DR BORIS LEISTEDT

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RESEARCH INTERESTS

Astrostatistics, data-driven observational cosmology and fundamental physics.

Probing fundamental physics (early universe/high-energy physics, dark matter/energy, gravity) with galaxy survey and cosmic microwave background data.[5,7] Data analysis with novel statistical estimators [6,13] and Bayesian inference methods (*e.g.*, Gaussian processes, hierarchical models)[2,12] for parameter estimation and systematics mitigation.[3,9] 2D/3D wavelets and sparsity [8,10]: applications to cosmology and geophysics. [1,4] Data sets: SDSS, WMAP, Planck, DES, Gaia, (e)BOSS, DESI, LSST.

The numbers in brackets refer to selected first- or second-author journal publications, see list below.

CURRENT AND PAST POSITIONS

NYU – New York University (USA) since 2015

NASA Einstein postdoctoral fellow in the Center for Cosmology & Particle Physics.
Visiting researcher at the New York University Center for Data Science,
and at the Simons Foundation Center of Computational Astrophysics.

UCL – University College London (UK) 2014 – 2015

Postdoctoral researcher in the Department of Physics & Astronomy.

EDUCATION

UCL – University College London (UK) 2011 – 2014

Doctor of Philosophy (PhD) in Physics and Astronomy, awarded 10/2014.
Thesis: *Accurate cosmology with galaxy and quasar surveys*. Advisor: Hiranya Peiris.

UMons – University of Mons (Belgium) and 2006 – 2011
Supélec – École Supérieure d'Électricité (France)

Joint Diplôme d'Ingénieur (dual MSc Electrical Engineering / Computer Science).
Thesis: *Optimal learning sets for preference modeling and decision making*.

Paris 11 – Orsay Paris-Sud University (France) 2008 – 2011

Master de Physique Fondamentale (MSc Physics, joint with engineering degree)

AWARDS

NASA Einstein Research Fellowship (national competitive 3yr physics fellowship)	2016 – 2019
Simons Foundation Research Fellowship (competitive 3yr interdisciplinary fellowship)	2015 – 2018
UCL Jon Darius Memorial Prize (outstanding PhD research in astrophysics)	2015
RAS Michael Penston Prize (runner-up, best UK PhD thesis in astrophysics)	2014
ORBEL award finalist (best MSc thesis in operational research in Belgium)	2011
High Octane award (top of MSc class), Faculty of Engineering, University of Mons	2011
T.I.M.E. scholarship held at UMons/Supélec/Paris 11 (competitive exchange program between top European engineering universities leading to a joint masters degree)	2008 – 2011

ORGANISATION OF WORKSHOPS AND SEMINARS

Since 2013	Co-organiser of the interdisciplinary *Biomedical and Astronomical Signal Processing (BASP) Frontiers workshops* (2013, 2015, 2017)
June 2014	Co-organiser of the *Cross-correlating cosmic probes* conference in UCL

SELECTED PRESENTATIONS

Meeting names are in italic. Inter-disciplinary talks and meetings are highlighted with *.
Talks at bi-annual DES and LSST DESC collaboration meetings are not included.

