

PETER L. TAYLOR

<https://pltaylor16.github.io/>

Research Focus: Survey cosmology, especially weak lensing, galaxy clustering, statistical inference and machine learning. I am particularly active in DESI and Euclid.

EMPLOYMENT

CCAPP Fellow

2022 – Present

Center for Cosmology and AstroParticle Physics
The Ohio State University
(5-year independent fellowship)

NASA Postdoctoral Program Fellow

2019 – 2022

Jet Propulsion Laboratory
California Institute of Technology
(3-year independent fellowship)

EDUCATION

PhD, Astrophysics

2016 – 2019

Mullard Space Science Laboratory
University College London
Thesis: *Cosmological Inference with Cosmic Shear*
Supervisors: Prof. Thomas Kitching & Prof. Jason McEwen

MRes, Astrophysics

2015 – 2017

Durham University
Thesis: *On the Shape of Dark Matter Halos in the Galaxy Cluster Abell 3827 and the Scattering Cross-Section of Dark Matter*
Supervisors: Prof. Richard Massey & Prof. Mathilde Jauzac

MMATH, Mathematics

2011 – 2015

University of Oxford
Dissertation: *Kaluza-Klein Cosmologies*
Supervisor: Prof. Pedro Ferreira

PUBLICATION METRICS

33 Papers (**12** First Author, **4** Student First Author)

h-index: **13** (ADS)

Citations: **> 1000** (ADS)

[Link to full list](#)

FUNDING PROFILE

\$950k as PI (or equivalent)

\$1.7 million external funding as named co-I or PI

\$2.3 million total funds as named co-I or PI when including internal JPL R&D grants

AWARDS

UCL Dean's Commendation Thesis Prize Faculty of Mathematical and Physical Sciences	<i>2020</i>
Alan Johnstone Award for Outstanding Graduate Research Department of Space and Climate Physics, University College London	<i>2018</i>
UK Science and Technologies Facilities Council Studentship Up to 3.5 Years of Graduate Research Funding	<i>2016</i>

SELECTED GRANTS

Science-PI NASA Astrophysics Theory Program Leveraging Weak Gravitational Lensing - Redshift Space Distortions Cross-correlations (\$748k)	<i>2021</i>
Co-I (1 of 5, PI E Huff) JPL Internal Research and Technology Development Fund Mass and Motion, Tension and Concordance: What Are Tensions in Current Data Telling us About Dark Energy? (\$220k)	<i>2020</i>
Co-I (1 of 1, PI E Huff) JPL Internal Topic Area Proposal Next-Generation Weak Lensing with Hyperspectral Imaging Surveys (\$400k)	<i>2020</i>
Co-I (1 of 10, Science-I B Lee) HST Cycle 28 Archival Study Constraining the masses of galaxy overdensities at $z > 1$ in CANDELS and COSMOS through weak lensing in the NIR (\$751k)	<i>2020</i>
PI NASA Postdoctoral Program Fellowship A Next Generation Statistical Analysis for Next Generation Dark Energy Surveys (~ \$200k)	<i>2019</i>

TEACHING AND MENTORING

Guest Lecturer Astro 5682 – Intro to Cosmology The Ohio State University	<i>10/24</i>
Project Supervisor Alexander Torres Undergraduate at The Ohio State University	<i>06/24 – Present</i>
Project Supervisor Sophie Olsen Undergraduate at The Ohio State University	<i>06/24 – 08/24</i>
Project Supervisor Matthew Craigie PhD Student at University of Queensland	<i>06/23 – 09/24</i>

Supervisor

06/22 – Present

Erik Zaborowski

PhD Student at The Ohio State University

NSF Graduate Research Fellowship Program (GRFP) Honorable Mention

Invited Lecturer

06/22

Euclid Advanced School, Les Houches, France

1.5 hour Lecture on Likelihoods in Cosmology (Video Recording)

Primary Supervisor

06/21 – 06/22

Sebastian Tsai

Project: *The Limits of k -cut 3×2 Point Statistics*

Caltech Summer Undergraduate Research Fellow

& Project Advisor for Senior Thesis at Yale

Now Business Analyst at McKinsey

Primary Supervisor

06/20 – 10/21

Leah Vazsonyi

Project: *Constraining $f(R)$ Gravity with k -cut Cosmic Shear*

Caltech Summer Undergraduate Research Fellow

Now PhD student at UNC Chapel Hill

Project Supervisor

6/20 – 12/20

Anurag Deshpande

PhD student at University College London

Now Machine Learning Scientist at Amazon

TALKS

University of Chicago (invited)	10/24
University of North Carolina, Chapel Hill	09/24
Duke University	09/24
Key Project 7 Workshop, DESI Conference, Marseille, France (invited, remote)	07/24
Euclid Conference, Rome, Italy	06/24
Cosmology from Home (selected, remote)	06/24
University of Michigan (invited)	06/24
University of Cincinnati (invited)	02/24
Parity Violations from Home 2023 (selected talk, remote, Video Recording)	10/23
CosmoPalooza ¹ (invited, remote, Video Recording)	10/23
CCAPP Symposium, The Ohio State University (internal)	09/23
Lensing on Different Scales Workshop, Chicago (selected talk)	07/23
DESI Meeting, Durham, UK (flash talk)	07/23

