CARDIFF SCIENTIFIC SOCIETY

Programme **2025–2026**

2025

17 Sep Next generation ultra-low-energy consumption 2D semiconductor materials and devices beyond silicon
Prof. Sir Colin Humphreys - Queen Mary University of London

1 Oct Science & Shakespeare
Prof. Robert Pickard - Cardiff University

15 Oct Gravitational Waves: Morning has Broken
Dr Chris North - Cardiff University

29 Oct Catalysis for Global Health
Dr Jennifer Edwards - Cardiff University

12 Nov Omega-3s: The science behind the headlines
Prof. Philip Calder - University of Southampton

26 Nov Cardiff Model for Violence Prevention
Prof. Jonathan Shepherd - Cardiff University

2026

28 Jan The Evolution in the Contemporary Management of Heart Valve Disease
Dr Richard Wheeler - Cardiff and Vale University Health Board

11 Feb Unravelling the past from hidden volcanic ash
Prof. Siwan Davies - Swansea University

25 Feb The scandal of research waste in clinical medicine
Prof. Hywel Williams - University of Nottingham

11 Mar The Useful Arts
Timothy Hunkin - Engineer and professional cartoonist

25 Mar Telomeres, mutation and cancer
Prof. Duncan Baird - Cardiff University

8 Apr Discovery and characterisation of lipids that drive thrombosis
Prof. Valerie O'Donnell - Cardiff University

2025

17 Sep Next generation ultra-low-energy consumption 2D semiconductor materials and devices beyond silicon

Prof. Sir Colin Humphreys *Queen Mary University of London*

Silicon semiconductors have dominated a $4 trillion electronics industry for close to 70 years, brought great benefits to society and constantly improved in performance, as described by Moore's Law. However, Moore's law is reaching physical limits. In addition, silicon electronics is energy hungry. The predicted expansion of artificial intelligence, which uses huge databases, suggests that in many developed countries data centres will comprise 30% of all electricity consumption by 2030. To address this daunting problem, a revolutionary approach using new materials is required. The leading contender is a new class of materials called 2D materials. The first 2D material was graphene, the best electrical conductor in the world. Sensors made from graphene consume up to 1000 times less power than silicon sensors. However, graphene cannot be used to make the logic transistors used in data centres because it has no bandgap, so other 2D semiconductors with a bandgap must be used. These have ultra-low energy consumption. This talk will discuss our recent results. If successful, our research will be revolutionary, enabling the UK to build new electronics industries using 2D semiconductor electronic devices.

1 Oct Science & Shakespeare

Prof. Robert Pickard *Cardiff University*

Shakespeare and Galileo were born in the same year: 1564. Shakespeare is credited with 39 plays, 154 sonnets and 2 narrative poems. These works have not changed for 400 years but only The Holy Bible has had a greater impact on the literature of the English-speaking world. Over the same time period, the quantity of scientific publications has increased, exponentially, along with our understanding of our place in the universe. Why are Shakespeare's works still relevant in 2025 ? Where does modern Science stand, now, in comparison with 1564 ? Science tries to determine truth but human beings still think and communicate in figurative language. Metaphors and personifications are not literally true. Superstition still seems to drive human behaviour rather than any rational assessment of the available evidence. In salary terms, entertainment is still the most valued occupation in our society.

15 Oct Gravitational Waves: Morning has Broken

Dr Chris North *Cardiff University*

In 2015 the twin LIGO detectors picked up the unmistakable signal of two black holes colliding in a distant galaxy, sending gravitational ripples through spacetime as predicted by Einstein's theories a century earlier. Dubbed GW150914, this event was announced in February 2016, hitting headlines all around the world. Since then, the network of detectors has grown to include Virgo in Europe and KAGRA in Japan, with more planned in coming years. With four observing runs under their belt, the number of detections has reached three figures and is due to rise further. If GW150914 represented the dawn of gravitational wave astronomy, then morning has truly broken on this rapidly evolving field of astrophysics. This talk will give an overview of the field, what has been learned about black holes, neutron stars, cosmology and gravity over the last decade, and what coming decades have in store.

