

THE JOURNAL FOR SCIENCE, ENGINEERING AND TECHNOLOGY

# advances

WALES

## Fake or real- can we trust the pictures we see?

A research team from Swansea University, working as part of an international collaboration, has shown that modern artificial intelligence tools can now generate facial images so realistic that most people cannot tell them apart from genuine photographs.



**6** AI-assisted brain atlas offers new levels of detail in MRI scans



**19** Flying smarter through digital innovation



Llywodraeth Cymru  
Welsh Government

## Medicine

- 6 AI-assisted brain atlas offers new levels of detail in MRI scans
- 8 Shaping the future of cardiac pacing
- 10 New research uncovers promising target for autoimmune disease treatment
- 11 Virus-delivered therapy enters first clinical trial on Cardiff

## Environment &amp; Energy

- 12 Warming winters could cause DNA damage in lizards

## Agriculture &amp; Food

- 13 Unlocking nutrient recovery from food wastewater
- 14 Turning wool into a sustainable feed revolution
- 15 Gene atlas paves the way for healthier oats
- 16 Reducing farm emissions through precision chemistry

## Information Technology

- 18 Advancing talent identification in elite cycling
- 19 Flying smarter through digital innovation
- 20 Fake or real - can we trust the pictures we see?

If you are based in Wales find out about Innovation support and funding at [Support and funding | Business Wales \(gov.wales\)](#)

## In Issue 108, Advances Wales highlights pioneering projects that support the Welsh Government's Innovation Strategy Missions: education, economy, health and wellbeing, climate and nature.

Innovation in Wales spans an extraordinary range of scales and disciplines, from probing the deepest structure of space-time to reshaping how food is grown, diseases are treated and digital systems are trusted.

Several features explore how data, artificial intelligence and advanced digital tools are transforming the way complex systems are understood and managed. AI-generated images raise urgent questions about trust and authenticity in a world where synthetic content is increasingly indistinguishable from reality. Digital twins are being used to model athlete development in elite sport, while an AI-assisted brain atlas reveals microscopic structures that could support earlier detection of neurodegenerative disease. Together, these advances show how data-rich models deepen insight while reshaping decision-making.

Fundamental science and enabling technologies form another strong thread. Welsh-led research is setting new limits on high-frequency gravitational waves, advancing compound semiconductor manufacturing, and applying bio-inspired electronics to restore natural heart rhythms. These breakthroughs are linked to translation, with virus-delivered cancer therapies entering clinical trials and new models of cardiac pacing progressing from laboratory to patient care.

Sustainability and resilience are also prominent. From precision chemistry to cut farm emissions, to recovering nutrients from wastewater, adapting crops through genomics, and turning wool into a sustainable feed ingredient, innovation is being used to reduce environmental impact while strengthening rural economies. Research into climate change impacts on wildlife and community projects further underlines the importance of linking science with stewardship.

Together, these stories show Wales combining scientific excellence with practical innovation, developing technologies and knowledge that are locally grounded, globally relevant and increasingly essential in a rapidly changing world.

**Gwyn Tudor**  
Editor

To subscribe or change your mailing details contact:  
[Welsh Government \(govdelivery.com\)](#)

Advances Wales is available online at: [Advances Wales | Business Wales \(gov.wales\)](#)  
This edition and past editions can all be viewed online.

#### Advances Wales Magazine Privacy Notice

The following Privacy Notice covers information collected to receive Advances Wales magazine. Upon receipt of this information the Welsh Government becomes the data controller for it.

#### Personal information that will be collected and held includes:

Personal details such as name, position, address and email address.

#### What do we do with your information?

In our remit as the data controller, the Welsh Government uses the information received to provide you with copies of Advances Wales and your details will be securely stored.

#### Who do we share your information with?

We will not pass your information on to third parties other than for mailing Advances Wales.

#### How long will we keep your information?

We will retain your details as long as you want to receive Advances Wales. If you request to be removed from the mailing list, your details will be removed within 10 working days.

#### Your rights in relation to your information

You have the right to:

- Access to the personal data that we are processing about you;
- Require us to rectify inaccuracies in that data;
- The right (in certain circumstances) to object to processing;
- The right for your data to be 'erased';
- Lodge a complaint with the Information Commissioner's Office (ICO) who is our independent regulator for data protection;
- The right to withdraw consent at any time.

For further details about the information which Welsh Government holds and its use, or if you wish to exercise your rights under GDPR, please see contact details below:  
Data Protection Officer, Welsh Government, Cathays Park, Cardiff CF10 3NQ  
Email: [Data.ProtectionOfficer@gov.wales](mailto:Data.ProtectionOfficer@gov.wales)

The contact details for the Information Commissioner's Office are:

Wycliffe House, Water Lane, Wilmslow, Cheshire SK9 5AF  
Telephone: 01625 or 0303 123 1113  
Website: [www.ico.org.uk](http://www.ico.org.uk)

#### If you do not wish to continue to receive Advances Wales

You can unsubscribe by emailing [Innovation@gov.wales](mailto:Innovation@gov.wales) or contact us at: Innovation team, Welsh Government, Crown Building, Cathays Park, Cardiff CF10 3NQ



Llywodraeth Cymru  
Welsh Government

PHOTOGRAPHY Sourced from organisations featured, their representatives, and Shutterstock.

Advances Wales is a quarterly technology journal produced by Welsh Government to showcase new developments in science, engineering and technology from Wales. Advances raises the profile of the technologies and expertise available from Wales in order to facilitate collaborative relationships between organisations and individuals interested in new technologies and innovation.

**Editorial Board:** Delyth Morgan, Sarah Brajer-Hughes, Simon Cooper, Gareth Browning, Marcia Jones, Richard Johnston.

For information on how to contribute features contact the editor,  
tel 029 2047 3455  
email: [advances@teamworkdesign.com](mailto:advances@teamworkdesign.com)

Advances Wales is designed and published on behalf of Welsh Government by Teamworks Design, The Maltings, East Tyndall Street, Cardiff CF24 5EA.  
Creative Design: Lee Gillum.

Opinions expressed in this magazine are not necessarily those of Welsh Government or its employees. Welsh Government is not responsible for third-party sources cited such as web sites or reports. ISSN 0968-7920.

Have you created a new technology or carried out research in Wales?  
If so, we'd love to hear from you...  
email: [advances@teamworkdesign.com](mailto:advances@teamworkdesign.com)

## Digital archaeology reveals major Roman ruins

**A pioneering heritage project led by Swansea University has uncovered one of the most significant Roman-era archaeological sites ever identified in Wales. Using advanced digital survey technology, researchers have revealed a hidden chapter of the nation's past.**

The ArchaeoMargam project has identified the footprint of a large, well-preserved Roman villa complex, filling a major gap in understanding the region's first-millennium AD history.

The discovery was made using high-resolution geophysical surveying by Welsh specialists Terradat. Their advanced magnetometry and ground-penetrating radar (GPR) mapped the site in remarkable detail without disturbing the ground. The results reveal a defended villa complex measuring more than 40 by 55 metres, with surrounding ditches and additional large structures, offering fresh insights into how this strategically important area of Wales was occupied and organised.

The surveys reveal an entire complex that points to a major centre of power and activity. Alongside the main villa is a substantial aisled building to the south-east, possibly a large agricultural store or a later ceremonial or meeting hall.