¹On behalf of the Euclid Consortium

Euclid Meeting, Copenhagen (flash talk, selected, remote)	06/23
Statistical Challenges in Modern Astronomy, State College (flash talk)	06/23
Euclid Early Career Talk Series (flash talk, remote)	10/22
CCAPP Symposium, The Ohio State University (internal)	09/22
University of Turin, Italy (invited, remote)	05/22
University of Waterloo, Canada (invited, remote)	02/22
Stanford University (invited, remote)	01/22
Queen Mary University of London (invited, remote)	11/21
Duke University (invited, remote)	10/21
ICG, University of Portsmouth (invited, remote)	10/21
University of California, Santa Cruz (remote)	10/21
Lawrence Berkeley National Lab (remote)	10/21
IPAC, California Institute of Technology (invited, remote)	10/21
University of Geneva (invited, remote)	10/21
USM/LMU, Munich (invited, remote)	09/21
Postdoc Lab-wide Seminar Series, Jet Propulsion Laboratory (remote)	08/21
University of Oxford (invited, remote)	07/21
University of Arizona (invited, remote)	03/21
Stanford University (remote)	12/20
Euclid Inter-Science Task Force (IST) Nonlinear Talk Series (invited, remote)	12/20
University of Minnesota (invited, remote)	10/20
External Synergies for Rubin Community Science Workshop ¹ (invited, remote)	08/20
Euclid US Talk Series (remote)	07/20
University of Manchester, Manchester, UK (invited)	08/19
Euclid Science Ground Segment, Euclid Conference, Helsinki, Finland	06/19
Euclid UK Meeting, University of Oxford, Oxford, UK (selected talk)	12/18
Euclid Weak Lensing and Galaxy Clustering Meeting, Milan, Italy	12/18
Alan Johnstone Prize Talk, University College London (internal)	11/18
Euclid France Weak Lensing Atelier, IAP, Paris, France (invited)	10/18
Jet Propulsion Laboratory, California Institute of Technology	08/18
MSSL, University College London (internal)	03/18
ICC/CEA, Durham University (internal)	06/16

PROFESSIONAL ACTIVITIES

Collaboration Membership

Euclid Consortium, Roman Cosmology Science Investigation Team,
Dark Energy Survey, Dark Energy Spectroscopic Instrument,
& Rubin Dark Energy Science Collaboration

Euclid Consortium

Member, Diversity Committee	2020 – 2023
Co-Lead, Weak Lensing Forward Modelling Work Package	2019 – 2023
Consultant, Likelihood Inter-Science Task-force	2019 – 2024
Science Organizing Committee, Les Houches Advanced School	2022
Internal Referee for Euclid Publications	2023 – Present
Flagship Paper Authorship Rights for > 1 Year of Infrastructure Work	2023 - Present

DESI

In-person Observing	2024
Internal Referee for DESI Publications	2024 - Present
Mentorship Program	2022 – Present

Refereeing and Reviewing

Subject-matter Expert Reviewer in NASA Proposal Peer Review	2021, 2022
Astronomy and Astrophysics	2019 – Present
Monthly Notices of the Royal Astronomical Society	2020 – Present
Journal of Cosmology and Astroparticle Physics	2021 – Present
The Open Journal of Astrophysics	2024 – Present

Organizer

CCAPP Seminar Series	2023 – 2024
NASA JPL Dark Sector Meetings	2020 – 2022
Mullard Space Science Laboratory Cosmology Journal Club	2017 – 2018

Fellow, Royal Astronomical Society

2017 – Present

OUTREACH & PUBLIC ENGAGEMENT

Lead Organizer

07/19

The Universe in Virtual Reality
Royal Society, London

Lead Organizer

07/18

Mullard Space Science Laboratory Work Experience Week
Week long program for high school students from underrepresented backgrounds.

