

Harry Desmond

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| CONTACT INFORMATION | <p>Institute for Cosmology and Gravitation University of Portsmouth Dennis Sciamia Building Portsmouth PO1 3FX United Kingdom</p> | <p><i>Email:</i> harry.desmond@port.ac.uk <i>Web:</i> University of Portsmouth <i>Citizenship:</i> Dual UK/USA <i>Date of birth:</i> 9 November 1990 <i>Orcid ID:</i> 0000-0003-0685-9791</p> |
| RESEARCH INTERESTS | <p>Astrophysical tests of fundamental physics, large-scale structure, galaxy dynamics & phenomenology: modified gravity, dark matter, galaxy scaling relations, the galaxy–halo connection, (constrained) cosmological N-body and hydrodynamical simulations, tests of the cosmological principle</p> <p>Astrostatistics and machine learning: Field-level inference, symbolic regression, explainable AI, causal discovery</p> <p>Stellar structure and evolution</p> | |
| EMPLOYMENT | <p>University Research Fellow & Proleptic Senior Lecturer Institute for Cosmology and Gravitation, University of Portsmouth</p> <p>McWilliams Fellow McWilliams Center for Cosmology, Carnegie Mellon University</p> <p>Junior Research Fellow University of Oxford (St. John’s College)</p> | <p>01/2022 –</p> <p>10/2021 – 12/2021</p> <p>10/2017 – 09/2021</p> |
| EDUCATION | <p>Stanford University Ph.D. Physics <i>Thesis:</i> Dynamical constraints on the galaxy–halo connection <i>Supervisor:</i> Risa Wechsler</p> <p>University of Oxford (St. John’s College) MPhys. Astrophysics & Theoretical Physics, first class honours <i>Thesis:</i> The baryonic Tully-Fisher relation predicted by cold dark matter cosmogony <i>Supervisor:</i> Subir Sarkar</p> | <p>09/2012 – 06/2017</p> <p>10/2008 – 06/2012</p> |
| SELECTED AWARDS AND HONOURS | <p>Beecroft Visiting Fellowship (University of Oxford)</p> <p>Royal Society Enhancement grant</p> <p>McWilliams Center Seed Grant (Carnegie Mellon University)</p> <p>Balzan Fellowship, Centre for Cosmological Studies, New College (University of Oxford)</p> | <p>01/2026–04/2026</p> <p>2022, 2023</p> <p>2021–2022</p> <p>2017</p> |

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| Paul H. Kirkpatrick award for excellence in teaching (Stanford University) | 2014 |
| Gregory and Mary Chabolla Graduate Fellowship (Stanford University) | 2012 |
| Scott Prize for best overall performance in the MPhys examination (University of Oxford) | 2012 |
| BP Prize for best MPhys project in theoretical physics (University of Oxford) | 2012 |
| Winton Capital Prize for highest marks in the second year Physics examinations (University of Oxford) | 2010 |
| Casberd Scholarship at St. John's College (University of Oxford) | 2009 |
| 39 th International Physics Olympiad in Hanoi, Bronze Medal | 2008 |

SELECTED
SEMINARS AND
PRESENTATIONS

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| Forward-modelling a two-rung distance ladder: A 1.8% constraint on H_0 | |
| <i>CosmoVerse Seminar</i> | 01/2026 |
| Exhaustive Symbolic Regression: Learning (Astro)Physics directly from Data | |
| <i>Astrophysics Colloquium</i> , IAP (recording) | 11/2025 |
| <i>Cosmology Seminar</i> , Queen Mary University | 10/2025 |
| <i>Symbolic Regression in the Physical Sciences</i> , Royal Society workshop | 04/2025 |
| <i>High Energy Physics Seminar</i> , University of Southampton | 11/2024 |
| <i>PHYSTAT conference</i> , Imperial College London (poster) | 09/2024 |
| <i>COSMO21 conference</i> , Chania, Crete | 05/2024 |
| <i>Astrophysics Colloquium</i> , University of Oxford | 02/2024 |
| <i>Astroseminar</i> , University of Waterloo | 01/2024 |
| <i>Webinar on Mathematics, Physics and Machine Learning</i> , IST Lisbon (online here) | 05/2023 |
| <i>ICG Monday Lunch Talk</i> , University of Portsmouth | 05/2023 |
| <i>Cosmology Seminar</i> , University of Sussex | 04/2023 |
| <i>Cosmology Seminar</i> , Imperial College London | 03/2023 |
| <i>Cosmology Seminar</i> , University College London | 01/2023 |
| Symbolic Regression: Philosophy, Methods & Practice | |
| <i>Cosmology Seminar</i> , University College London | 10/2024 |
| <i>Machine Learning Seminar</i> , Microsoft London | 07/2024 |
| Modified Newtonian Dynamics: Observational successes and challenges | |
| <i>Rencontres de Moriond, Gravitation</i> , La Thuile, Italy (Invited) | 04/2025 |
| <i>Cosmology Seminar</i> , University of Oxford | 04/2025 |