Margam is already known for its Bronze Age, Iron Age, medieval and post-medieval heritage, but until now little was known about its Romano-British past. Its location suggests it played a key role in controlling trade, movement and resources across the region.

Alongside the digital surveys, ArchaeoMargam has carried out targeted excavations and a major community engagement programme. More than 900 people, including school pupils, students and volunteers, have taken part in hands-on learning linked to the research.

 [www.terradat.co.uk](http://www.terradat.co.uk)

## Bee-friendly garden blossoms at Cardiff primary school

**Pupils at ILM Primary School in Cardiff are enjoying a new pollinator garden thanks to a collaboration led by Cardiff University. The project forms part of an initiative delivered through the University's long-running Pharmabees programme aimed at encouraging communities to reconnect with nature through creativity.**

The project brings together work from seven local artists to work with residents and community groups on nature-focused creative activities. Artists Louise Shenstone and Nancy Evans guided pupils through a series of workshops exploring pollinators, biodiversity and environmental design. The children helped shape the final layout of the bee-friendly garden, choosing planting schemes and decorative elements to transform an underused corner of the schoolyard.

**The garden now provides a colourful, sensory space that supports outdoor learning and wellbeing, while raising awareness of the crucial role pollinators play in maintaining biodiversity. The workshops also gave pupils hands-on experience in environmental stewardship, helping to build long-term understanding of how to protect and enhance urban nature.**



The initiative continues to expand, with upcoming plans including a bee trail developed with local schools, pollinator-friendly planters across the neighbourhood, and a new nature space. A pop-up exhibition will also highlight the area's wildlife and encourage residents to connect with nature on their doorstep.

Delivered with Creative Cardiff, the project demonstrates how creativity, community engagement and environmental science can work together to enrich local spaces and support Cardiff's ambition to become a more bee-friendly city.

 [www.cardiff.ac.uk](http://www.cardiff.ac.uk)

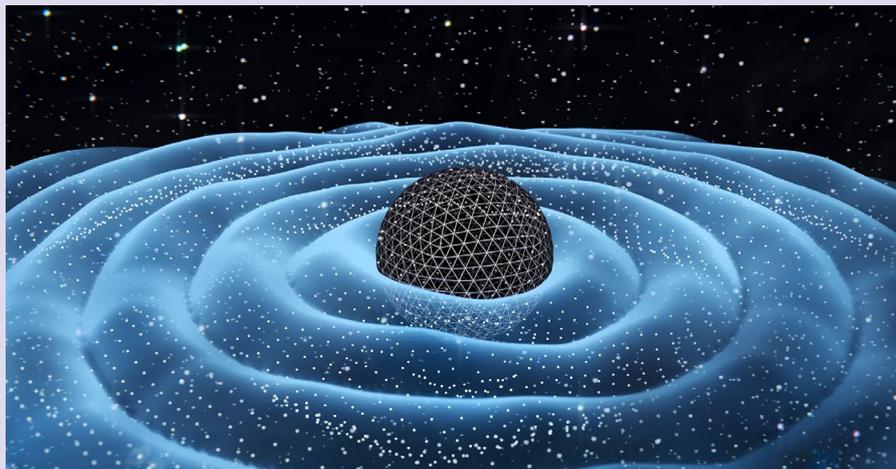
# Setting new limits on high-frequency gravitational waves

**The world's most sensitive table-top interferometer has completed its first science run at Cardiff University, setting new limits on the existence of extremely high-frequency gravitational waves.**

The Quantum Enhanced Space-Time measurement (QUEST) experiment complements larger facilities with its compact design.

QUEST is designed to probe the fundamental structure of space-time by measuring changes in length as small as one hundred trillionth of the width of a human hair. During a three-hour test run, the system reached a level of sensitivity previously thought possible only in much larger instruments, opening new ways to explore some of physics' deepest questions, from quantum gravity and dark matter to signals from the early universe.

**QUEST is tuned to search for much faster vibrations in space-time. These very high-frequency waves, which oscillate millions to billions of times per second, could be generated by exotic phenomena including primordial black holes, early-universe processes or certain forms of dark matter.**



The project builds on more than five decades of Welsh leadership in gravitational-wave research but takes the field in a new direction by showing that precision experiments of this kind can be carried out on a laboratory bench rather than in kilometre-scale facilities.

After four years of design, construction and testing, the successful first science run marks an important milestone. The team is now preparing for a much longer observing campaign, which will push the instrument to even greater sensitivity and allow a deeper search for signs of quantum space-time and other new physics.

 [www.cardiff.ac.uk](http://www.cardiff.ac.uk)

## IN BRIEF

### Walkway unlocks Cardiff Bay's potential

A proposed elevated walkway linking Penarth seafront with Cardiff Bay could showcase how innovative infrastructure design can deliver long-term economic, environmental and wellbeing benefits for Wales. The Penarth Headland Link project would create a 1.1km viaduct-supported walkway. Designed for both pedestrians and cyclists, the structure would sit approximately 11 metres above ground level and be positioned away from cliffs to improve safety and resilience. The design incorporates modern civil engineering approaches, including prefabricated construction techniques to reduce build time and disruption, and allowances for rising sea levels linked to climate change. The structure has been engineered to minimise mechanical stress, withstand extreme coastal conditions and support long-term durability, with a projected lifespan extending well beyond conventional infrastructure projects.

### Exploring teenagers' use of AI companions

Researchers at Bangor University have published new findings examining how teenagers are using AI companions and the impact these systems are having on their social lives and decision-making. The report analyses survey data from 1,009 UK teenagers aged 13–18 and explores how young people interact with AI chatbots. The findings show that AI companions are already a significant presence in teenagers' daily lives, with 96% of respondents having used at least one AI system for companionship-related purposes. While most respondents do not believe AI companions can feel emotions, over half believe these systems can think or understand. More than half of those surveyed reported moderate to high levels of trust in the advice they receive from AI, and many described using these tools for curiosity, entertainment and advice. A significant minority also reported confiding in AI companions about serious personal matters.

### Liquid metals could transform power electronics

A new UK research project is exploring how liquid metals could transform the design of power electronics, making them more reliable, reusable and recyclable at end of life. The project, co-led by Compound Semiconductor Applications Catapult, in south Wales, and the University of Cambridge, is developing a novel internal "floating" structure for power electronic devices using liquid metals, designed to reduce mechanical stress during operation and improve long-term performance. Crucially, the approach also allows components to be separated more easily when systems reach the end of their working life, supporting reuse and material recovery rather than disposal. This is particularly significant as global electronic waste continues to rise, driven by rapid electrification across energy, transport and industrial sectors. Alongside the liquid metal concept, the team is developing a modular "standard cell" approach to power electronics, enabling repair and reuse across multiple applications.

### Community optometry could reduce sight loss risk

New research suggests that expanding the role of qualified local optometrists could significantly reduce waiting times for eye care services and help prevent avoidable sight loss. The study, led by Cardiff University, examined the management of neovascular age-related macular degeneration (nAMD) and glaucoma, two of the most common causes of sight loss in Wales and England. Both conditions require lifelong monitoring, placing increasing pressure on Hospital Eye Services as case numbers continue to rise. The research evaluated enhanced primary care services in three areas of Wales, where suitably qualified optometrists monitor and manage patients in the community. Over a 12-month period, the approach dramatically reduced waiting lists, cutting nAMD cases from more than 200 to just three, and glaucoma cases from several thousand to single figures. The findings show that community-based optometry services can deliver care at comparable cost to hospital provision, while freeing specialist capacity and enabling earlier intervention.

