \| Harvard & Smithsonian (Joint Cosmology Group)<br>*Detection and Removal of CMB B-mode Dust via Statistical Anisotropy* |
| Sep. 2017 | Max-Planck-Institut für Astronomie (Rix Group)<br>*Creating Objective Scores for Nucleosynthetic Yield Tables* |
| Sep. 2017 | Heidelberg Institute for Theoretical Studies (Springel Group)<br>*Choosing Nucleosynthetic Yield Tables for Hydrodynamical Simulations* |

## PROFESSIONAL ACTIVITIES

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| **Referee** | MNRAS (2020−), JCAP (2020−), MPLA (2021−) |
| **Coadvisor** | *Jess Boyland* Simons-NSBP Undergraduate Scholars Program (2020−) |

## MISCELLANEOUS

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|---|---|
| **Computing Languages** | Python, C++ |
| **Codes Developed** | `EffectiveHalos`, `encore`, `HIPSTER`, `RascalC`, `CLASS-PT`, `ChempyMulti`, `HADES` |
| **Teaching** | 6 years of online tutoring (high-school to post-Masters level)<br>Teaching assistant for Princeton introductory astronomy class (AST203)<br>TEFL qualification in English teaching with 2 months experience in China |

**REFEREES**


**Prof. D N Spergel**
*(Princeton Advisor)*
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Flatiron Institute, 162 $5^{\text{th}}$ Ave.
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**Prof. D J Eisenstein**
*(Harvard Advisor)*
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