

Harry Desmond

CONTACT INFORMATION	Institute for Cosmology and Gravitation University of Portsmouth Dennis Sciamia Building Portsmouth PO1 3FX United Kingdom	<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
RESEARCH INTERESTS	Astrophysical tests of fundamental physics, galaxy dynamics & phenomenology: modified gravity, dark matter, galaxy scaling relations, the galaxy–halo connection, (constrained) cosmological N-body and hydrodynamical simulations Machine learning and artificial intelligence: Symbolic regression, explainable AI, astro-statistics Stellar structure and evolution	
EMPLOYMENT	Royal Society University Research Fellow Institute for Cosmology and Gravitation, University of Portsmouth	01/2022 –
	McWilliams Fellow McWilliams Center for Cosmology, Carnegie Mellon University	10/2021 – 12/2021
	Junior Research Fellow University of Oxford (St. John’s College)	10/2017 – 09/2021
EDUCATION	Stanford University Ph.D. Physics <i>Thesis:</i> Dynamical constraints on the galaxy–halo connection <i>Supervisor:</i> Risa Wechsler	09/2012 – 06/2017
	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	10/2008 – 06/2012
SELECTED AWARDS AND HONOURS	Royal Society Enhancement grant	2022, 2023
	McWilliams Center Seed Grant (Carnegie Mellon University)	2021–2022
	Balzan Fellowship, Centre for Cosmological Studies, New College (University of Oxford)	2017
	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

Exhaustive Symbolic Regression: Learning (Astro)Physics directly from Data

<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

<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

<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

<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

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

<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

<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

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

<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

<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

<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

<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

<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

POSTDOC SUPERVISION	<i>Indranil Banik</i>	08/2024 –
	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 SUPERVISION	<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
	Modelling the baryonic Tully–Fisher relation at $z > 0$ (w/ A. Ponomareva & T. Yasin)	
	<i>Enoch Ko</i> (BSc, Oxford)	2024 – 2025
	Quantifying Renzo’s rule (w/ A. Ponomareva & T. Yasin)	
	<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 –
Inferring astrophysical laws with symbolic regression (w/ 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
Constraining the functional form of luminosity and mass functions	
<i>Dhruva Patel</i> (BSc, Open University)	2023 – 2024
Testing the isotropy of the universe	
<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) Baryon mass functions from ALFALFA \times SDSS	2018 – 2019
	<i>Eliza Dickie</i> (MPhys, Oxford) Fifth-force observables in hydrodynamical simulations	2018 – 2019
	<i>Kris Pardo</i> (PhD, Princeton) Testing self-interacting dark matter with galaxy warps (w/ P. Ferreira)	2018 – 2019
	<i>William Martin</i> (BSc, Cambridge) Dynamical probes of screened fifth forces	2018
TEACHING	Lecturer: Functions of a complex variable & integral transforms (Portsmouth) Course designer & lecturer: <i>Exploring galaxies with the Sloan Digital Sky Survey</i> (CMU) 2022 Tutor: Cosmology 4 th year MMathPhys course (Oxford) Tutor: Astrophysics 4 th year MPhys major option (Oxford) Tutor: Mechanics CP1 (Oxford)	2023 – Hilary 2021 2020 – 2021 Hilary 2018
	Stanford Teaching Assistantships Cosmology (<i>Phys 361</i> ; graduate level) Intermediate Electromagnetism II (<i>Phys 121</i> ; 2nd yr undergraduate) Introduction to Laboratory Physics (<i>Phys 67</i> ; 1st yr undergraduate) Mechanics and Special Relativity (<i>Phys 61</i> ; 1st yr undergraduate) Modern Physics (<i>Phys 26</i> ; physics for non-majors) Physics TA mentor (Stanford Mentors in Teaching Program) Mentor, “Gravity! From the Big Bang to Black Holes” (MOOC run by Paris Diderot) Stanford Splash!	Winter 2016 Spring 2015 Spring 2014 Autumn 2013 Spring 2013 2014 – 2017 2016 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 <i>MNRAS</i> , <i>ApJ</i> , <i>JCAP</i> , <i>A&A</i> , <i>MDPI (Galaxies, Particles)</i> , <i>IJMPA</i> , <i>IJMPD</i> , <i>EPJP</i> , <i>MPLA</i> , <i>Phys. Lett. B</i> , <i>Hindawi</i> , <i>Ap&SS</i> , <i>Open J. of Astrophysics</i> , <i>Int. J. Theor. Phys.</i> , <i>Class. Quantum Grav.</i> , <i>Nuclear Physics B</i> , <i>PRD</i> , <i>PRR</i> , <i>PRL</i> , <i>PASA</i> and <i>Science</i> Guest Editor of Special Issue “The Hubble Tension in Cosmology” (<i>Galaxies</i>) STFC Small Award reviewer Member of the MIGHTEE collaboration	2016 – 2025 2024 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 ($\times 2$)	2020 – 2021
	MMathPhys masters project assessor (Oxford)	2019
	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
TRAINING	Publicity officer for Oxford University Space and Astronomical Society	2010 – 2011
	Introduction to Management (Royal Society)	7/2023
	Leadership Effectiveness (Royal Society)	10/2023
PUBLICATIONS	arXiv	
	NASA ADS	
	INSPIRE HEP	