Testing Λ CDM with local large-scale structure, galaxies, and stars

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| <i>Astrophysics Seminar</i> , Bath | 11/2024 |
| <i>Universe Seminar</i> , IAP | 10/2024 |
| <i>Relativity and Cosmology Seminar</i> , QMUL | 11/2023 |
| <i>Dalitz Seminar</i> , University of Oxford | 05/2022 |
| <i>JBCA Colloquium</i> , University of Manchester | 04/2022 |
| <i>Cosmology Seminar</i> , University of Pennsylvania | 12/2021 |
| <i>Astronomy Seminar</i> , Case Western Reserve University | 12/2021 |
| <i>Cosmology Seminar</i> , University of Hawaii | 12/2021 |
| <i>ICG astrophysics Colloquium</i> , University of Portsmouth | 11/2021 |

Inferring Causation from Correlation

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| <i>ICG Forum</i> , Portsmouth | 06/2024 |
| <i>Cosmology journal club</i> , University of Oxford | 01/2024 |

Four ways of looking at the Radial Acceleration Relation

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| <i>Cosmology Seminar</i> , University of Strasbourg | 10/2024 |
| <i>Cosmology Seminar</i> , Indian Institute of Technology, Hyderabad | 04/2024 |
| <i>Cosmology Seminar</i> , CEICO - FZU, Prague | 02/2024 |
| <i>Astronomy Seminar</i> , University of St Andrews | 02/2024 |

Fundamental physics from galaxies

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| <i>Astrophysics Colloquium</i> , Institute for Theoretical Astrophysics, Oslo | 01/2020 |
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Astrophysical tests of gravity

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| <i>The Paris–Saclay AstroParticle Symposium 2019</i> | 10/2019 |
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A local resolution of the Hubble tension: The impact of screened fifth forces on the cosmic distance ladder

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| <i>Standard cosmology at the threshold of change?</i> , Thessaloniki | 06/2024 |
| <i>Cosmic Controversies</i> , Chicago | 10/2019 |

Galaxy velocity & size correlations, the halo Tully–Fisher relation and tests of the External Field Effect

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| <i>Bonn gravitation workshop</i> | 09/2019 |
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Fifth force searches in galaxies

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| <i>PPPAC Seminar</i> , Imperial College London | 03/2021 |
| <i>Progress on Old and New Themes in Cosmology</i> , Avignon, France | 12/2020 |
| <i>Dark Energy in a Dark Age</i> , APCTP, Pohang, South Korea | 10/2020 |
| <i>CRAG Seminar</i> , Sheffield | 10/2020 |
| <i>Cosmology Seminar</i> , Institute for Theoretical Astrophysics, Oslo | 01/2020 |
| <i>The Paris–Saclay AstroParticle Symposium 2019</i> | 10/2019 |
| <i>The Cosmic Web workshop</i> , Edinburgh | 06/2019 |
| <i>15th Patras Workshop on Axions, WIMPs and WISPs</i> , Freiburg | 06/2019 |
| <i>Cosmology Seminar</i> , University College London | 06/2019 |
| <i>Astrophysics Seminar</i> , Imperial College London | 05/2019 |
| <i>ICG Colloquium</i> , Portsmouth | 03/2019 |
| <i>Cosmology Seminar</i> , Durham ICC | 02/2019 |
| <i>LSS group meeting</i> , Edinburgh | 02/2019 |
| <i>Particle Theory Seminar</i> , Nottingham CAPT | 02/2019 |
| <i>IAP Universe Journal Club</i> , Paris | 10/2018 |
| <i>Cosmology group meeting</i> , University of Pennsylvania, Philadelphia | 10/2018 |
| <i>Cosmology Seminar</i> , CITA, Toronto (online here) | 07/2018 |
| <i>Aquila consortium group meeting</i> , Stockholm | 03/2018 |

