UNIVERSITY OF CAMBRIDGE
Institute of Astronomy

Institute of Astronomy Alumni Stargazing Evening

Friday 7 November 2025

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Introduction

Welcome

We are delighted to welcome you back to the Institute of Astronomy for an evening of discovery and reconnection.

Tonight brings together our alumni, researchers, and students to explore the latest breakthroughs in our understanding of the Universe, share new developments since your last visit, and enjoy an evening of stargazing.

We are also proud to mark the 30th anniversary of the Astrophysics Undergraduate Course - a landmark in Cambridge's teaching and a significant contribution to shaping the future of astrophysics.

Thank you for joining us, and for being part of the Institute's continuing story.

Professors Cathie Clarke and Mark Wyatt
Co-Directors

Professors Mark Wyatt & Cathie Clarke

> *"an evening of discovery and reconnection."*

Programme

5pm	Doors open for drinks reception
5.45pm	*Welcome introduction* from Professor Mark Wyatt
5.50pm	*AI and the Future of Scientific Discovery* Dr Will Handley, followed by Q&A
6.20pm	*The Search for Life beyond the Solar System* Professor Nikku Madhusudhan, followed by Q&A
6.50pm	Student flash talks
7pm	Stargazing (weather permitting)
8pm	Warm drinks, finger-food buffet, and posters
9pm	Event closes

Dr. Will Handley (Gonville & Caius 2008)

Will Handley is an Associate Professor at the Institute of Astronomy, University of Cambridge. His interdisciplinary research weaves together theory, observation, and statistical inference to tackle fundamental questions in cosmology and particle physics.

Dr Handley's work focuses on fundamental questions in our universe, from the nature of dark energy and dark matter to gravitational physics. To address these questions, he develops advanced artificial intelligence and Bayesian statistical methods. His research creates computational tools that help scientists analyse complex data and test fundamental theories against observation.

He has created widely-used software packages adopted by research groups worldwide, working at the intersection of AI and modern cosmology.

AI and the Future of Scientific Discovery

Scientific discovery is being transformed by Artificial Intelligence. AI is no longer just a tool for automating tasks; it can now perform complex logical inference, identify patterns in vast datasets, and generate testable predictions in ways that complement, and sometimes exceed, human capabilities.

This talk will explore how AI is transforming research, with astronomy serving as a powerful case study. We will see why our field—with its vast public datasets, large-scale facilities, and deep-rooted technical expertise—has become a natural pioneer in adopting and developing these tools. Through examples from cosmology and astrophysics, we'll see how AI is helping researchers probe the deepest questions about dark matter, gravitational physics, and the fundamental nature of our universe.

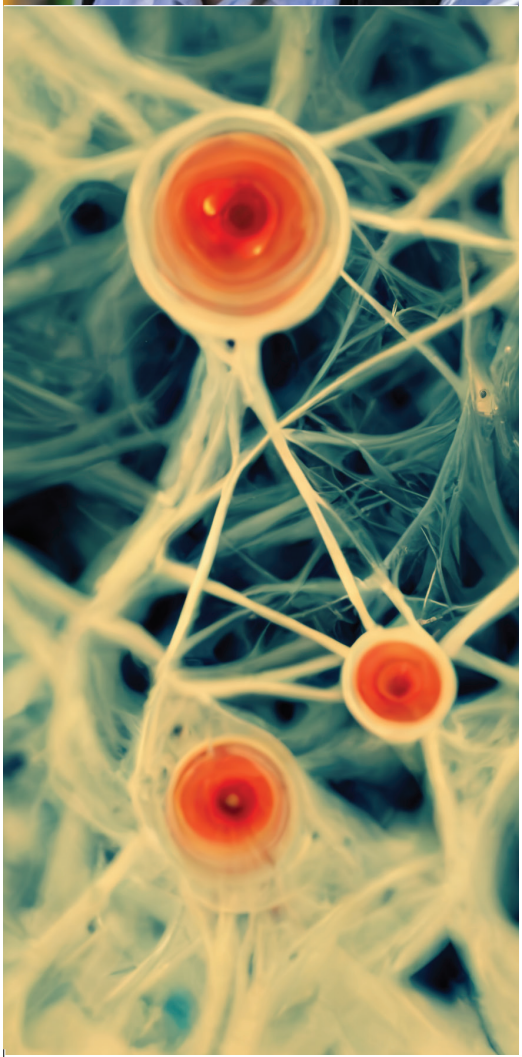


Image below: Compromise-free Bayesian neural networks, Will Handley.

