

Contact:

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Main research interests:

- Nature of dark matter and dark energy; gravity on large scales
- Large-scale structure of the Universe; galaxy – dark matter link
- Optimal design, analysis, and quality control of cosmological surveys
- Data analysis and inference methods, explainable machine learning, spatial statistics, uncertainty modelling, Bayesian techniques

Education and career:

2021+ Professor of Astrophysics, University College London (UCL)

2017 – 2021 Reader of Astrophysics, UCL

2013 – 2017 Lecturer of Astrophysics, UCL

2012 – 2017 STFC Ernest Rutherford Fellow

2010 – 2013 Research Fellow, University of Edinburgh

2007 – 2010 PhD in Astrophysics, University of Bonn; advisor: Peter Schneider

2002 – 2007 Diploma in Physics, University of Bonn

Publications:

See [NASA ADS Listing](#)

Statistics as of July 2024:

- 182 publications of which 149 are published in international peer-reviewed journals
- 12800+ citations according to NASA ADS
- 27 refereed articles with more than 100 citations
- Hirsch index: 52

Awards, grants, distinctions:

2024 – 2025 Co-I of DiRAC national high-performance computing grant [125K GPUh]

2024 – 2027 Co-I of ARCHER2 GPU-enabled software development grant [280K £]

2024 Euclid Consortium **Special Talent And Recognition Prize**, leadership & coordination category

2024 – 2027 Co-I of STFC Small Grant on the baryon-to-halo mass relation in galaxies with DESI and 4MOST [460K £]

2024 – 2027 PI of **LSST Dark Energy Science Collaboration software development** Phase C contribution at UCL [308K £]

2023 – 2028 PI of **ERC Consolidator Grant** project GrowInTheDark [2.3M €]

2022 – 2028 Co-I of renewal for the UCL Centre for Doctoral Training in Data-Intensive Science [1.6M £]

2021 – 2024 PI of **STFC Consolidated Grant project** on joint analysis of cosmological surveys [230K £]

2021 – 2024 PI of **LSST Dark Energy Science Collaboration software development** Phase B contribution at UCL [390K £]

2020 – 2025 PI of UK Space Agency **Euclid Bridging Grant @ UCL** [1.9M £]

2019 PI of Alan-Turing Institute “AI for Science” Strategic Priority Fund grant [7K £]

2017 – 2020 PI of UK Space Agency **Euclid Implementation Phase Grant @ UCL** [800K £]

2015 – 2019 Co-I of ING proposals for PAU Survey (WHT@La Palma) [180 nights]
 2015 – 2016 Co-I of ISSI International Team on gravitational magnification [22K CHF]
 2015 – 2018 Co-I on UCL Astrophysics Consolidated Grant [130K £]
 2014 Royal Astronomical Society **Winton Award** [1K £]
 2014 – 2017 Foreign Co-I on NASA ATP Award [620K \$]
 2014 – 2017 PI of STFC **Ernest Rutherford Grant** [220K £]
 2013 – 2014 PI of ISSI International Team on intrinsic galaxy alignments [22K CHF]
 2013 Associate Fellow of the UK Higher Education Academy
 2013 Fellow of the Royal Astronomical Society
 2013 PI of Royal Society Research Grant [15K £]
 2012 – 2017 STFC **Ernest Rutherford Fellowship** [5yr; 530K £]
 2012 – 2015 **Royal Astronomical Society Fellowship** [3yr; 280K £], *declined*
 2008 Prize (Alumni-Preis, Uni. Bonn) for best student initiative (PI) [1K €]
 2008 Stipendiary of the Wilhelm und Else Heraeus-Stiftung [1K €]
 2007 – 2010 'honors program', Bonn-Cologne Graduate School [3yr; 10K €]
 2007 – 2010 Fellow of the Deutsche Telekom Stiftung [3yr; 70K €]
 2002 – 2007 Fellow of the Studienstiftung des deutschen Volkes [5yr; 5K €]

Talks, colloquia, lectures:

I have given ca. 30 invited presentations over the past 10 years, about half of which internationally. Highlights include:

- keynote/review speaker at Sesto Workshop “Intriguing inconsistencies in the growth of structure” (Italy 2022), Workshop “Key Challenges in Galaxy & CMB lensing” (Cambridge 2022), Lorentz Workshop “Extracting Information from Weak Lensing” (Netherlands 2015)
- invited talks at interdisciplinary conferences, including “STFC Astronomy and AI event”, “Statistical Challenges in 21st Century Cosmology”, “Interplay between Particle and Astrophysics”, “Astronomical Data Analysis”, and “Big Data”
- invited lecturer at International Max Planck Research Summer School (Germany 2024), CDT-Jordan Summer School (UCL 2022), Euclid Advanced School (Les Houches 2022), GOLD cosmology PhD programme (Paris 2020, cancelled due to pandemic), and Tonale Winter School on Cosmology (Italy 2018)
- invited participant in several selective summer research programmes at Aspen/USA and Benasque/Spain
- colloquia at IPMU Tokyo, CEA Saclay, the ESA SPACE forum Slovakia, Unis. Bochum, Durham, Geneva, Heidelberg, Hyderabad, Imperial, Manchester, Portsmouth, Sussex, & Zurich