Gravitational maps and tests of screening

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| <i>Aquila consortium group meeting</i> , MPIA, Garching | 11/2017 |
| <i>Cosmology group meeting</i> , University of Pennsylvania, Philadelphia | 09/2017 |

Dynamical constraints on the galaxy–halo connection

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| <i>The Physics of Galaxy Scaling Relations</i> , Queen’s University, Kingston (poster) | 07/2018 |
| <i>Lunchtime Talk</i> , ESO, Garching | 11/2017 |
| <i>Quantifying and Understanding the Galaxy–Halo Connection</i> , KITP, University of California Santa Barbara (poster) | 05/2017 |
| <i>Cosmology Seminar</i> , University of Sussex | 08/2016 |
| <i>Cosmology Seminar</i> , University College London | 08/2016 |
| <i>Galaxies Discussion Group</i> , Cambridge | 08/2016 |
| <i>FLAT Talk</i> , Durham | 08/2016 |
| <i>Institute for Astronomy Seminar</i> , Edinburgh | 08/2016 |

Testing halo abundance matching with galaxy dynamics

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| <i>2016 Munich Joint Conference, Discs in Galaxies</i> , ESO, Garching (poster) | 07/2016 |
| <i>SnowPAC 2016, The Galaxy–Halo Connection</i> , Snowbird, Utah, USA | 03/2016 |

The Tully–Fisher and mass–size relations from halo abundance matching

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| <i>CosmoClub Cosmology Seminar</i> , UCSC | 11/2015 |
| <i>Santa Cruz Galaxy Workshop</i> , UCSC (online here) | 08/2015 |
| <i>KIPAC Tea</i> , Stanford | 06/2015 |

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| POSTDOC | <i>Indranil Banik</i> | 08/2024 – |
| SUPERVISION | Local solutions to the Hubble and bulk flow tensions | |
| | <i>Ricardo Landim</i> | 10/2022 – 08/2024 |
| | Constraining screened scalar–tensor theories with galaxy dynamics | |
| STUDENT | <i>Noah Pierce</i> (BSc, Southampton) | 2025 |
| SUPERVISION | Testing the local supervoid with galaxy counts (w/ T. Yasin, R. Stiskalek & I. Banik) | |
| | <i>Thenu Kaluarachchige</i> (BSc, St. Andrews) | 2025 |
| | Inferring the Universe’s age from the Milky Way’s oldest stars (w/ I. Banik & R. Stiskalek) | |
| | <i>Joshua Darne</i> (MPhys, Oxford) | 2025 |
| | The radial acceleration relation in hydrodynamical simulations (w/ T. Yasin & R. Stiskalek) | |
| | <i>Antonio Nájera</i> (PhD, Portsmouth) | 2024 – |
| | New handles on the cosmic distance ladder | |
| | <i>Aditya Naik</i> (BSc, QMUL) | 2024 |
| | Inferring causation from correlation | |
| | <i>Catherine Spencer</i> (MPhys, Oxford) | 2024 – 2025 |
| | The environment-dependence of galaxy properties (w/ T. Yasin & M. Jarvis) | |
| | <i>Fedir Boreiko</i> (BSc, Manchester) | 2024 – 2025 |
| | Kinematic constraints on halo abundance matching (w/T. Yasin, R. Stiskalek & M. Jarvis) | |
| | <i>Enoch Ko</i> (BSc, Warwick) | 2024 – 2025 |
| | Quantifying Renzo’s rule (w/ T. Yasin, R. Stiskalek & M. Jarvis) | |
| | <i>James Harvey</i> (BSc, Oxford) | 2024 |
| | Predicting star formation histories from halo mergers (w/ T. Yasin & R. Stiskalek) | |
| | <i>Alicia Martin</i> (PhD, Oxford) | 2023 – |
| | Machine-learning fundamental physics from cosmology (w/ P. Ferreira, T. Yasin & D. Bartlett) | |
| | <i>Lukas Kammerer</i> (PhD, Hagenberg) | 2023 – |
| | Symbolic emulators for cosmological power spectra (w/ D. Bartlett & P. Ferreira) | |
| | <i>Param Upadhyay</i> (BSc, Tufts) | 2023 |
| | A second look at the bulk flow of CosmicFlows-4 (w/ S. von Hausegger & S. Sarkar) | |
| | <i>Amelia Ford</i> (BSc, Southampton) | 2023 – 2024 |
| | Symbolically regressing luminosity and mass functions (w/ D. Bartlett & P. Ferreira) | |
| | <i>Dhruva Patel</i> (BSc, Open University) | 2023 – 2024 |
| | Testing the isotropy of the universe | |