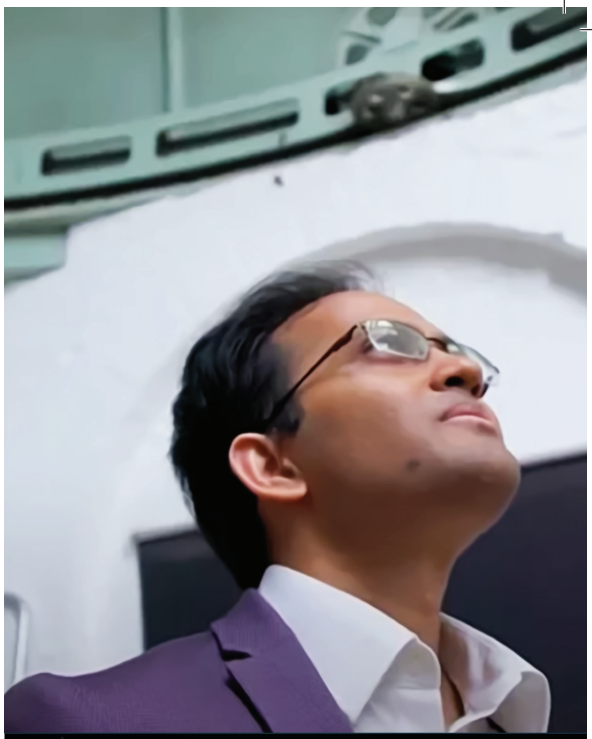
But this transformation brings both opportunities and challenges. While AI can process information at unprecedented scales and identify patterns invisible to human

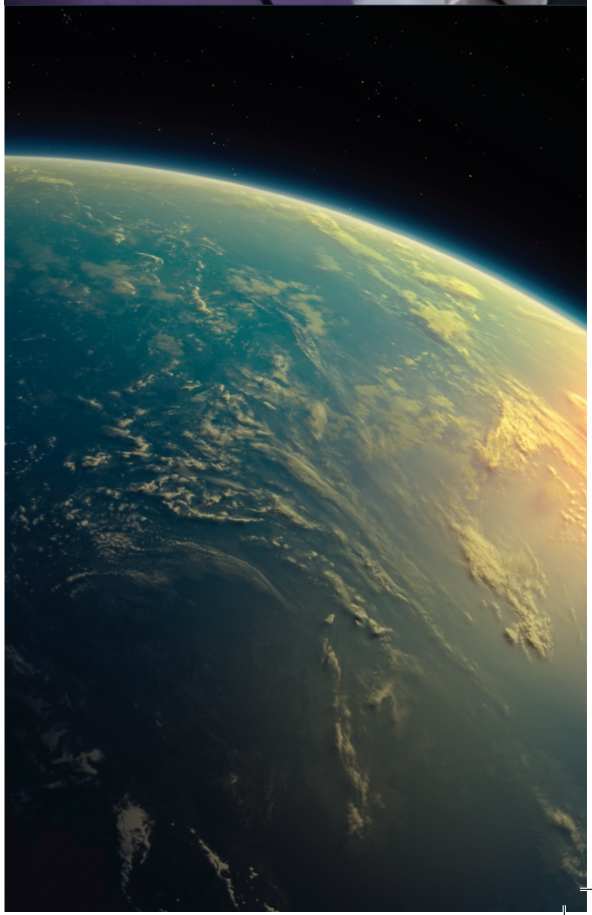
researchers, it also raises important questions about reproducibility, validation, and the distinction between data processing and genuine scientific understanding. How do we ensure scientific rigour when AI can generate convincing but potentially flawed results? What are the practical implications for training the next generation of scientists?

Drawing on real-world applications from the frontline of research, this talk will provide a balanced view of where this new era is taking us. We'll explore how scientists are learning to work alongside these powerful tools and how the techniques being pioneered in astronomy today are set to become widespread across all fields of research and industry.

Whether you're curious about the latest technological developments or concerned about their implications for scientific practice and education, this talk will offer practical insights into a major transformation in how we do science.

