Oliver H. E. Philcox MSci

Email: ohep2@alumni.cam.ac.uk

Peyton Hall, 4 Ivy Lane, Princeton, NJ 08544, USA *(Semester)*

17 Ashdale, Bishop's Stortford, Herts, CM23 4EA, UK *(Home)*

Mob: +1 (857) 253-8764 (USA) ⋄ +44 7964 359967 (UK)

EDUCATION

Department of Astrophysical Sciences, Princeton University, USA   *2019 - Present*
Graduate Student

    Advisors: Prof. David N. Spergel, Prof. Joanne Dunkley & Prof. Matias Zaldarriaga

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

    Courses: *Radiative Processes in Astrophysics (A), Astrophysical Fluid Dynamics (A)*
                Advanced Scientific Computing: Stochastic Methods (A)
    Research Projects: 'Estimating Covariance Matrices for the Two- and Three-Point Galaxy Correlation Functions in Arbitrary Survey Geometries' & 'Configuration-Space Estimators for Small-Scale Anisotropic Power Spectra and Bispectra' (*Advisors: Prof. Daniel J. Eisenstein & Dr. Ross O'Connell*)

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

    Part III: 1st Class (Rank 1/28, 97%)
    Courses: *Cosmology (97%), Advanced Cosmology (91%), General Relativity (92%)*
                Quantum Field Theory (84%), Stellar Structure and Evolution (95%)
    Master's Thesis: 'Detection and Removal of B-mode CMB Dust Foregrounds with Signatures of Statistical Anisotropy' (*Advisors: Dr. Blake D. Sherwin & Dr. Alexander van Engelen*)
    Institute of Astronomy Prize

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

    Part II: 1st Class (Rank 1/20, 90%)
    Courses include: Cosmology, Stars, Galactic Dynamics, Fluids, Relativity, Quantum Mechanics
    Part IB: 1st Class (Rank 9/578)
    Courses: Maths (86%), Physics A (94%) and Physics B (85%)
    Part IA: 1st Class (Rank 6/626)
    Courses: Maths (94%), Physics (89%), Chemistry (84%) and Earth Sciences (73%)
    Holgate Pollard Memorial Prize for Part II Examination Results, 2017
    College & Rowley Mainhood Prizes for Achievement, 2015-8

RESEARCH EXPERIENCE

Center for Astrophysics | Harvard & Smithsonian   Sep. 2018 - Jun. 2019
Pre-Doctoral Student with Prof. Daniel Eisenstein   *Cambridge, USA*

· Developed approximations for the covariance matrices of two- and three-point galaxy correlation functions using only a single large scale structure survey via a grid-based jackknife approach.
· Derived relevant statistical estimators involving Monte Carlo methods and importance sampling to compute high-dimensional integrals at low computational expense, allowing for matrices with precisions comparable to millions of mocks to be computed in tens of CPU-hours.
· Created a new estimator for small-scale power spectrum estimation in configuration space.
· Applied techniques to survey data from BOSS and compared this to results from mock galaxy catalogs.
· Developed the publicly released `RascalC` and `HIPSTER` codes and wrote three first-author papers on the techniques.

Institute of Astronomy
Master's Student with Dr. Blake Sherwin

Oct. 2017 - Jun. 2018
Cambridge, UK

· Searched for signatures of polarized Galactic thermal dust emission in CMB B-mode maps via statistical analyses of characteristic intermediate-scale anisotropy patterns.
· Constructed a rudimentary method for single-frequency CMB dust removal and used up-to-date thermal dust simulations to forecast the effectiveness of these techniques for upcoming experiments.
· Created a freely-available Python package (`HADES`) and published a first-author paper on the results.

Max-Planck-Institut für Astronomie
Summer Intern with Dr. Jan Rybizki

Jul. - Sep. 2017
Heidelberg, Germany

· Developed a statistical scoring system to rank nucleosynthetic yield tables based on their abilities to reproduce proto-solar abundances using the galactic chemical evolution code *Chempy* and MCMC.
· Created statistical models using Bayesian and Cross-Validation approaches in Python.
· Optimised the software performance by implementation of a neural network, using `PyTorch`.
· Prepared a first-author paper on the methodologies and published code online.

Center for Astrophysics | Harvard & Smithsonian
PRISE Research Fellow with Dr. Ákos Bogdán

Jun. - Aug. 2016
Cambridge, USA

· Worked in the High Energy group, calculating dark matter profiles for nearby elliptical galaxies, using IR and X-ray observations to trace stellar mass and hot gas (a proxy for gravitational mass).
· Analysed Chandra and 2MASS data using the `CIAO` and `XSPEC` packages, fitting to established models.

SELECTED PUBLICATIONS & TALKS

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

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).

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).

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)

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).

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).

Dec. 2019	Princeton University (Gravity Group) *Detection and Removal of CMB B-mode Dust via Statistical Anisotropy*
Nov. 2019	JINA-CEE Nuclear Astrophysics Seminar *Inferring the Milky Way Stellar Initial Mass Function using Chemical Evolution Modelling*
Jul. 2019	Center for Astrophysics	Harvard & Smithsonian (Daniel Eisenstein's Group) *Computing Clustering Statistics and Covariances in Configuration Space*
Apr. 2019	Center for Astrophysics	Harvard & Smithsonian (Joint Cosmology Group) *Detection and Removal of CMB B-mode Dust via Statistical Anisotropy*
Mar. 2018	CMB-S4 Conference (Argonne) *Modeling Dust Foregrounds* (Contributed slides)
Sep. 2017	Max-Planck-Institut für Astronomie (Hans-Walter Rix's Group) *Creating Objective Scores for Nucleosynthetic Yield Tables*
Sep. 2017	Heidelberg Institute for Theoretical Studies (Volker Springel's Group) *Choosing Nucleosynthetic Yield Tables for Hydrodynamical Simulations*

REFEREES

References available on request