Project Mentor

07/18

Mullard Space Science Laboratory Work Experience Week

Outreach Talk

04/18

Institute for the Arts, London

Project Mentor

07/17

Mullard Space Science Laboratory Work Experience Week

Public Talk

06/17

Westminster School, London

Public Demonstrator Mullard Space Science Laboratory 50th Anniversary Open Day	05/17
Gravitational Lensing Demonstrator Euclid Consortium School Science Day, London	05/17
Demonstrator Schools' Science Festival, Durham	03/16
Planetarium Demonstrator Celebrate Science Festival, Durham	10/15

FIRST AUTHOR PUBLICATIONS

1. **Peter L. Taylor**, Andrei Cuceu et al. **CombineHarvesterFlow**: Joint Probe Analysis Made Easy with Normalizing Flows. *The Open Journal of Astrophysics*, 10.33232/001c.124495, 2024.
2. **Peter L. Taylor**, Matthew Craigie, Yuan-Sen Ting. Unsupervised Searches for Cosmological Parity-Violation: An Investigation with Convolutional Neural Networks. *Phys. Rev. D*, 109:083518, 2024.
3. **Peter L. Taylor** and Katarina Markovič. Covariance of photometric and spectroscopic two-point statistics: Implications for cosmological parameter inference. *Phys. Rev. D*, 106(6):063536, 2022.
4. **Peter L. Taylor**, Katarina Markovič, Alksitis Portsidou and Eric Huff. Redshift space distortions: Unmixing radial scales in projection. *Phys. Rev. D*, 105(8):084007, 2022.
- 5.² **Peter L. Taylor** et. al. [94 co-authors]. Euclid: forecasts for k -cut 3x2 point statistics. *The Open Journal of Astrophysics*, 10.21105/astro.2012.04672, 2021.
6. **Peter L. Taylor**, Francis Bernardeau, Eric Huff. x -cut Cosmic Shear: Optimally Removing Sensitivity to Baryonic and Nonlinear Physics with an Application to the Dark Energy Survey Year 1 Shear Data. *Phys. Rev. D*, 103(4):043531, 2021.
7. **Peter L. Taylor**, Thomas D. Kitching, Justing Alsing, Benjamin D. Wandelt, Stephen M. Feeney, and Jason D. McEwen. Cosmic Shear: Inference from Forward Models. *Phys. Rev. D*, 100:023519, 2019.
8. **Peter L. Taylor**, Thomas D. Kitching, and Jason D. McEwen. Nonparametric cosmology with cosmic shear. *Phys. Rev. D*, 99:043532, 2019.
9. **Peter L. Taylor**, Francis Bernardeau, and Thomas D. Kitching. k -cut cosmic shear: Tunable power spectrum sensitivity to test gravity. *Phys. Rev. D*, 98(8):083514, 2018.
10. **Peter L. Taylor**, Thomas D. Kitching, Jason D. McEwen, and Thomas Tram. Testing the cosmic shear spatially-flat universe approximation with generalized lensing and shear spectra. *Phys. Rev. D*, 98(2):023522, 2018.
11. **Peter L. Taylor**, Thomas D. Kitching, and Jason D. McEwen. Preparing for the cosmic shear data flood: Optimal data extraction and simulation requirements for stage iv dark energy experiments. *Phys. Rev. D*, 98:043532, 2018.
12. **Peter Taylor**, Richard Massey, Mathilde Jauzac, Frederic Courbin, David Harvey, Remy Joseph, and Andrew Robertson. A test for skewed distributions of dark matter, and a possible

²Euclid Consortium Paper.

detection in galaxy cluster abell 3827. *Monthly Notices of the Royal Astronomical Society*, 468(4):50045013, 2017.

PAPERS BY STUDENTS

13. Leah Vazsonyi, **Peter L. Taylor**, Georgios Valogiannis, Nesar S. Ramachandra, Agnès Ferté, and Jason Rhodes. Constraining $f(R)$ Gravity with a k -cut Cosmic Shear Analysis of the Hyper Suprime-Cam First-Year Data. *Phys. Rev. D.*, 104(8):083527, 2021.

14. A. Deshpande, **P. L. Taylor**, and T. Kitching. Accessing the high- ℓ frontier under the reduced shear approximation with k -cut cosmic shear. *Phys. Rev. D*, 102(8):083535, 2020.

PAPERS BY STUDENTS (SUBMITTED OR IN COLLAB. WIDE REVIEW)

15. E. Zaborowski, **P. Taylor** et. al. A Sound Horizon-Free Measurement of H_0 in DESI. arXiv:2411.16677 (2024). (*JCAP submitted*)

16. Matthew Craigie, **Peter L. Taylor**, Yuan-Sen Ting, Carolina Cuesta-Lazaro, Rossana Ruggeri and Tamara M Davis. Unsupervised Searches for Cosmological Parity Violation: Improving Detection Power with the Neural Field Scattering Transform. arXiv:2405.13083 (2024). (*PRD submitted*)

OTHER PUBLICATIONS

17. R. Calderon, (... **P. Taylor**). DESI 2024: Reconstructing Dark Energy using Crossing Statistics with DESI DR1 BAO data. *Journal of Cosmology and Astroparticle Physics* 2024.10 (2024): 048.