### Alliance targets crop disease threatening global food security

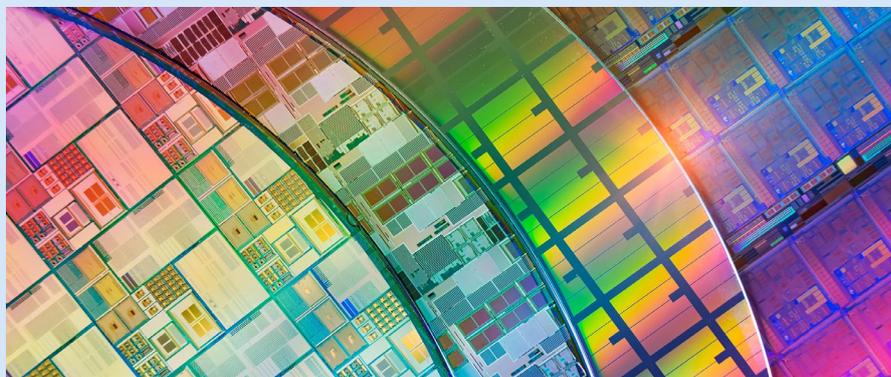
Scientists at Aberystwyth University are leading new cross-border research aimed at tackling one of agriculture's most damaging plant diseases. The project brings together researchers from Aberystwyth University and University College Cork to address *Phytophthora infestans*, a highly destructive plant pathogen responsible for major crop losses worldwide, including potato late blight. The disease poses ongoing economic and food security challenges and remains difficult to control using existing methods. The collaboration will combine expertise in artificial intelligence, metabolomics, plant pathology and phenotyping to improve understanding of how crops respond to infection and to support the development of more sustainable disease management strategies. By integrating advanced data analysis with biological insight, the research aims to reduce reliance on chemical controls and support more resilient agricultural systems.

# Institute for Compound Semiconductors marks ten years of innovation

**Cardiff University's Institute for Compound Semiconductors (ICS) is marking ten years at the forefront of compound semiconductor research, fabrication and industry collaboration. Founded in 2015, the Institute was established to provide a world-class environment where industry and academia can co-develop commercially viable semiconductor technologies.**

Designed from the outset to bridge the gap between fundamental research and industrial manufacturing, ICS offers open-access cleanroom facilities and specialist expertise supporting device prototyping, process development and system integration. Its mission, to turn cutting-edge semiconductor science into deployable technology, has helped position Wales as a UK leader in compound semiconductor innovation.

The Institute has played a central role in building the wider South Wales Compound Semiconductor Cluster, contributing to skills and workforce development activity. This includes leading a Placed Based Impact Accelerator (PBIAA), which is developing specialist training pathways



to ensure the region has the high-value skills required for advanced semiconductor manufacturing.

ICS's partnership with the Compound Semiconductor Centre remains one of its flagship collaborations, supporting Europe's first dedicated prototyping facility for compound semiconductor devices. Its work has enabled new advances in areas such as telecommunications, sensing, healthcare and quantum technologies.

Since moving into its permanent home with a purpose-built 1,500m<sup>2</sup> cleanroom, ICS has scaled full wafer

fabrication to 150mm for InP photonics and to 200mm wafer diameters for GaAs and GaN based electronics and photonics. These, in some cases world leading, steps are critical for wider industrial adoption and commercial viability.

A decade on, the Institute continues to drive technological innovation, economic impact and skilled job creation.

 [www.cardiff.ac.uk/institute-compound-semiconductors](http://www.cardiff.ac.uk/institute-compound-semiconductors)

## New nanogel technology targets drug-resistant bacteria

Research led by scientists at Swansea University have developed a new nanogel technology capable of rapidly destroying drug-resistant bacteria, offering a promising approach to tackling some of the most persistent challenges in modern medicine. The innovation centres on a heteromultivalent nanogel, a soft, flexible particle engineered from crosslinked polymers. By combining this flexible structure with specific sugar molecules and antimicrobial peptides, the nanogel can recognise, bind to and selectively attack harmful bacteria. The sugars bind to specific proteins on bacterial surfaces, guiding the nanogel to its target. Once attached, the antimicrobial peptides disrupt the bacterial membrane, leading to rapid cell death while leaving surrounding healthy cells unharmed. Laboratory testing showed the nanogel eliminated over 99.99 per cent of free-floating *Pseudomonas aeruginosa* bacteria and more than 99.9 per cent of biofilm-associated bacteria within 12 hours. The technology also proved effective against *Escherichia coli* and MRSA, highlighting its potential as a versatile strategy against multidrug-resistant infections.

## Agriculture innovation centre boosts skills and sustainability

A new £10 million agriculture innovation centre has officially opened in north Wales, strengthening facilities for land-based education, skills development and sustainable farming. Coleg Cambria has launched Hwb Arloesi at its Llysfasi campus, a state-of-the-art, two-storey, carbon-neutral complex designed to support innovation across further and higher education agriculture programmes. The centre brings together teaching, research and wellbeing spaces under one roof. Facilities include specialist laboratories, classrooms, a higher education centre, library, meeting and collaboration spaces, and a wellbeing hub, all designed to create a modern learning environment aligned with the evolving needs of the agriculture sector. By combining advanced facilities with skills-focused education, the new centre aims to support the future workforce needed to drive innovation, sustainability and productivity in Welsh agriculture.

## New UK centre for doctoral training in semiconductor skills

Swansea University is leading a major national initiative to strengthen the UK's semiconductor skills base with the launch of a new Centre for Doctoral Training (CDT). The programme will be delivered through Swansea's Centre for Integrative Semiconductor Materials, in collaboration with the University of Leeds. The programme will provide advanced doctoral-level training aligned with the technical needs of a resilient and competitive semiconductor manufacturing sector. The Centre will train up to 60 PhD researchers over five cohorts, combining world-class academic research with industry-embedded projects. Training will take place in state-of-the-art cleanroom facilities in Swansea and Leeds, representing more than £80 million of investment. With South Wales already home to a growing semiconductor cluster, the new CDT reinforces Wales' role as a national hub for semiconductor innovation, skills development and advanced manufacturing.

## Highlighting sustainable moss industry

New research has shed light on the little-known commercial moss harvesting industry in Wales and the factors that have enabled it to persist as a small-scale rural economic activity. A study led by Bangor University, examined moss picking in Mid Wales and its role in helping farmers diversify income. The research warns that the delicate ecosystems supporting moss harvesting could be placed at risk if future policy changes fail to recognise how the industry operates in practice. The study found that moss pickers typically rely on accumulated, experience-based knowledge rather than formal species identification, allowing them to harvest in ways that encourage regrowth and long-term sustainability. The industry is characterised by long-standing trust-based relationships between pickers and forest managers, which underpin access to harvesting permits and security of supply. While the sector faces challenges from changing environmental regulation, the research also highlights new opportunities through niche markets and online sales.

## Vaccines strengthen livestock immunity

Scientists at Aberystwyth University are leading new research into how a widely used vaccine could strengthen overall immunity in livestock and support more sustainable farming practices. The four-year study is investigating the concept of trained immunity, a form of immune memory in which vaccination reprogrammes the innate immune system to respond more effectively to future, unrelated infections. The research focuses on the BCG vaccine, which is already being explored as a tool for controlling bovine tuberculosis and has been shown to trigger trained immune responses. The team will examine the molecular and cellular mechanisms that underpin trained immunity in vaccinated animals. By understanding how immune responses are enhanced at a biological level, the research aims to inform new approaches to disease prevention in livestock.