Jan 2017 *	*BASP Frontiers Workshop 2017*, Villars, Switzerland (**invited**)
Oct 2016	Department of Physics, University of Oxford, UK (**invited**)
Oct 2016	Department of Physics, Yale University, USA (**invited**)
Sept 2016	Department of Physics & Astronomy, Rutgers University, USA (**invited**)
May 2016	Department of Physics & Astronomy, University of Delaware, USA (**invited**)
May 2016 *	*Statistical Challenges in 21st Century Cosmology*, Chania, Greece.
Apr 2016 *	Center for Data Science, New York University, USA (**invited**)
Apr 2016	American Physical Society (APS), Salt Lake City, USA (**invited**)
Apr 2016	McWilliams Center for Cosmology, Carnegie Mellon University, USA (**invited**)
Mar 2016	Kavli Institute for Particle Astrophysics and Cosmology, Stanford University, USA
Feb 2016	*SphereX Community Workshop*, California Institute of Technology, USA
Jan 2016 *	*Sampling & non-sampling methods in cosmology*, University of California, Berkeley, USA
Dec 2015	Dept of Physics & Astronomy, Imperial College London, UK (**invited**)
Mar 2015	Dept of Physics & Astronomy, University College London, UK
Jan 2015 *	*BASP Frontiers Workshop 2015*, Villars, Switzerland (**best presentation prize**)
Nov 2014	Lawrence Berkeley Laboratory, Berkeley, USA (**invited**)
Nov 2014	Perimeter Institute, Waterloo, Canada (**invited**)
Nov 2014	Institute of Astronomy & DAMPT, University of Cambridge, UK (**invited**)
Sept 2014	Institute for Advanced Study / Princeton University, USA
Sept 2014	Institute for Strings, Cosmology & Astroparticle Physics, Columbia University, USA
Sept 2014	Institute for Theory and Computation, Harvard University, USA
Sept 2014	Center for Cosmology and AstroParticle Physics, Ohio State University, USA
Aug 2014	COSMO 2014, Kavli Institute for Cosmological Physics, University of Chicago, USA
July 2014	Laboratório Interinstitucional de e-Astronomia, Rio de J., Brazil (webminar, **invited**)
July 2014 *	*Science on the Sphere, Royal Society Seminar*, Chicheley Hall, UK (**invited**)
Jun 2014 *	*Astronomy and Biomedical Imaging Workshop*, UCL Crick Institute, UK
Apr 2014 *	*Statistical Challenges in 21st Century Cosmology*, Lisbon, Portugal
Apr 2014	*Progress on Old and New Themes in Cosmology*, Avignon, France
Mar 2014	*49th Rencontres de Moriond*, La Thuile, Italy
Dec 2013	London Cosmology Discussion Meeting (LCDM), UK
Nov 2013	Department of Physics, University of Oxford, UK (**invited**)
Oct 2013	Institute of Cosmological Sciences, University of Barcelona, Spain
Aug 2013 *	*Wavelet and Sparsity XV, SPIE 2013*, San Diego, USA (**invited**)
July 2013	*Challenges for Next Gen. LSS Surveys*, Ascona, Switzerland (**best presentation prize**)

ACADEMIC SERVICE AND OTHER AFFILIATIONS

Since 2016	Full member of the LSST Dark Energy Science Collaboration.
Since 2014	Member of the Dark Energy Survey (with full individual data-rights).
Since 2013	Referee for MNRAS, JOSA

PUBLIC CODES AND CONTRIBUTIONS

`Daft`	Beautiful interactive rendering of probabilistic graphical models
`Delight`	Physical, data driven photometric redshifts using Gaussian Processes.
`London CC`	Codes of conduct for conferences and events, and relevant resources.
`PZ tools`	Tools for photometric redshift estimation and mock generation.
`QuickSip`	Quickly weight & project Survey Image Properties (e.g. seeing) into HEALPix maps.
`So3`	Sampling theorem and Wigner transforms on the 3D ring torus.
`S2let`	2D spherical spin directional wavelets, curvelets, and ridgelets on the sphere.
`Flag` (`let`)	3D Fourier-Laguerre sampling theorem, harmonic transforms and 3D wavelets.

OUTREACH AND PUBLIC ENGAGEMENT

Since 2013 I have been tweeting about astronomy and careers in STEM with the username @ixkael.

Apr 2016	Seminar on galaxy survey data analysis at the NYU Center for Data Science.
2013–2015	Seminar organiser for the UCL *Certificate in Astronomy* course.
May 2014	Talk on cosmological data analysis at the UCL Crick workshop.
Apr 2014	Article on BICEP2 and inflation for the T.I.M.E.A.A. newsletter.
Feb 2014	Seminar on modern cosmology for the UCL Postgraduate Physics Society.
2013–2015	Animator for the Your Universe outreach festival, UCL (high-school students).
2013	Various outreach talks about cosmology in London amateur astronomy clubs.
2012	Consultant for the `Dash` theatre company (trailer of the project).