18. Euclid Collaboration: (... **P. L. Taylor**). Euclid. I. Overview of the Euclid Mission. *A & A special issue ‘Euclid on Sky’*. (2024).

19. Kyle Finner (... **Peter L. Taylor 7/8**). Near-IR weak-lensing (NIRWL) measurements in the CANDELS fields I: point-spread function modeling and systematics. *The Astrophysical Journal* 958.1 (2023): 33.

20. A. Ferté (...**Peter L. Taylor 5/6**) et. al. Categorizing models using self-organizing maps: An application to modified gravity theories probed by cosmic shear. *The Open Journal of Astrophysics*, 10.21105/astro.2110.13171, 2023.

21. T. D. Kitching, A. C. Deshpande and **P. L. Taylor**. Spatially varying additive biases in cosmic shear data. *The Open Journal of Astrophysics*, 10.21105/astro.2010.07749, 2021.

22. T. D. Kitching, A. C. Deshpande, and **P. L. Taylor**. Mitigating biases in cosmic shear power spectra amplitude inference. *The Open Journal of Astrophysics*, 10.21105/astro.2110.01275, 2021.

23. A. Deshpande, T. Kitching, V. Cardone, **P. L. Taylor**, S. Casas, S. Camera, C. Carbone, M. Kilbinger, V. Pettorino, Z. Sakr, et al. Euclid: The reduced shear approximation and magnification bias for stage iv cosmic shear experiments. *Astronomy and Astrophysics*, 636, 2020.

24. Thomas D. Kitching, **Peter L. Taylor**, Peter Capak, Daniel Masters, and Henk Hoekstra. Rainbow cosmic shear: Optimization of tomographic bins. *Phys. Rev. D*, 99(6):063536, 2019.

25. Alessio Spurio Mancini, **Peter L. Taylor**, R Reischke, T. Kitching, V. Pettorino, B. M. Schafer, B. Zieser, and P. M. Merkel. 3d cosmic shear: Numerical challenges, 3d lensing random fields generation, and minkowski functionals for cosmological inference. *Phys. Rev. D*, 98(10):103507, 2018.
26. Richard Massey, David Harvey, Jori Liesenborgs, Johan Richard, Stuart Stach, Mark Swinbank, **Peter Taylor** et al. Dark matter dynamics in abell 3827: new data consistent with standard cold dark matter. *Monthly Notices of the Royal Astronomical Society*, 477(1):669677, 2018.
27. M. Jauzac, D. Eckert, J. Schwinn , D. Harvey , C. M. Baugh, A. Robertson, S. Bose, R. Massey (... **Peter Taylor 23/24**) et al. The Extraordinary Amount of Substructure in the Hubble Frontier Fields Cluster Abell 2744, *Monthly Notices of the Royal Astronomical Society*, 463(4), 3876-3893, 2016.

SUBMITTED PAPERS

28. Sankarshana Srinivasan, Daniel B Thomas and **Peter L. Taylor**. Cosmological gravity on all scales IV: 3x2pt Fisher forecasts for pixelised phenomenological modified gravity. arXiv:2409.06569 (2024). (*JCAP submitted.*)
29. A.G. Adame, (... **P. Taylor**). DESI 2024 VI: Cosmological Constraints from the Measurements of Baryon Acoustic Oscillations. arXiv:2404.03002 (2024). (*JCAP submitted.*)
30. A.G. Adame, (... **P. Taylor**). DESI 2024 VII: Cosmological Constraints from the Full-Shape Modeling of Clustering Measurements. arXiv:2411.12022 (2024). (*JCAP submitted*)

PAPERS IN COLLABORATION WIDE REVIEW

31. V. Cardone (... **P. L. Taylor**). Euclid Preparation TBD. Cosmology Likelihood for Observables in Euclid (CLOE): Theoretical Recipe.
32. S. Joudaki (... **P. L. Taylor**). Euclid Preparation. TBD. Cosmology Likelihood for Observables in Euclid (CLOE): Code Implementation.

NON-REFEREED PAPERS

33. T.D. Kitching, N. Tessore, **P.L. Taylor**. Spatial propagation of weak lensing shear response corrections. arXiv:2302.14656 (2023).