# AI-assisted brain atlas offers new levels of detail in MRI scans

**A new AI-assisted brain atlas developed by an international research team, including scientists from Cardiff University, is set to enhance how researchers and clinicians study the human brain.**

**Known as NextBrain, the atlas offers a far more detailed anatomical map than existing resources and allows MRI scans to be analysed in minutes, revealing features not previously visible through standard imaging.**

Created in collaboration between Cardiff University, University College London, the University of Girona, and the Massachusetts Institute of Technology, this is the first atlas of the entire adult human brain constructed at microscopic resolution and optimised for use with MRI. Its open availability is expected to support research into ageing and neurodegenerative diseases such as Alzheimer's.

The atlas took six years to develop using post-mortem donations from five adults. Each brain was dissected into around 10,000 thin sections, stained

to highlight cellular structures, imaged under a microscope and digitally reconstructed into a 3D model. MRI scans taken prior to dissection were used as a reference to ensure accurate reassembly.



**“Similar to a jigsaw puzzle, these scans helped us put the pieces back together. The brain is incredibly complex. Existing atlases identify major structures, but smaller sub-regions, often affected early in diseases such as Alzheimer's, have been difficult to detect until now.”**

**Matteo Mancini**

Brain Research Imaging Centre  
Cardiff University

Artificial intelligence was crucial in aligning the microscopic images with the MRI scans, correcting distortions between the two techniques and ensuring anatomical accuracy. AI also supported the labelling of 333 brain regions across each donor model, dramatically speeding up a process that would otherwise require decades of manual work.

The final atlas represents an “average” of the five reconstructed brains, making it applicable to MRI scans of adults across a wide age range. It has already been tested on thousands of MRI datasets from different scanners and settings, demonstrating consistent and reliable performance.

In one evaluation, NextBrain successfully identified tiny subregions of the hippocampus, the part of the brain central to memory, within an





ultra-high-resolution MRI scan. In another, it was used to analyse age-related changes in brain volume across more than 3,000 participants, revealing patterns that existing tools were unable to capture.

By helping researchers detect subtle structural changes, the atlas may support earlier identification of diseases such as Alzheimer's, long before clinical symptoms appear. It also enables more detailed study of how different brain regions change throughout life.

Dr Zane Jaunmuktane of UCL commented: "Our aim was to allow researchers to identify hundreds of brain regions quickly and consistently, while preserving the anatomical precision normally associated with microscope data. Because NextBrain is freely available, groups worldwide can begin using it straight away."



**With its combination of microscopic-level mapping, AI-assisted reconstruction and compatibility with routine MRI, this project is set to become an important resource for neuroscience research, medical imaging and the study of age-related and neurodegenerative disease.**

#### Contact

**Cardiff University**

[www.cardiff.ac.uk](http://www.cardiff.ac.uk)

[communications@cardiff.ac.uk](mailto:communications@cardiff.ac.uk)



**CARDIFF**

# Shaping the future of cardiac pacing

A Welsh medtech company is pioneering a new generation of pacemaker technology that could transform the treatment of heart failure worldwide.



**Based in Cardiff and spun out of research at the Universities of Bristol, Bath and Auckland, Ceryx Medical is developing intelligent, adaptive pacing systems designed to restore the heart's natural rhythms rather than simply maintain a fixed beat.**

Traditional pacemakers are effective at stabilising heart rate, but they operate at a constant rhythm that does not respond to the body's changing demands. During rest, exercise or stress, a healthy heart automatically adjusts its pace and

timing in synchrony with the lungs. In patients with heart failure, this natural variability is lost – and existing pacemakers cannot replicate it.

Ceryx Medical's technology is based on artificial neuron circuits that generate complex, physiological signals. These circuits can mimic the way the nervous system modulates the heart, enabling a pacemaker to respond dynamically as the patient breathes, moves or rests. The result is a pacing system that works with the body rather than around it, restoring the adaptive rhythm patterns associated with a healthy heart.

The company's first product, a temporary external pacing device, is already in clinical evaluation (Advances Wales issue 96). Early data from ongoing trials is highly promising, showing strong

potential for improving recovery after cardiac surgery by supporting more natural cardiac function during the healing period. These trials build on a global first-in-human study centred at the University Hospital of Wales in Cardiff, where the external device demonstrated the feasibility of the artificial neuron approach in real clinical settings.

Alongside this work, the company is developing a fully implantable, miniaturised pacemaker designed for long-term use in patients with chronic heart failure. This permanent device will incorporate the same neural-inspired control system, delivering responsive support tailored to each patient's physiology. If successful, it could represent the first major leap in pacemaker technology for decades.



Heart failure affects around 64 million people globally and is diagnosed in up to 920,000 people in the UK, with a further 200,000 new cases each year. This growing burden makes it one of the world's most urgent and persistent health challenges.

The scientific foundations of the platform lie in advanced bioelectronics and biomimicry. By modelling the behaviour of natural neural networks and embedding those patterns into silicon circuits, the system produces a truly adaptive pacing signal. This enables synchronisation between the heart and lungs, a physiological interaction known as cardiorespiratory coupling, which has been shown to significantly improve efficiency and cardiac output. Replicating this behaviour has

long been a target in cardiac medicine, and this new technology offers one of the most convincing pathways toward achieving it at scale.

Development of the implantable system continues in close collaboration with engineering and clinical partners across the UK and internationally. These partnerships allow the company to refine device design, optimise its neural algorithms and ensure that the technology can be integrated safely into established cardiac care workflows.

By harnessing the principles of neural control and real-time physiological feedback, the team is aiming to improve survival rates and enhance quality of life for millions of patients.

With both temporary and permanent pacing platforms moving forward, and early clinical data supporting the promise of the approach, the company is well positioned to drive a fundamental shift in how heart failure is treated.

**Contact**

**Ceryx Medical**

- 🌐 [www.ceryxmedical.com](http://www.ceryxmedical.com)
- ☎ 07810 754896
- ✉ [info@ceryxmedical.com](mailto:info@ceryxmedical.com)



CARDIFF

# New research uncovers promising target for autoimmune disease treatment

**Researchers have identified a key mitochondrial protein that drives harmful T-cell overactivity in autoimmune disease.**

**Autoimmune diseases, such as rheumatoid arthritis or type 1 diabetes are driven by immune cells called T-cells, which are normally responsible for protecting the body from infections. However, in autoimmunity, these T-cells mistakenly start to attack the body's own healthy tissues instead of foreign invaders like bacteria and viruses.**

When T-cells normally respond to infections, they undergo changes in their metabolism (the ability to process dietary fuels like sugar and protein) to help them carry out their immune response. In autoimmune diseases like rheumatoid arthritis or type 1 diabetes, these changes cause the T-cells to harm the body. By targeting the metabolic changes in T-cells, it could be possible to find new treatments for this condition.

The new research has revealed that a protein called ABHD11, found in the mitochondria (the cell's engines that power an immune response), plays a key role in regulating T-cell overactivity. Researchers, studying immune cells from the blood of people living with and without type 1 diabetes or rheumatoid arthritis, have found that using a drug to stop the ABHD11 protein from working reduces inflammation by minimising T-cell overactivity, limiting their production of inflammatory signals. The researchers also observed that blocking ABHD11 with the same drug delayed the development of type 1 diabetes, offering hope for future therapies aimed at controlling autoimmune conditions.