29 Oct How can catalysis help to solve Global Health Issues?

Dr Jennifer Edwards *Cardiff University*

The conversion of chemicals to useful cleaning agents using light and photocatalysts presents a green alternative to traditional, thermal catalysis pathways and is showing great promise in disinfection and chemical remediation of wastewater streams. We have investigated how graphitic carbon nitrides can be used to produce H_2O_2 (a potent biocide) from water and air, without the need for molecular H_2. A further use for these photocatalysts ties closely with improving population health by reducing infection spread. On exposure to water, air and sunlight photocatalysts will generate reactive oxygen species (ROS) that have high oxidising potentials. These ROS can be used in a range of innovative cleaning applications — reducing viral and bacterial loads on surfaces, fabrics and in water. This talk will summarise our advances in creating new solutions for disinfection and cleaning, using just sunlight, air and water.

12 Nov Omega-3s: The science behind the headlines

Prof. Philip Calder *University of Southampton*

Not all fat is bad! Omega-3s are a healthy fat. The important omega-3s are found in seafood, especially in certain types of fish, and in supplements sometimes called fish oils. There is a long history of research in omega-3s and a strong interest in whether and how they can keep people healthy. Consequently omega-3s are often in the news. This talk will explain the science of omega-3s and see whether the headlines reflect what we know.

26 Nov Cardiff Model for Violence Prevention

Prof. Jonathan Shepherd *Cardiff University*

The Cardiff Model for Violence Prevention is the use by multi-disciplinary prevention boards of specific data recorded in hospital emergency departments. It was developed following Professor Shepherd's seminal discovery in his PhD research – since replicated around the world – that at least half of violence serious enough to result in emergency hospital treatment is not known to police. Jonathan Shepherd convened and for 20 years chaired Cardiff's violence prevention board – the prototype community safety partnership subsequently mandated in Great Britain in the 1998 Crime and Disorder Act. Controlled effectiveness, cost benefit and process evaluations in cities in the UK, Australia and the USA have found significant violence reductions, cost savings and that the Model can be implemented overseas. In 2019, the UK government's impact assessment estimated that savings over 10 years would be £858 million if the Model is implemented in just 5% of local authority areas. UK government investment followed.

2026

28 Jan **The Evolution in the Contemporary Management of Heart Valve Disease**

Dr Richard Wheeler *Cardiff and Vale University Health Board*

Valvular heart disease has a growing prevalence across the world and is a major cause of mortality and morbidity. The ageing population particularly in industrialised countries has led to a changing epidemiology with degenerative valve disease overtaking rheumatic causes. The technological advances in the last 25 years have been truly remarkable with an explosion of minimally invasive techniques to replace and repair valves. These procedural advances have also been supported by improved cardiac imaging modalities including 3D echocardiography and cardiac MRI. Patients now have a range of surgical and percutaneous techniques in order to deliver the best outcomes for symptom improvement and long term survival.

11 Feb **Unravelling the past from hidden volcanic ash**

Prof. Siwan Davies *Swansea University*

Unearthing ancient volcanic ash from the depths of ice sheets and lakes has provided critical evidence for our reconstruction of past environments and climates. Advancements in the detection of microscopic volcanic ash particles hidden within vast geological and environmental archives has given rise to a key technique for constraining the timing of past climatic changes. This lecture explores the power of this approach for addressing many of the major environmental challenges that we face today.