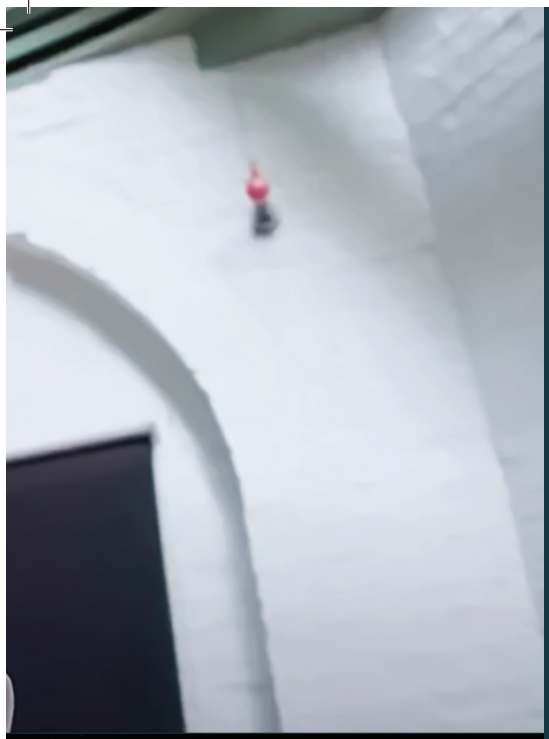
Professor Nikku Madhusudhan

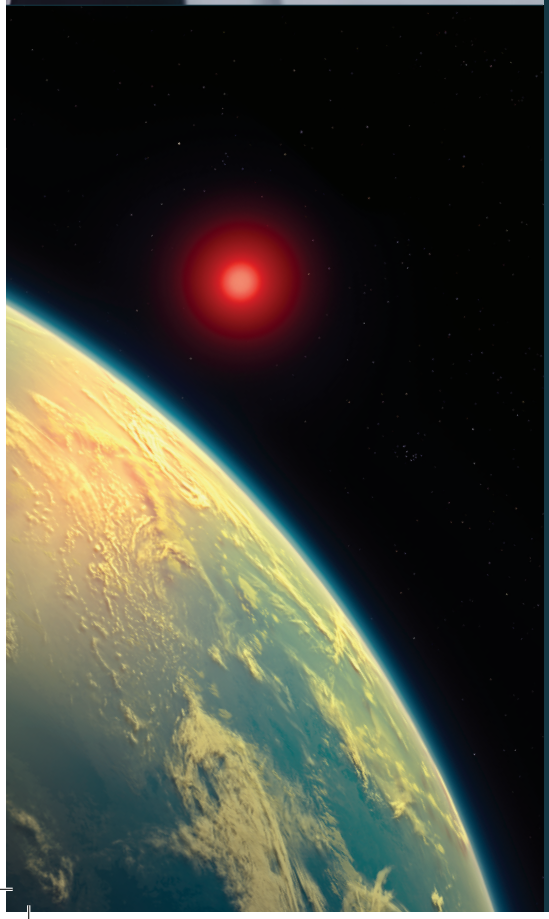




Nikku Madhusudhan is a Professor of Astrophysics and Exoplanetary Science at the University of Cambridge's Institute of Astronomy. Renowned for pioneering atmospheric retrieval methods for exoplanets, his recent work identified Hycean worlds—planets with ocean-covered surfaces and hydrogen-rich atmospheres.

In 2023, he led the first discovery of carbon-bearing molecules in a possible Hycean world using the James Webb Space Telescope. He earned his PhD in Physics from MIT and held postdoctoral positions at MIT, Princeton, and Yale before joining Cambridge in 2013. Madhusudhan has received numerous awards, including the Young Scientist Medal in Astrophysics from the International Union of Pure and Applied Physics, the MERAC Prize in Theoretical Astrophysics from the European Astronomical Society, and the Pilkington Prize for excellence in teaching at Cambridge.