The research was co-led by Dr Nick Jones from Swansea University, Professor Emma Vincent, at the University of Bristol and Dr James Pearson from Cardiff University.



**“This research opens up exciting possibilities for developing new treatments that work by adjusting how immune cells use fuels from our diet, a process known as metabolism. ABHD11 could be a valuable target for drugs aimed at reducing inflammation and preventing autoimmune flare-ups. Current treatments for autoimmune diseases can have significant side effects and don't work for everyone. This study adds to growing evidence that adjusting immune cell metabolism could offer a safer and more effective approach.”**

**Dr Nick Jones**  
Swansea University

The team are hoping to extend their findings into the effects of blocking ABHD11 in other immune cell types with implications towards other autoimmune diseases.

Yasmin Jenkins, PhD student at Swansea University, said: “Manipulating immune cell metabolism in autoimmune disease offers a promising therapeutic avenue to explore, and our work highlights the exciting potential of ABHD11 as a target for the development of new treatments. With further work looking at the effects of targeting ABHD11 in other immune cell types, we hope that this potential therapeutic benefit can be extended to a wide range of autoimmune conditions”



Mitochondria - 3d illustration

**Contact**

**Swansea University**

www.swansea.ac.uk

01792 602706

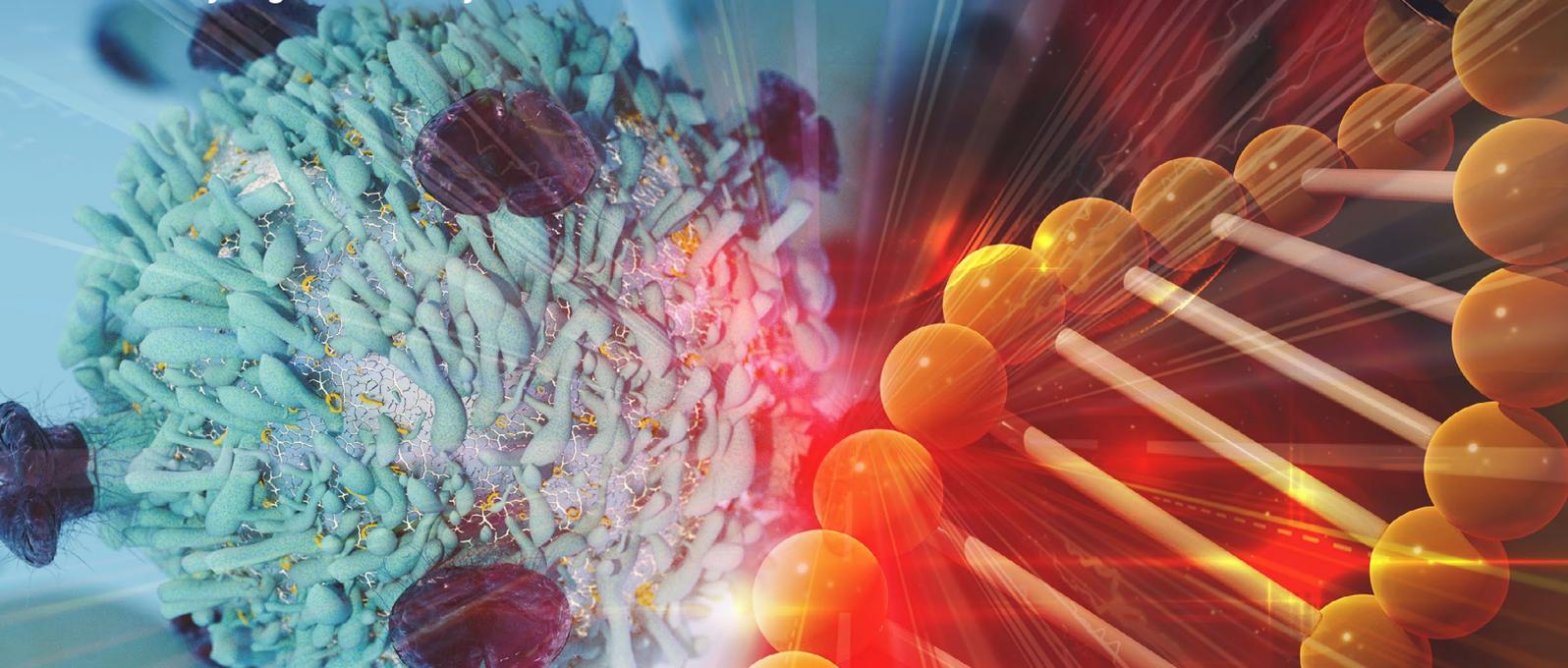
press@swansea.ac.uk



**SWANSEA**

# Virus-delivered therapy enters first clinical trial in Cardiff

A clinical trial has begun to test a new type of cancer therapy that uses an engineered virus to selectively target and destroy tumour cells from within.



**The treatment, known as TROCEPT-01 (or ATTR-01), represents the first clinical use of a viral platform originally developed at Cardiff University.**

TROCEPT-01 belongs to a growing class of treatments known as oncolytic virotherapies, which use modified viruses to infect and kill cancer cells. While the idea of using viruses to treat cancer has been explored for some time, this technology introduces a more precise approach. The virus has been engineered to recognise markers found primarily on tumour cells, helping it to target cancer while largely sparing healthy tissue.

Once inside a tumour cell, the virus multiplies until the cell bursts, destroying it from within, and releasing thousands of new viruses that can go on and repeat the process in surrounding cancer cells. At the same time, the virus delivers a gene that enables the infected cell to produce a checkpoint inhibitor, a type of immunotherapy that helps the immune system recognise and attack cancer. This combined action is designed not only to kill cancer cells directly but also to stimulate a wider immune response against the tumour.

The technology was developed in the laboratory of Professor Alan Parker at Cardiff University before being licensed to Accession Therapeutics in 2021. The company has since progressed the platform

through regulatory approval and into human trials. In the ATTEST study, the therapy is being evaluated in patients with several hard-to-treat solid tumours, including pancreatic, lung, bladder, head and neck, endometrial and bile duct cancers.



**Laboratory studies suggest the treatment has a high level of tumour selectivity, supporting the potential for targeted activity within cancer tissue. In Wales, the trial is being delivered through the Cardiff Cancer Research Partnership, which brings together universities, NHS organisations and clinical teams to accelerate access to innovative cancer therapies.**

A “first-in-human” trial is the earliest stage of clinical testing, in which a new therapy is given to people for the first time. Before reaching this point, treatments undergo extensive studies to understand how they

work and to assess potential safety risks. These early trials are designed primarily to establish whether the treatment can be given safely, how it behaves in the body and what dose should be used, rather than to demonstrate how effective it is against the disease. They are a critical step in turning scientific discoveries into potential new medicines.

Patients are being treated at Velindre Cancer Centre and the University Hospital of Wales, where clinicians are assessing safety, tolerability and appropriate dosing. Researchers describe the trial as a strong example of “bench-to-bedside” translation, with a discovery made in a Welsh university now being tested in NHS patients.