25 Feb **The scandal of research waste in clinical medicine**

Prof. Hywel Williams *University of Nottingham*

In 2009, Chalmers and Glasziou suggested that up to 85% of medical research is wasteful. Much as we might like to think that research waste does not occur in dermatology, the truth is that a lot of our clinical research is done without any form of prioritisation that takes existing research into account. Studies are often poorly designed, and many are not reported at all or reported in a biased and unusable way. In this talk, I shall suggest some solutions to the pernicious problem of research waste by highlighting some of our work at the Centre of Evidence-Based Dermatology. These solutions include mapping existing evidence, prioritising research questions that are important to patients through priority setting partnerships, promoting prospective registration of research protocols to prevent cheating, developing core outcome sets so that studies can be compared and combined, working with methodologists to ensure robust study design, publishing 100% of planned research and making sure that clinically relevant results are disseminated effectively to a community of research users. Reducing research waste is everyone's business that includes clinicians, nurses, methodologists and patients.

11 Mar **The Useful Arts**

Timothy Hunkin *Engineer and professional cartoonist*

Tim has had a varied career. A cartoonist for the Observer, a TV writer presenter (Secret Life of Machines), museum designer and latterly making arcade machines for two arcades (The Under the Pier Show and Novelty Automation). This talk is about his hands on process of designing the arcade machines – sometimes literally thinking with the hands.

25 Mar **Telomeres, mutation and cancer**

Prof. Duncan Baird *Cardiff University*

Telomeres are protective caps at the ends of our chromosomes, like the plastic tips on shoelaces that stop them from fraying. They keep our genetic material safe and help cells divide properly. Each time a cell divides, telomeres get a little shorter. Over time, they become too short, and the cell can no longer divide, which is a natural part of aging. This helps prevent damaged cells from growing out of control. However, if telomeres become too short and the cell doesn't shut down like it should, it can lead to serious problems. The ends of chromosomes can stick together, causing damage to our DNA and leading to diseases like cancer. Cancer cells often find ways to keep their telomeres long so they can keep dividing. On the other hand, in aging, short telomeres can lead to weaker tissues and organs. So telomeres play a key role in both cancer and aging. In this lecture I will illustrate our work on how telomeres cause mutations in cancer cells and what this means for patients.

8 Apr **Discovery and characterisation of lipids that drive thrombosis**

Prof. Valerie O'Donnell *Cardiff University*

Thrombosis is a major cause of illness and death in almost all forms of human disease, including inflammation, cardiovascular disease, immunity, cancer and infection. While we know a lot about how clots form, there are many aspects of clot biology that are still mysterious. One example relates the biology of mature thrombi living in our bodies (e.g. after a deep vein thrombosis or during formation of an aortic aneurysm, they can stay in our bodies for months or even years). In our laboratory in Cardiff, during the last 20 years, we have used biophysical methods to discover new ways in which blood cells communicate to cause a clot to form. Through this work we identified large numbers of molecules called enzymatically oxidized phospholipids (eoxPL) that are made in response to challenge (trauma, infection, etc) by platelets and white blood cells. These lipids can increase clotting by binding and activating coagulation factors and also they can activate gene transcription and anti-microbial functions of cells. In this presentation, we will discuss the discovery and characterisation of these fascinating molecules in our laboratory using mass spectrometry, and how we worked out their structures and biological actions. We will also discuss studies using human patients and animal models that demonstrated to us how the lipids act during haemostasis, thrombosis, cardiovascular disease and arthritis. These lipids directly link inflammation with thrombosis and suggest new ways in which we could prevent clotting across many different human diseases.

ORGANISING COMMITTEE

LECTURE DETAILS

The 2025–26 programme wiill take place in the Wallace Lecture Theatre 0.13, Main Building on Cardiff University campus.

Lectures start at 6:45 PM

If you are arriving by car, pay-and-display parking is available along Park Place or Museum Avenue. For those arriving by train, the nearest station is Cathays Station.

MEMBERSHIP

Annual membership for 2025/26 is £15 giving access to all twelve lectures. Membership is free for students and under 18s

To become a Member, please sign up on the website or send a cheque made payable to Cardiff Scientific Society, with your name and address details to:

Cardiff Scientific Society, 18 Hollybush Road,
Cyncoed, Cardiff, CF23 6TA
email: members@cardiffscientificsociety.org

www.cardiffscientificsociety.org

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