REFERENCES

Hiranya Peiris – `h.peiris@ucl.ac.uk`
Director, Oskar Klein Centre for Cosmoparticle Physics, Stockholm, Sweden
Professor, Dept of Physics & Astronomy, University College London, UK

David Hogg – `david.hogg@nyu.edu`
Professor, Center for Cosmology and Particle Physics, New York University, USA

Alan Heavens – `a.heavens@imperial.ac.uk`
Director, Imperial Centre for Inference and Cosmology, Imperial College London, UK
Chair in Astrostatistics, Department of Physics, Imperial College London, UK

Licia Verde – `liciaverde@icc.ub.edu`
Professor, Institute of Cosmos Sciences, University of Barcelona, Spain

Joshua Frieman – `frieman@fnal.gov`
Professor, Kavli Institute for Cosmological Physics, University of Chicago, USA

Ofer Lahav – `o.lahav.ac.uk`
Professor, Dept of Physics & Astronomy, University College London, UK

PUBLICATIONS

Journal names are abbreviated as follows:

MNRAS : Monthly Notices of the Royal Astronomical Society	ApJ: the Astrophysical Journal	PRD : Physics Review D
IEEE TSP : IEEE Transactions on Signal Processing	A&A : Astronomy & Astrophysics	PRL : Physics Review Letters

REFEREED JOURNAL ARTICLES (FIRST AUTHOR ONLY):

1. *Wavelet reconstruction of pure E and B modes for CMB polarisation and cosmic shear analyses*.
   B. Leistedt, J. D. McEwen, M. Büttner, H. V. Peiris, MNRAS, in press, 2016.
2. *Hierarchical Bayesian inference of galaxy redshift distributions from photometric surveys*.
   B. Leistedt, D. J. Mortlock, H. V. Peiris, MNRAS, 460(4): 4258-4267, 2016.
3. *Mapping and simulating systematics due to spatially-varying observing conditions in DES SV data.*
   B. Leistedt, H. V. Peiris, F. Elsner *et al* (DES collaboration), ApJS, 226, 2, 2016.
4. *3D weak lensing with spin wavelets on the ball*.
   B. Leistedt, J. D. McEwen, T. Kitching, H. V. Peiris, PRD, 92, 123010, 2015.
5. *Constraints on primordial non-Gaussianity from 800,000 photometric quasars*.
   B. Leistedt, H. V. Peiris, N. Roth, 2014, PRL, 113, 221301, 2014.
6. *Exploiting the full potential of photometric quasar surveys: Optimal power spectra through blind mitigation of systematics*.
   B. Leistedt, H. V. Peiris, MNRAS, 444(1): 2-14, 2014.
7. *No new cosmological concordance with massive sterile neutrinos*.
   B. Leistedt, H. V. Peiris, L. Verde, PRL, 113, 041301, 2014.
8. *S2LET: a code to perform fast wavelet analysis on the sphere*.
   B. Leistedt, J. D. McEwen, P. Vandergheynst, Y. Wiaux, A&A, 558, A128, 2013.
9. *Estimating the large-scale angular power spectrum in the presence of systematics: a case study of Sloan Digital Sky Survey quasars*.
   B. Leistedt, H. V. Peiris, D. Mortlock, A. Benoit-Lévy, A. Pontzen, MNRAS, 435(3): 1857-73, 2013.
10. *Exact Wavelets on the Ball*.
    B. Leistedt, J. D. McEwen, IEEE TSP, 60, 6257-6269, 2012.
11. *3DEX: a code for Fast Fourier-Bessel Decomposition of All-Sky 3D Surveys*.
    B. Leistedt, A. Rassat, J-L Starck, A. Refregier, A&A, 540, A60, 2011.

PRE-PRINTS (FIRST AUTHOR ONLY)

12. *Data-driven, interpretable photometric redshifts from unrepresentative training data*.
    B. Leistedt, D. W. Hogg, in prep.

REFEREED JOURNAL ARTICLES (COLLABORATIONS WITH SIGNIFICANT CONTRIBUTIONS ONLY)

13. *Unbiased pseudo-Cl power spectrum estimation with mode projection*
    F. Elsner, **B. Leistedt**, H. V. Peiris, MNRAS, in press.
14. *Spin-SILC: CMB polarisation component separation with spin wavelets.*
    K. Rogers, H. V. Peiris, **B. Leistedt**, J. D. McEwen, A. Pontzen, MNRAS, in press, 2016.
15. *Second-generation curvelets on the sphere*.
    J. Y. H. Chan, **B. Leistedt**, T. Kitching, J. D. McEwen, IEEE TSP, 65, 5-14.