## Contact

**Cardiff University**

www.cardiff.ac.uk

communications@cardiff.ac.uk



CARDIFF

# Warming winters could cause DNA damage in lizards

**New research led by Bangor University has uncovered evidence that warmer winters, driven by climate change, may cause DNA damage in certain lizard species.**

**The study, which examined common wall lizards introduced to southern England, highlights an emerging and previously overlooked vulnerability in animals that rely on external temperatures to function.**

Lizards are ectotherms so cannot regulate their body temperature internally and instead depend on environmental heat sources such as the sun. For ectotherms, winter is a critical period of reduced activity or hibernation, during which their metabolic processes slow to conserve energy. As climate change causes winter temperatures to warm faster than summer temperatures, this natural cycle is being disrupted. Yet while the effects of warmer summers are increasingly well understood, the consequences of warmer winters remain largely unexplored.

To investigate these impacts, the research team recreated winter conditions in controlled environments and monitored lizards over a period of three and a half months. The animals were housed in conditions simulating a typical cold winter, a constantly mild winter and a fluctuating winter with alternating warm and cold periods. Throughout the experiment, the scientists assessed changes in behaviour, physical condition and oxidative stress. Oxidative stress occurs when the balance between free radicals and antioxidants within cells is disrupted. This imbalance can damage DNA, proteins and cell membranes and is associated with ageing, reduced fertility and decreased survival in wildlife.

The findings revealed that lizards exposed to a constant mild winter temperature became significantly more active than expected for the

season. Increased activity during hibernation can deplete the energy reserves needed to survive until spring. In contrast, lizards experiencing fluctuating temperatures behaved much like those in a typical winter, suggesting that the duration of warming episodes, rather than temperature alone, plays a critical role. Crucially, the constant mild regime also showed signs of elevated DNA damage, likely caused by increased oxidative stress. These effects may not be immediately visible through behaviour but still represent important underlying physiological risks.

The study suggests that while common wall lizards may appear outwardly resilient to moderate winter warming, subtle molecular costs could accumulate under sustained mild conditions. These hidden impacts may influence long-term health, reproduction and survival. The researchers emphasise the importance of incorporating both behavioural and physiological sensitivity into models predicting species resilience to climate change.



**The team now hopes to extend their research to other ectothermic species and to explore how different patterns of winter warming affect survival and reproduction. Their findings highlight the need for greater attention to winter climate change and the subtle yet significant risks it poses to wildlife.**

Miary Raselimanana from Bangor University noted that the consequences of winter warming remain understudied, despite the fact that winter temperatures are increasing more rapidly. “Hibernating ectotherms are particularly vulnerable because their physiology depends directly on environmental conditions. Research has often focused on constant temperature changes and has overlooked the role of variability. Understanding which warming patterns are most disruptive is essential for predicting how species will respond to a changing climate.”

## Contact

**Bangor University**

www.bangor.ac.uk

01248 383298

press@bangor.ac.uk



**BANGOR**

# Unlocking nutrient recovery from food wastewater

**A Welsh innovation is transforming how wastewater from food manufacturing is treated, turning what was once a costly environmental challenge into a valuable resource for agriculture.**



**Pennotec, based in northwest Wales is pioneering a circular economy approach that recovers nutrients from food factory wastewater and returns them to farming in the form of fertiliser and feed ingredients.**

Food manufacturing wastewater is rich in nutrients such as phosphorus, nitrogen, proteins and fats. However, conventional treatment processes rely on synthetic chemicals to separate solids and meet strict discharge limits, particularly for phosphate. While effective, these non-biodegradable synthetic chemicals contaminate the recovered material, preventing it from being reused in agriculture. Pennotec is working with South Caernarfon Creameries (SCC) to demonstrate a more sustainable alternative.

The company's technology uses two innovative products derived from crab shells to create a biodegradable and food-safe treatment process that avoids synthetic chemicals altogether.

The first product, FloXan, is a natural chitosan-based solid/liquid separation aid that replaces conventional chemical coagulants used to remove solids from wastewater. Chitosan is a biodegradable biopolymer derived from crustacean shells, such as crab shells, and is widely used in food, water treatment and medical applications because it is non-toxic, effective

and environmentally safe. The second product is a natural adsorbent that removes dissolved phosphate and nitrate from the treated water. Together, these technologies allow wastewater to be cleaned to the required environmental standards while keeping the recovered nutrients free from chemical contamination.

This means that both the solid nutrients and the captured phosphates can be upcycled into agricultural fertiliser, rather than being disposed of as waste. Looking ahead, the use of chitosan also opens the possibility that proteins and fats recovered from food factory wastewater could be repurposed into agricultural feed.



**For food manufacturers, it offers a way to reduce treatment costs and environmental impact while meeting discharge regulations. For farmers, it provides locally sourced fertiliser and feed inputs, reducing reliance on imports and supporting more resilient supply chains.**

By enabling nutrients to be recovered and reused, this approach supports a Circular Economy in which resources remain in productive use rather than being lost to disposal.

The current project is providing real-world data on how the technology performs in a demanding industrial setting, helping to build the evidence needed for wider adoption.

Pennotec is now exploring the wider market for innovative dairy and slurry dewatering solutions, where nutrient recovery could deliver significant economic and environmental benefits.

Through hands-on knowledge exchange events with farmers and food producers, the company is shaping a commercialisation plan to turn this cutting-edge research into a practical, market-ready solution.

As the project progresses, the team is seeking food manufacturers interested in evaluating the technology and helping to shape its future development.

## Contact

**Pennotec**

www.pennotec.com  
01766 810345  
enquiries@pennotec.com



PWLLHELI

# Turning wool into a sustainable feed revolution

**A Welsh agri-tech start-up is reimagining one of the country's most undervalued natural resources and transforming it into a powerful driver of sustainability and rural prosperity.**

**LanoTech is pioneering the use of lanolin, the natural grease found in sheep's wool, as a sustainable alternative to imported vegetable oils in poultry feed. In doing so, the company is creating a new circular economy that links sheep farmers, feed manufacturers and poultry producers, while reducing the environmental impact of animal agriculture.**

Despite Wales's strong sheep-farming heritage, wool has long been a low-value by-product, with many farmers receiving minimal returns. At the same time, the animal feed industry relies heavily on imported oils such as soya and palm, which are associated with deforestation, long supply chains and rising costs.

LanoTech's approach offers a solution to both challenges. By extracting lanolin from wool and incorporating it into poultry feed, the company can replace environmentally damaging ingredients with a locally sourced, natural alternative, creating value from a material that is often treated as waste.

The idea was sparked during a conversation between company founder Clodagh Weingart and a shrimp farmer in Mexico, who explained that cholesterol derived from lanolin is routinely used in shrimp feed. This prompted Clodagh to ask whether the same approach could work for poultry. She went on to explore the technical and commercial potential of lanolin-based feed, and the concept has now progressed to world-first live trials, carried out in collaboration with Aberystwyth University, AberInnovation and Scotland's Rural University College (SRUC).

The trials involve 240 birds receiving feed containing different concentrations of lanolin. Researchers are collecting detailed data on bird performance,



digestibility and meat quality, with early results already showing encouraging signs.

If successful, the trials could pave the way for lanolin to become a mainstream ingredient in poultry feed, reducing reliance on imported oils while creating a new market for wool.

This innovation is about more than improving feed ingredients. It offers a practical model that brings together sustainability, food security and rural economic resilience.

For sheep farmers, it creates a higher-value outlet for wool, helping to strengthen farm incomes. For the feed and poultry sectors, it provides a locally sourced, traceable and more sustainable ingredient, reducing dependence on imports and supporting the growth of a home-grown agri-tech supply chain.