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| <i>Tomas Sousa</i> (MPhys, Nottingham) | 2023 |
| Machine-learning the inflaton potential (w/ P. Ferreira & D. Bartlett) | |
| <i>Richard Stiskalek</i> (PhD, Oxford) | 2022 – |
| Leveraging constrained large-scale structure simulations for new tests of physics (w/ J. Devriendt & A. Slyz) | |
| <i>Nazanin Azimi</i> (BSc, CMU) | 2022 |
| Emulating stellar structure simulations | |
| <i>Ekaterine Dadiani</i> (PhD, CMU) | 2021 – 2022 |
| The galaxy–halo connection in the MassiveBlack-II simulation | |
| <i>Øyvind Christiansen</i> (PhD, Oslo) | 2021 – 2022 |
| Simulating asymmetric correlation functions in modified gravity (w/ D. Mota) | |
| <i>Tariq Yasin</i> (DPhil, Oxford) | 2020 – 2023 |
| Combining kinematic and photometric constraints on the galaxy–halo connection (w/ J. Devriendt & A. Slyz) | |
| <i>Maxwell Hutt</i> (MPhys, Oxford) | 2020 – 2022 |
| Topics in constrained N-body simulation (w/ J. Devriendt & A. Slyz) | |
| <i>Alicia Martin</i> (MPhys, Manchester) | 2020 |
| Symbolically regressing halo density profiles (w/ P. Ferreira, T. Yasin & D. Bartlett) | |
| <i>Deaglan Bartlett</i> (DPhil, Oxford) | 2019 – 2022 |
| Fundamental physics from galaxies (w/ P. Ferreira) | |
| <i>Richard Stiskalek</i> (BSc, Glasgow) | 2019 |
| Halo abundance matching with total baryonic mass | |
| <i>Isabel Sands</i> (BSc, Yale) | 2019 |
| Numerical solutions for scalar field profiles (w/ P. Ferreira) | |
| <i>Robert Clemenson</i> (MPhys, Oxford) | 2019 |
| Non-gaussianity of weak lensing likelihoods (w/ S. Joudaki) | |
| <i>Darsh Kodwani</i> (DPhil, Oxford) | 2018 – 2019 |
| Screened modified gravity in relativistic perturbation theory | |
| <i>Thomas Holvey</i> (MPhys, Oxford) | 2018 – 2019 |
| Baryon mass functions from ALFALFA × SDSS | |
| <i>Eliza Dickie</i> (MPhys, Oxford) | 2018 – 2019 |
| Fifth-force observables in hydrodynamical simulations | |
| <i>Kris Pardo</i> (PhD, Princeton) | 2018 – 2019 |
| Testing self-interacting dark matter with galaxy warps (w/ P. Ferreira) | |
| <i>William Martin</i> (BSc, Cambridge) | 2018 |
| Dynamical probes of screened fifth forces | |

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| TEACHING | Lecturer: Functions of a complex variable & integral transforms (Portsmouth) | 2023 – |
| | Course designer & lecturer: <i>Exploring galaxies with the Sloan Digital Sky Survey</i> (CMU) | 2022 |

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| Tutor: Cosmology 4 th year MMathPhys course (Oxford) | Hilary 2021 |
| Tutor: Astrophysics 4 th year MPhys major option (Oxford) | 2020 – 2021 |
| Tutor: Mechanics CP1 (Oxford) | Hilary 2018 |