16. *Cosmology from Cosmic Shear with DES Science Verification Data*.
DES collaboration (including **B. Leistedt**), PRD, 94, 022001, 2016.
17. *Cosmic Shear Measurements with DES Science Verification Data*.
M. Becker *et al.* (DES collaboration, including **B. Leistedt**), PRD, 94, 022002, 2016.
18. *Redshift distributions of galaxies in the DES SV shear catalogue and implications for weak lensing*.
C. Bonnett *et al.* (DES collaboration, including **B. Leistedt**), PRD, 94, 042005, 2016.
19. *redMaGiC: Selecting Luminous Red Galaxies from the DES Science Verification Data*.
E. Rozo *et al.* (DES collaboration, including **B. Leistedt**), MNRAS, in press 2016.
20. *SILC: a new Planck Internal Linear Combination CMB temperature map using directional wavelets.*
K. Rogers, H. V. Peiris, **B. Leistedt**, J. D. McEwen, A. Pontzen, MNRAS, 460(3), 3014-3028, 2016.
21. *No galaxy left behind: Accurate clustering for incomplete galaxy samples in the Dark Energy Survey*.
E. Suchyta, E. Huff *et al.* (DES collaboration, including **B. Leistedt**), MNRAS, 457(1): 786-808, 2016.
22. *Debiasing systematics mitigation methods in galaxy angular clustering estimators.*
F. Elsner, **B. Leistedt**, H. V. Peiris, MNRAS, 456(2): 2095-2104, 2016.
23. *CMB lensing tomography with the DES Science Verification galaxies*.
T. Giannantonio *et al.* (DES collaboration, including **B. Leistedt**), MNRAS, 456(3), 3213-3244, 2016.
24. *Galaxy clustering, photometric redshifts & diagnosis of systematics in the DES Science Verification data*.
M. Crocce *et al.* (DES collaboration, including **B. Leistedt**), MNRAS, 455(4): 4301-4324, 2016.
25. *A novel sampling theorem on the rotation group*.
J. D. McEwen, M. Büttner, **B. Leistedt**, H. V. Peiris, Y. Wiaux, IEEE Sig Proc Letters, 22, 12, 2015.
26. *Modelling the Transfer Function for the Dark Energy Survey*.
C. Chang *et al.* (DES collaboration, including **B. Leistedt**), ApJ, 801, 73, 2015.

PRE-PRINTS (COLLABORATIONS WITH SIGNIFICANT CONTRIBUTIONS ONLY)

27. *Directional spin wavelets on the sphere*.
J. D. McEwen, **B. Leistedt**, M. Büttner, H. V. Peiris, Y. Wiaux, submitted to IEEE TSP.

PROCEEDINGS ARTICLES (POSTED ON ARXIV ONLY)

28. *Analysing the polarisation of the CMB with spin scale-discretised wavelets*.
B. Leistedt, J. D. McEwen, M. Büttner, H. V. Peiris, Y. Wiaux, P. Vandergheynst, BASP 2015.
29. *On spin scale-discretised wavelets on the sphere for the analysis of CMB polarisation*.
J. McEwen, M. Büttner, **B. Leistedt**, H. V. Peiris, Y. Wiaux, P. Vandergheynst, 2014, SCCC21/IAU306.
30. *Flaglets on the ball for studying the large-scale structure of the Universe*.
B. Leistedt, H. V. Peiris, J. D. McEwen, 2013, Wavelets & Sparsity XV, SPIE 2013.
31. *Fourier-Laguerre Transform, Convolution and Wavelets on the Ball*.
J. D. McEwen, **B. Leistedt**, 2013, International Conference on Sampling Theory and Applications.
32. *Flaglets: Exact Wavelets on the Ball*. **B. Leistedt**, J. D. McEwen, 2013, BASP Frontiers 2013.