The Search for Life beyond the Solar System

The search for life beyond the solar system is one of the major frontiers of modern astronomy. Numerous efforts are underway to discover habitable exoplanets around nearby stars and to search for biosignatures in their atmospheres using large telescopes in space and on ground. The detection of atmospheric signatures of habitable Earth-like exoplanets is challenging due to their small planet-star size contrast and thin atmospheres. However, recent theoretical studies suggest that a diverse range of habitable environments are possible around other stars which may be more observable than Earth-like planets. These include hycean worlds, planets with ocean-covered surfaces and hydrogen-rich atmospheres, for which atmospheric observations are already feasible with current facilities, such as the James Webb Space Telescope (JWST). The first atmospheric spectrum of a possible hycean world, K2-18 b, observed with JWST led to inferences of multiple carbon-bearing molecules in its atmosphere with hints of a potential biosignature.

In this talk, we will discuss such advancements at the forefront of exoplanetary science in the search for habitable conditions and signatures of life beyond the solar system.

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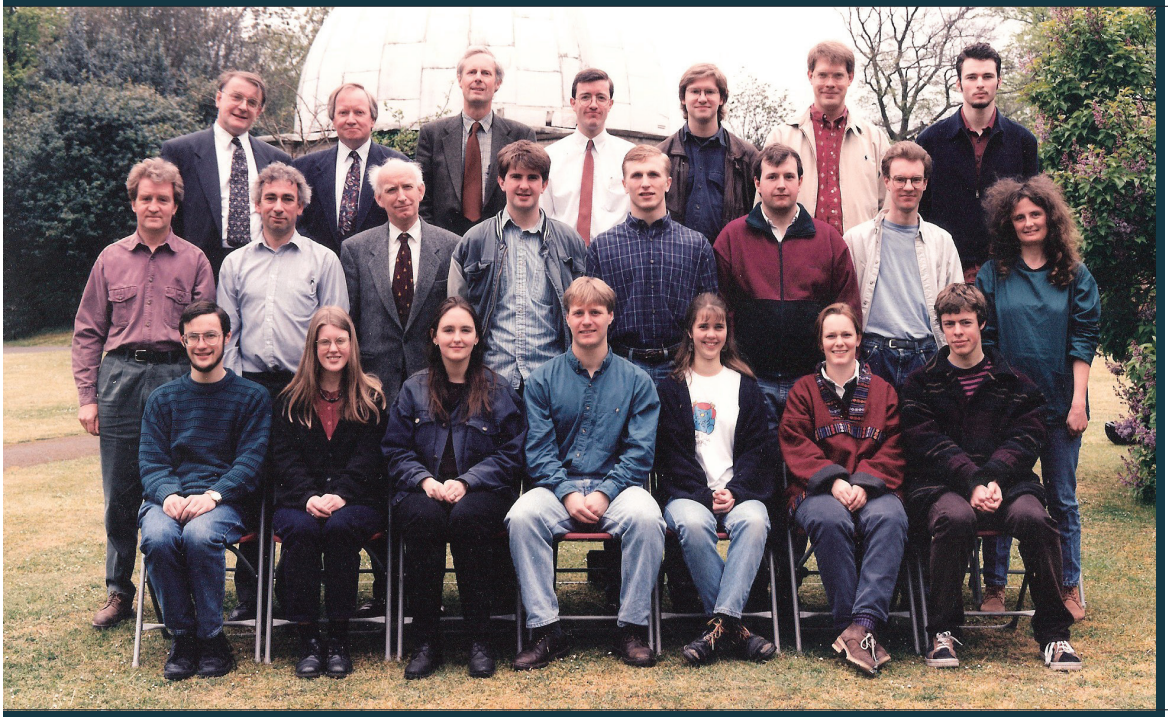

This year marks the 30th anniversary of the beginning of the University's first dedicated undergraduate astrophysics course, as Part II Astrophysics opened its doors to the first cohort in Michaelmas 1995. This course, the brainchild of Douglas Gough and Jim Pringle, has gone from strength to strength and, from its very small-scale beginnings (see first Class photo above) now typically attracts around 30 plus students per year. Those of you who were in at the beginning will still find many of the staff in this photo still around the IoA and involved in the course. Although the course has grown, and we now also run a Masters level course (Part III Astrophysics) many of the distinctive features of the course's earliest years survive, particularly the cohesion of the cohort and the friendly relations with staff (all enabled by the traditional IoA coffee and biscuits). We extend a particular welcome to those of you who are alumni of our Part II and Part III courses and thank you for coming back to see us this evening.

Cover image • Cat's Paw Nebula: NGC 6334: NASA, ESA, CSA, STScI