Stanford Teaching Assistantships

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| Cosmology (<i>Phys 361</i> ; graduate level) | Winter 2016 |
| Intermediate Electromagnetism II (<i>Phys 121</i> ; 2nd yr undergraduate) | Spring 2015 |
| Introduction to Laboratory Physics (<i>Phys 67</i> ; 1st yr undergraduate) | Spring 2014 |
| Mechanics and Special Relativity (<i>Phys 61</i> ; 1st yr undergraduate) | Autumn 2013 |
| Modern Physics (<i>Phys 26</i> ; physics for non-majors) | Spring 2013 |
| Physics TA mentor (Stanford Mentors in Teaching Program) | 2014 – 2017 |
| Mentor, “Gravity! From the Big Bang to Black Holes” (MOOC run by Paris Diderot) | 2016 |
| Stanford Splash! | 2014 – 2017 |

LANGUAGES

Python, JAX, C/C++, Mathematica, Fortran, Matlab, SQL, ROOT
Simulation codes: RAMSES, MESA
English (native), French (intermediate), German (basic)

SERVICE

Referee for *MNRAS*, *ApJ*, *JCAP*, *A&A*, *MDPI (Galaxies, Particles)*, *IJMPA*, *IJMPD*, *EPJP*, *MPLA*, *Phys. Lett. B*, *Hindawi*, *Ap&SS*, *Open J. of Astrophysics*, *Int. J. Theor. Phys.*, *Class. Quantum Grav.*, *Nuclear Physics B*, *PRD*, *PRR*, *PRL*, *Science Bulletin*, *PASA*, *JHEAp*, *Phil. Trans. R. Soc. A* and *Science* 2016 –

Member of the Aquila Consortium Editorial Advisory Group 2022–2023 & 2025–2027

External PhD thesis examiner (Nottingham) 2025

Guest Editor of Special Issue “Symbolic Regression in the Physical Sciences” (*Philosophical Transactions of the Royal Society A*) 2025

Guest Editor of Special Issue “The Hubble Tension in Cosmology” (*Galaxies*) 2025

STFC Small Award reviewer 2024

Member of the MIGHTEE collaboration 2023 –

ICG Colloquium organiser (Portsmouth) 2022 –

Internal fellowship assessor (Portsmouth) 2022

EuCAPT Portsmouth & Sussex rep and Training task force member 2022 –

McWilliams Journal Club organiser (CMU) 2021 – 2022

External grant reviewer for the Polish National Science Centre (×2) 2020 – 2021

MMathPhys masters project assessor (Oxford) 2019

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| | Academic Services Committee (St. John’s College) | 2019 – 2020 |
| | Cosmology Reading Group organiser (Oxford) | 2017 – 2019 |
| | Novel Probes Project, founding member | 2017 |
| WORKSHOP ORGANISATION | National Astronomy Meeting parallel session “ <i>Theoretical and observational approaches to the Hubble tension</i> ” (Durham) | 07/2025 |
| | Symbolic Regression in the Physical Sciences (Royal Society, London) | 04/2025 |
| | <i>Stellar Tests of Gravity</i> workshop (CMU) | 03/2022 |
| | Aquila Consortium group meeting (St John’s College, Oxford) | 05/2019 |
| OUTREACH | Interviewed for <i>New Scientist</i> (regarding this) | 8/2024 |
| | Interviewed for <i>The Sensemaker</i> (article) | 5/2024 |
| | Wrote article for <i>The Conversation</i> | 5/2024 |
| | Interviewed for <i>New Scientist</i> (article) | 3/2024 |
| | SciTech Day career panelist (Carnegie Science Center, Pittsburgh) | 12/2021 |
| | Oxford Stargazing, Cosmology stall | 2018 – 2019 |
| | St. John’s College | |
| | Inspire Digital column “ Dr Harry’s Questions ” | 2019 – 2020 |
| | Research Blast | 02/2020 |
| | Teachers’ Residential Programme mini-seminar | 04/2019 |
| | Publicity officer for Oxford University Space and Astronomical Society | 2010 – 2011 |
| TRAINING | Introduction to Management (Royal Society) | 7/2023 |
| | Leadership Effectiveness (Royal Society) | 10/2023 |
| PUBLICATIONS | arXiv | |
| | NASA ADS | |
| | INSPIRE HEP | |