The impact of this approach has already been recognised nationally. In 2025, LanoTech was named UK Rural Start-up of the Year, highlighting the



“We're creating a Welsh circular economy that connects sheep farmers, feed manufacturers and poultry producers. Lanolin has huge untapped potential, and Wales is perfectly placed to lead this innovation. We want to work with partners across farming, feed and food production to build a model that works for everyone.”

**Clodagh Weingart**  
Founder

company's potential to reshape how agriculture and innovation work together.

As the process moves towards commercialisation, the company is now seeking industry and stakeholder input to ensure that the solution can be scaled and adopted successfully.

By turning a wool by-product into a sustainable feed ingredient, the company is not just creating a new product, it is helping to build a more circular, resilient and future-focused agri-food system.

## Contact

**LanoTech Ltd**

🌐 [www.lanotech.org](http://www.lanotech.org)

☎ 07967 662 630

✉ [clodagh.weingart@lanotech.org](mailto:clodagh.weingart@lanotech.org)



**ABERYSTWYTH**

# Gene atlas paves the way for healthier oats

**A major international collaboration has produced the most comprehensive genetic atlas of oats ever created.**

**The breakthrough will accelerate the development of more nutritious, higher-yielding and climate-resilient oat varieties, a growing priority as global food systems face mounting environmental pressures.**

The work, carried out by the PanOat consortium, includes the full sequencing of the genomes of 33 representative oat varieties and detailed analysis of more than 9,000 cultivated and wild oat lines. This has produced the first oat pangenome, a complete catalogue of all genes found across the species, showing how genetic variants differ between populations. Alongside it, the first pan-transcriptome reveals how these genes are switched on and off during development in six plant tissues, from roots to grains. The resulting genetic atlas shows how oats compensate for missing or inactive genes by increasing activity in related ones. This adaptation helps maintain yield and stability despite their intricate DNA structure. Together, these resources provide a high-resolution map of oat diversity that allows breeders to target valuable traits with much greater precision.

Oats pose a particular scientific challenge because they contain three merged genomes, each larger than the human genome. These originated in ancient wild species that hybridised millions of years ago and have since been reshaped by gene loss, duplication and chromosome rearrangements

as oats adapted to new environments. While this diversity underpins resilience, it also creates genetic incompatibilities that can cause breeding crosses to fail or produce unstable offspring.

By clarifying how these genomes differ, the new atlas helps breeders avoid these incompatibilities and combine beneficial traits, such as drought



**This detailed gene atlas is reinforced by a complementary global study of oat diversity in which Aberystwyth University also played a key role. Led by Agriculture and Agri-Food Canada, the study analysed more than 9,000 oat lines from around the world, including historic material preserved for decades in Aberystwyth's Gogerddan seed bank. It showed that cultivated oats arose from multiple domestication events, identified clear genetic population structures, and pinpointed chromosome differences that create reproductive barriers between groups.**



tolerance, disease resistance and improved nutritional quality, more effectively. This is especially important in the UK, where winter oats must cope with increasingly unpredictable cold-season weather. Breeders often need to introduce traits from spring oats or wild relatives while preserving winter hardiness, a process that the new genomic resources now make far more reliable.

Together, the two projects provide both the broad evolutionary context and the fine-scale genetic detail needed to unlock the complexity of the oat genome. By linking global diversity with a high-resolution gene atlas, the researchers are giving breeders powerful new tools to develop oat varieties that are more resilient to climate change, healthier for consumers and more reliable for farmers—helping to secure the future of a crop that is central to sustainable agriculture and global nutrition.

## Contact

**Aberystwyth University**

🌐 [www.aber.ac.uk](http://www.aber.ac.uk)

☎ 07496 914301

✉ [ctn1@aber.ac.uk](mailto:ctn1@aber.ac.uk)



**ABERYSTWYTH**

# Reducing farm emissions through precision chemistry

**Keeping farms productive while cutting their environmental impact is one of the biggest challenges facing UK agriculture. From air pollution to climate change, farming is under pressure to do more with fewer emissions, less waste and more efficient use of nutrients.**

**New research from Bangor University is showing how changing the chemistry of slurry could make a big difference. By fine-tuning acidity levels, farmers may be able to cut harmful ammonia emissions, keep more nutrients in the soil and reduce their reliance on artificial fertilisers.**

Livestock slurry is a valuable resource. It contains nitrogen, phosphorus and other nutrients that crops need to grow. But it also has a downside. When slurry is stored or spread on fields, some of its nitrogen escapes into the air as ammonia gas. This contributes to air pollution, has implications for human health,

damages sensitive habitats and represents a loss of fertiliser that farmers have already paid for.

In the UK, ammonia from agriculture is one of the main barriers to meeting air-quality and environmental targets. Finding ways to keep nitrogen in the soil rather than in the atmosphere is therefore a top priority. This is where slurry acidification comes in. A carefully measured amount of acid, often sulphuric acid, is added to slurry before or during spreading. This lowers the slurry's pH, making it slightly more acidic.

That small chemical change has a big effect. Under normal conditions (a slurry pH of 7-8), a significant proportion of the nitrogen in slurry exists as ammonia, which is volatile and escapes easily into the air. When the pH is lowered (e.g. to pH 5.5), ammonia

is converted into ammonium, which stays dissolved in the slurry and then in the soil. Plants can take up ammonium through their roots, so instead of being lost as pollution, more nitrogen ends up feeding crops.

Slurry acidification is already used commercially in countries such as Denmark, but until now there has been limited evidence about how well it works under UK farming conditions. The Bangor study, which is part of a larger project led by ADAS, covering both grassland and arable systems, has looked at slurry acidification in the lab, in controlled mini-ecosystems and on real UK grassland fields.

One of their key findings was that precision matters. At a slurry pH of around 5.5, ammonia emissions were cut by more than half compared with untreated slurry. At the same time, more nitrogen stayed in a form that crops can use, increasing the slurry's fertiliser value.



In the field trials, researchers applied acidified slurry to grassland and monitored soil, crops and biology over time. Although the slurry temporarily lowered soil pH, the soil's natural buffering capacity brought levels back to normal within the growing season. Importantly, grass growth, crop quality and soil life were not harmed. This helps address one of farmers' main concerns: will repeated use of acidified slurry make soils too acidic? Under typical UK conditions, the results suggest the risk is low, although long-term monitoring will still be important.

The team also used special mesocosm chambers, small enclosed systems that mimic field conditions, to measure ammonia losses very precisely. These experiments showed that acidification can reduce emissions as effectively as shallow injection, one of the main low-emission spreading methods currently promoted in the UK. This matters because injection equipment is expensive and not always practical, especially on smaller farms or in hilly areas. Acidification could offer a more flexible and affordable option that works with existing spreading machinery.

But this would need further clarification at field scale, as well as acknowledgement that slurry acidification would represent an acceptable alternative to slurry injection or spreading with a trailing hose or shoe.

The results show that slurry acidification could become a key part of the UK's move towards low-emission agriculture. It offers a way to cut pollution, improve fertiliser efficiency and support productive farming at the same time.



Another important discovery was that UK slurries behave very differently from one farm to another. Some slurries resist changes in pH more than others, meaning they need more acid to reach the target level. This means UK farmers cannot simply copy acid-dosing rules from abroad. Instead, slurry will need to be tested and treated more precisely, with dosing adjusted to match local conditions. That finding has implications for contractors who are likely to be responsible for slurry acidification on farms, as well as equipment suppliers, advisers and future support schemes.