Teaching:

2021+ Module co-lead, 1st year undergraduate lecture course “**Mathematical Methods II**”, UCL
 2017+ Organiser of 'Physics-Astro Data Roundtable'; monthly cross-disciplinary sessions on statistics and data science, UCL
 2016 – 2020 Module lead, **Masters-level final-year astrophysics projects**, UCL
 2015 – 2021 Module co-lead, 3rd year undergraduate lecture course “**Physical Cosmology**”, UCL
 2013 Lecturer of undergraduate course “**Astronomy 1S**” (stars & planets), Uni. Edinburgh
 2011 – 2014 Guest lecturer at graduate courses in Advanced Cosmology, UCL and Scottish Universities Physics Alliance
 2009 – 2010 Lecturer in introductory extragalactic astronomy, Uni. Bonn
 2007 – 2010 Tutor, coordinator, and developer of advanced lab course on optical astronomy and gravitational lensing, Uni. Bonn & Hoher List Observatory
 2005 – 2008 Tutor and organiser of tutorials and exams for lectures on introductory Galactic and extragalactic astronomy, Uni. Bonn

Supervision:

- I currently supervise postdoctoral research fellows working on

- ◆ weak lensing and galaxy clustering cosmology with Euclid and DESI
- ◆ observational constraints on the galaxy-dark matter environment link
- ◆ methodology and application of simulation-based inference
- ◆ photometric redshift analysis software for the LSST-DESC
- ◆ Euclid Science Ground Segment infrastructure and software development
- I currently supervise PhD projects on topics including
 - ◆ simulation-based inference in cosmology and seismology
 - ◆ generative models and explainable artificial intelligence applications in astrophysics
 - ◆ the link between dark and baryonic matter from large galaxy surveys
- Completed PhD projects for which I was main supervisor:
 - ◆ K. Lin (2020-24), PhD on simulation-based inference and wavelet statistics applied to large-scale structure; moved to PDRA at MSSL
 - ◆ F. Gerardi (2019-23), PhD on multi-messenger inference problems; moved to data science position in industry
 - ◆ M. von Wietersheim-Kramsta (2019-23), PhD on simulation-based inference in weak lensing; moved to PDRAs at UCL & Uni. Durham
 - ◆ B. Stölzner (2019-22), PhD in redshift calibration and inference for the KiDS and LSST surveys; moved to PDRA at Uni. Bochum
 - ◆ A. Cuceu (2018-21), PhD on cosmology from the clustering of large-scale structures; moved to PDRA at Ohio State University
 - ◆ C. Mahony (2018-21), PhD on gravitational magnification with the LSST; moved to PDRA at Uni. Bochum
 - ◆ D. Piras (2017-21), PhD on inference in cosmology and seismology with generative machine learning models; moved to PDRAs at UCL & Uni. Geneva
 - ◆ H. Johnston (2016-20), PhD on analysis of galaxy clustering and alignments; moved to PDRA at Uni. Utrecht
 - ◆ S. Pyne (2015-20), PhD on higher-order weak lensing statistics; moved to Research Fellow at UCL
 - ◆ D. Gualdi (2014-18), PhD on data compression for galaxy survey analysis; moved to PDRA at Uni. Barcelona
 - ◆ J. Soo (2014-18), PhD on photometric redshifts for current and future surveys; moved to Lecturer position at Universiti Sains Malaysia
 - ◆ R. Schuhmann (2013-16), PhD on data transformation techniques in cosmology; moved to PDRA at Uni. Edinburgh
 - ◆ C. Duncan (2011-14), PhD on cosmic magnification (2010-2014), Uni. Edinburgh; moved to PDRAs in quantitative biology and Euclid PSF modelling
- I have to date supervised 20+ MSc/MSci and 10+ undergraduate project students.

Coordinator and organiser roles:

2024	Co-organiser (SOC) of the LILAC workshop at Harvard CfA
2024	Co-organiser (LOC & SOC) of the “Golden Years” meeting in Leiden
2023	Co-organiser (SOC) of the Lorentz Center meeting “A holistic approach to galaxy intrinsic alignments”
2022 – 2023	Session convener and facilitator of Nature Reviews Physics and Alan Turing Institute series on machine learning in physics
2022+	Initiator and co-lead of the echOLA research community project
2021+	Management Team & Academic Liaison in the UCL Centre for Doctoral Training in Data-Intensive Science
2021+	Euclid Tiger Team lead on imaging mask production
2020+	Co-coordinator of KiDS Weak Lensing team
2019	Main organiser of ‘Data science in Physics and Astronomy’ workshop, Alan Turing Institute, London
2019+	Deputy Lead OU-LE3 in the ESA Euclid Science Ground Segment
2018	Host of PAU Survey Collaboration meeting, UCL

