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Edinburgh Winter Lecture Programme – 2024 / 25

All talks start at 7.30pm (arrival ~7.15pm) in the Royal Society of Edinburgh, 22 - 26 George Street

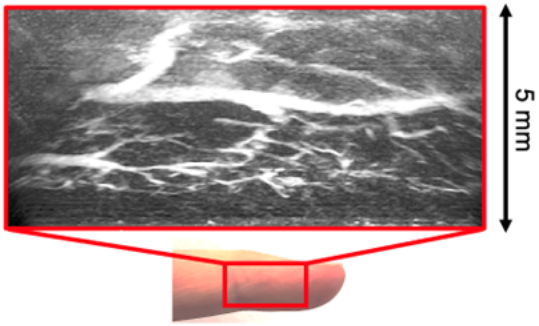
Download the talk abstracts at: tinyurl.com/5fcbj6zp

Tuesday 26th November 2024

Dr James Guggenheim

University of Birmingham

Photoacoustic imaging – transforming medical imaging using sound and light

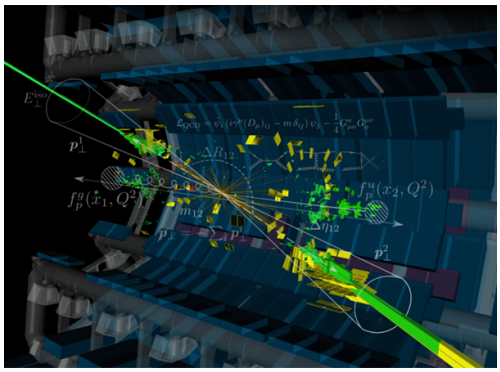


Tuesday 28th January 2025

Prof Andy Buckley

University of Glasgow

Seeing the big picture: particle physics meta-analysis and reinterpretation



Tuesday 11th March 2025

Dr Stefania Soldini

University of Liverpool

From Asteroids Detection to Deflection: The Journey of Planetary Defense

We sincerely thank Photonic Solutions for sponsorship

In attendance exhibiting select product lineup

Free and open to non-members.

For more information contact Calum Ross (calum.ross@hw.ac.uk)

Edinburgh IOP Winter Lecture Programme – 2024 / 2025

Tuesday 26th November 2024 — Dr James Guggenheim (University of Birmingham)
Lecture Title: Photoacoustic imaging – transforming medical imaging using sound and light
Abstract: Photoacoustic imaging is an emerging medical imaging technique in which ultrasound waves are generated deep inside living tissues by illuminating them with pulsed light. By mapping optical information onto weakly-scattered ultrasound waves, this provides a means to overcome the usual penetration depth and spatial resolution limits of purely optical imaging techniques. As a result, photoacoustic imaging enables 3D non-invasive high-resolution imaging of small blood vessels and other tissue structures invisible to other imaging techniques such as X-ray and conventional ultrasound. Through spectroscopic approaches, it also enables functional imaging of, e.g., blood oxygenation. As a result, photoacoustic imaging is attracting significant attention worldwide. In this talk, I will introduce the physics of photoacoustic imaging, and provide examples of what it can do. I'll also describe some of the key breakthroughs that have elevated its performance, in particular the adoption of ultrasensitive laser based ultrasound sensors – devices based on intriguing physics, extremely well suited to detecting photoacoustic signals and thus providing exquisite image quality. I'll go on to discuss some exciting frontiers in the field including increasing the imaging speed, depth and resolution, and exploiting interesting properties of coherent photoacoustic excitation light to unlock new capabilities.

Tuesday 28th January 2025 — Prof Andy Buckley (University of Glasgow)
Lecture Title: Seeing the big picture: particle physics meta-analysis and reinterpretation
Abstract: Big experiments in particle physics, such as the several mammoth apparatus operating at the Large Hadron Collider, have issued thousands of data analyses papers in the last decade, many of them searching for signs of new physics beyond the Standard Model. So far, there is no smoking-gun evidence, meaning that many previously leading hypotheses have been ruled out. But how much of that data also rules out ideas they were not designed for, especially when datasets are combined and used all at once rather than one at a time? In this talk I will introduce the ideas and challenges of analysis preservation, reinterpretation, and their potential for getting maximum scientific value from particle-physics experiments.

Tuesday 11th March 2025 –Dr Stefania Soldini (University of Liverpool)
Lecture Title: From Asteroids Detection to Deflection: The Journey of Planetary Defense
Abstract: Asteroids are primordial remnants from the formation of our Solar System approximately 4.6 billion years ago. The gravitational influence of large planets, along with collisions with other asteroids, alters their orbits, which can also be affected by non-gravitational forces. As a result of these deflections, some asteroids may eventually intersect Earth's orbit, posing potential threats to our planet.
Despite these risks, asteroids are also abundant in valuable resources, representing significant opportunities for future economic ventures in space and the support of human spaceflight. Recent advancements in robotic spacecraft have enhanced our understanding of these celestial bodies, particularly through the return of samples that provide insights into their formation.
Since 2019, numerous robotic missions have been launched to study asteroids. Notable examples include JAXA's Hayabusa2, which successfully returned samples from the asteroid Ryugu in December 2020 and is set to arrive at asteroid 1998 KY26 in 2031. NASA's OSIRIS-REx mission returned samples from Bennu in September 2023. Additionally, NASA's Lucy mission, launched in October 2021, aims to explore seven of Jupiter's trojan asteroids, with the recent discovery of a contact binary moonlet around asteroid Dinkinesh.
The importance of planetary defense is underscored by NASA's DART mission, which successfully impacted the asteroid Dimorphos in September 2022, thereby altering its orbital period. Following this mission, ESA's Hera mission, launched in October 2024, will further investigate the Didymos binary system. JAXA's MMX mission, scheduled for launch in 2026, aims to conduct a sample return from Phobos, while NASA's Psyche mission, launched in 2023, will explore the first known metal asteroid in 2026. Furthermore, ESA has approved the RAMSES mission, which will intercept asteroid Apophis in 2029.
This lecture will provide a comprehensive overview of recent advancements in planetary defense and space exploration, highlighting the latest activities related to asteroid missions and future trends in the field.