#### Contact

**Bangor University**

www.bangor.ac.uk

01248 383298

press@bangor.ac.uk



BANGOR

# Advancing talent identification in elite cycling

**A new university–industry collaboration is exploring how advanced data analytics, artificial intelligence and digital twin technologies could reshape talent identification in elite professional cycling.**



**Swansea University has partnered with INEOS Grenadiers to develop data-driven systems designed to identify emerging and currently overlooked cycling talent earlier and more effectively. The research addresses a fundamental challenge in high-performance sport: how to make robust, evidence-based talent decisions in environments characterised by complex, fragmented and often incomplete data.**

At the centre of the collaboration is a research project focused on the use of digital twins - virtual, data-rich models of athletes that bring together performance, training and competition data over time. As new information is added, these digital twins evolve, enabling researchers to move beyond isolated performance snapshots and instead build a longitudinal view of development. This helps to track progression, understand emerging patterns and explore how different training, racing or environmental scenarios might influence long-term potential.

Professional cycling provides a particularly rich test environment for this research. The sport generates large volumes of performance data through power meters, wearable sensors, laboratory testing and detailed race analytics. However, much of this data is collected under varying conditions, stored across

disparate platforms and subject to inconsistency in quality, particularly at junior and sub-elite levels. These factors make traditional, manual approaches to talent identification increasingly challenging as the sport becomes more competitive and globally distributed.

The project seeks to address these limitations by integrating internal team performance metrics with publicly available race and results data. By combining these sources, the research aims to develop automated analytics systems capable of monitoring the development of junior riders across selected countries. These systems are designed to identify patterns of performance that may indicate long-term potential, including atypical or non-linear development pathways that conventional scouting approaches may overlook.

A key concept underpinning the work is the creation of a digital thread linking an athlete's training history, competitive exposure and performance outcomes over time. This continuous data linkage allows researchers and practitioners to contextualise performance more effectively, providing deeper insight into how athletes progress and how early indicators of future success might emerge. The digital thread also provides a foundation for more advanced modelling, including the simulation of alternative development scenarios within an athlete's digital twin.

Artificial intelligence and machine learning techniques play a central role in managing the scale and complexity of the data involved. Automated methods are being explored to detect standout performances within large datasets, compare development trajectories across cohorts and support decision-making under uncertainty. Rather than replacing expert judgement, these tools are intended to act as decision-support systems, augmenting human expertise and helping to reduce bias in early-stage talent identification.

As professional cycling continues to evolve, with increasing international participation and narrowing performance margins, early and accurate talent identification is becoming a strategic priority. This collaboration illustrates how digital twins, AI-enabled analytics and integrated data architectures could underpin future approaches to talent development, not only in cycling but across high-performance sport more broadly. By shifting the focus from isolated metrics to system-level, longitudinal analysis, the research aims to establish more resilient and transparent pathways for identifying and nurturing athletic potential.



**“The emerging fields of data science and AI are the next frontier for the sport. These projects form part of a wider portfolio of work with academia and industry to accelerate understanding and application within professional cycling. My experience of working with Swansea University has consistently delivered direct impact on the way we operate.”**

**Dr Scott Drawer,**  
Performance Director  
INEOS Grenadiers

## Contact

**Swansea University**

www.swansea.ac.uk

01792 602706

press@swansea.ac.uk



SWANSEA

# Flying smarter through digital innovation

**A Caerphilly-based technology company is helping to modernise how aircraft operate in some of the UK's busiest and most complex airspace, using digital innovation to make flying safer, more connected and more efficient.**

**Twelve Technology has developed SmartSkies, a cloud-based aviation platform that transforms how flight information is recorded, shared and managed across the general aviation sector. Designed for private and recreational flying, the platform replaces outdated, paper-based processes with a secure, real-time digital system that gives pilots, airfields and regulators instant access to critical flight data.**

General aviation, which includes small aircraft, flying schools and local airfields, still relies heavily on manual systems developed many years ago. As drones, unmanned aircraft and increasing air traffic share the same skies, these legacy processes no longer provide the visibility or coordination required to support safe and efficient operations.

SmartSkies addresses this gap by creating a digital ecosystem for flight operations. Pilots can submit and update flight information electronically,

airfields can view movements as they happen, and data is stored securely in the cloud for oversight and analysis. This improves transparency across the airspace and supports faster, better-informed decision-making.



The platform has been engineered to meet the technical and regulatory demands of modern aviation. It integrates GPS positioning, secure data transmission and scalable cloud infrastructure, ensuring flight records remain accurate, resilient and accessible. Mobile and airfield interfaces allow users to interact with the system easily, whether in the cockpit, control office or on the ground.

Developed in collaboration with the wider aviation ecosystem, the platform has been tested with early adopters including helicopter operators and airfields. It has also been designed to align with the requirements of organisations such as the Civil Aviation Authority and NATS, enabling digital records to sit alongside national air traffic systems.

The platform is now being rolled out to pilots, airfields and training organisations, with future developments planned to support drone operations. This project demonstrates how advanced digital platforms can modernise a traditionally conservative sector, improving safety, efficiency and connectivity across UK airspace.

## Contact

### Smart Skies

🌐 [www.smartskies.app](http://www.smartskies.app)

☎ 07940 951 795

@ [sayhello@smartskies.app](mailto:sayhello@smartskies.app)



CAERPHILLY

# Fake or real - can we trust the pictures we see?

A research team from Swansea University, working as part of an international collaboration, has shown that modern artificial intelligence tools can now generate facial images so realistic that most people cannot tell them apart from genuine photographs, even when the subject is a well-known public figure.



**The study, examined how people perceive synthetic images created using widely available AI models, including ChatGPT and DALL-E. These systems use machine learning techniques known as generative models, which analyse millions of real images and learn how to produce new ones that mimic the patterns, textures and lighting of authentic photography.**

Previous research has already demonstrated that AI-generated images of fictional people can be indistinguishable from the real thing. The Swansea team went further by creating synthetic images of actual individuals, including well-known celebrities, to investigate whether familiarity with a face could help people spot fakes.

Across four controlled experiments, the results were striking. Participants from the UK, USA, Canada, Australia and New Zealand were shown a mixture of real and AI-generated faces and asked

to judge which were genuine. Not only were they unable to reliably identify the synthetic images, they often mistook them for real photographs. Even when the researchers provided comparison photos or tested participants on well-known faces, accuracy improved only marginally.



The findings highlight what the researchers call a new level of “deepfake realism”. Deepfakes are artificially generated images, videos or audio recordings created using AI. As these systems become more powerful and accessible, the potential for misuse grows. Synthetic images could, for example, depict a public figure endorsing a product, political viewpoint or organisation without their knowledge, influencing public opinion in subtle or harmful ways.

Professor Tree from Swansea University explains: “This study shows that AI can create synthetic images of both new and known faces that most people can’t tell apart from real photos. Familiarity with a face or having reference images didn’t help much in spotting the fakes, that is why we urgently need to find new ways to detect them. While automated systems may eventually outperform humans at this task, for now, it’s up to viewers to judge what’s real.”

The research underscores the need for reliable detection tools and improved public awareness, as AI-generated images become increasingly woven into everyday media.

## Contact

Swansea University

[www.swansea.ac.uk](http://www.swansea.ac.uk)

01792 602706

[press@swansea.ac.uk](mailto:press@swansea.ac.uk)



SWANSEA