- 2017 – 2019 Euclid weak lensing covariance taskforce co-lead
 2016 **Main organiser (LOC & SOC) of national Alan Turing Institute Summit** on “Big data in the physical sciences”, Royal Society, London
 2015 – 2018 Host and scientific organiser of 4 focussed 2/3-day workshops on Euclid analysis challenges
 2015 Co-organiser (LOC & SOC) of conference “Accurate Astrophysics. Correct Cosmology.”, Royal Astronomical Society, London
 2014 Co-organiser of National Astronomy Meeting parallel session on spectroscopic cosmology surveys, Portsmouth
 2013 – 2014 Organiser of two week-long workshops on intrinsic alignments at the International Space Science Institute, Bern
 2012 – 2013 Lead organiser (LOC & SOC) of the Durham-Edinburgh Extragalactic Workshops VIII and IX, Unis. Durham and Edinburgh
 2011+ **Work Package Manager for Euclid weak lensing final data product validation**
 2011 – 2015 Organiser of institute colloquia, UCL and Uni. Edinburgh
 2010+ **Manager of the Euclid Intrinsic Alignments work package**
 2007 – 2010 Initiator of new astronomical advanced lab experiments at Bonn University, incl. fund-raising and design development of new telescope (50K €)
 2007 – 2010 Coordinator and co-founder of the HOLIGRAIL project: long term observational cosmology project, re-vitalisation and modernisation of Hoher List Observatory, practical astronomy training of undergraduate students

Committees, collaborations, working groups:

- 2023+ ESO concept Wide-field Spectroscopic Telescope (WST), science team member
 2023+ **Simons Observatory SO:UK oversight committee**
 2021+ DESI Publication Board, member/editor
 2021 LSST Dark Energy Science Collaboration Council nominations committee
 2021+ LSST:UK Project Delivery Group
 2020+ **IOP JUNO/Athena SWAN EDI charter lead for UCL Physics & Astronomy**
 2020 – 2023 **Chair of the Departmental Equality, Diversity and Inclusion committee**
 2020+ DESI Collaboration member
 2020+ International Astrostatistics Association, member
 2019+ 4MOST Consortium & WAVES Collaboration member
 2018 – 2019 **LSST Dark Energy Science Collaboration Spokesperson Nomination Committee**
 2018+ LSST:UK Consortium Board
 2017 – 2021 **UK representative on the Operations Committee, LSST Dark Energy Science Collaboration**
 2017 – 2021 LSST:UK Point of Contact for the LSST Dark Energy Science Collaboration
 2016+ Departmental Equality, Diversity and Inclusion committee
 2016 – 2020 **UCL eResearch domain steering committee**
 2016+ PAU Survey management board
 2015 – 2017 LSST DESC Membership Committee
 2014 – 2017 **LSST:UK Executive Group**
 2014+ Full member of LSST Dark Energy Science Collaboration
 2012+ Kilo-Degree Survey, science team
 2012 – 2016 RCSLenS, analysis team
 2010+ Founding member of the Euclid Consortium
 2008+ Euclid Weak Lensing Science Working Group

Peer review, examinations, evaluation panels:

- Referee for A&A, ApJ, ApJL, ApJS, JCAP, MNRAS, Nature Astronomy, and PRL
- PhD examiner at UCL (11x), Queen Mary, Bristol, Durham, Leiden (2x), Marseille, Portsmouth, ETH Zurich
- STFC Ernest Rutherford Fellowship panel (2019 – 2022)

- NASA Roman Space Telescope project peer review panel (2023)
- External expert on the STFC Project Peer Review Panel
- Reviewer of Isaac Newton Group observing proposals
- Reviewer of German (DFG), Swiss (SNF), and Japanese (JSPS) research council proposals
- Reviewer of applications to: STFC Consolidated Grants, national high-performance computing grants (DiRAC), STFC Rutherford Fellowships, Royal Society Dorothy Hodgkin Fellowships

Public engagement:

- Interactive sessions with primary school classes (Upper Key Stage 2/10-12 year-olds) answering children's questions on Space and Astronomy, online and in person
- ESERO-UK Euclid primary school teaching resource pack:
<https://www.stem.org.uk/resources/elibrary/resource/525626/euclid-space-telescope-mission>
- Lecturer at teacher CPD sessions
- *Mission to Mars* lecture and activity session (ca. 2h) for children aged 5-12
- Regular public lectures for various audiences from primary schools to general public, including the topics
 - ◆ The ESA Euclid Mission
 - ◆ The Big Observatories
 - ◆ Bend it like Einstein – gravitational lensing
 - ◆ How clumpy is the Universe?
- *Nature* video discussion on dark matter and dark energy with G. Smoot (UC Berkeley) and B. Demirkoz (CERN)
- Organiser of public events, science fairs, open days & career sessions