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12th February 2026 weekly

ISSN 2753-2771

Surrey Uni leads research to replace plastic with paper for liquids

8 February 2025

A multimillion-pound research project, called SustaPack, aims to overcome manufacturing challenges for the next generation of sustainable, paper-based packaging for liquids. Backed by a £1 million grant from the Engineering and Physical Sciences Research Council (EPSRC) as part of UKRI's co-investing programme, packaging technology company Pulpex Ltd has joined forces with the University of Surrey to refine its manufacturing processes to provide a viable solution to plastic pollution.

Contributing matching support towards the project, Pulpex has already made significant strides in the development of its patented technology, which produces degradable bottles made from natural wood fibres. The packaging offers a sustainable alternative to traditional plastic materials and can be recycled in existing paper waste streams.

However, designing the next generation of production technology and materials requires novel and fundamental research to address current limitations, including new analytical techniques to improve product quality, optimising performance and reducing in-process imperfections.

Scott Winston, CEO at Pulpex, said:

"We're excited to strengthen our existing collaboration with the University of Surrey to enhance our technologies and processes. Our SustaPack partnership will help us advance safe, sustainable packaging solutions, enabling brand owners to meet Net-Zero targets. It gives consumers sustainable choices, delivers answers for brand owners, and enables supply chains and retailers to deliver their carbon footprint reduction goals – a priority for all."

A key feature of the packaging is its multi-layered barrier coating, which prevents contained liquid from leaking, as well as inward oxygen permeation, maintaining high-quality products for consumers. To create a step-change in the energy usage in methods used to apply these coatings, the researchers plan to develop innovative processes that consume less energy and water while increasing the shelf life of packaged goods.

Professor Joseph Keddie, from the University of Surrey's School of Mathematics and Physics, and Fellow of the Institute for Sustainability, said:

"Over the past couple of years, I have forged a close relationship with Pulpex as a Royal Society Industry Fellow, and I am enthusiastic about strengthening our ties through our SustaPack Partnership.

"Our aim here is to combine novel coating processes, mechanistic modelling, computer vision and artificial intelligence (AI) to establish a 'dry' spray coating process that deposits food-safe, degradable coatings. This technology, which isn't yet commercially available, will not only drive the next generation of packaging technology but will also contribute to a significant reduction in plastic pollution and lower carbon emissions from manufacturing."

A multi-disciplinary team of researchers will explore the feasibility of using thermal imaging to detect defects in wet coatings as they occur, enabling immediate corrections using AI. Multi-scale mechanistic models of the coating process will be employed to identify the sources of imperfections and non-uniformities and then eliminate them to ensure optimal packaging performance.

By applying innovative computer vision techniques powered by AI, the project aims to identify production defects in real-time, optimise materials and processes, and achieve 100% reliability in the manufactured products.

The outcomes of the project could set new standards for environmentally friendly packaging, helping brand owners reduce their environmental impact amidst ever-increasing environmental regulations – while offering consumers eco-friendly options to help fight against plastic pollution.

From left to right: Dr Hui Luo and Professor Robert Dorey (University of Surrey's School of Engineering); Professor Joseph Keddie (University of Surrey's School of Mathematics and Physics); Scott Winston, CEO at Pulpex; Barrie Harvey, COO at Pulpex; Dr Simon Hadfield (University of Surrey's Centre for Vision, Speech and Signal Processing); Professor Charley Wu (University of Surrey's School of Chemistry and Chemical Engineering).

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Surrey Uni making self-driving cars safer

8 February 2025

With self-driving cars expected to hit British roads next year (2026), a new motion forecasting framework developed by the University of Surrey and Fudan University, China, promises to make autonomous cars both safer and smarter.

Researchers have combined their expertise to create RealMotion – a novel training system that seamlessly integrates historical and real-time scene data with contextual and time-based information, paving the way for more efficient and reliable autonomous vehicle technology.

Dr Xiatian Zhu, senior lecturer at the Centre for Vision, Speech and Signal Processing and the Insitute for People-Centred AI at the University of Surrey and co-author of the study, said:

“Driverless cars are no longer a futuristic dream. Robotaxis are already operating in parts of the USA and China, and self-driving vehicles are expected to be on UK roads as early as next year. However, the real question on everyone’s mind is: how safe are they?

“While AI operates differently from human drivers, there are still challenges to overcome. That’s why we developed RealMotion – to equip the algorithm with not only real-time data but also the ability to integrate historical context in space and time, enabling more accurate and reliable decision-making for safer autonomous navigation.”

Existing motion forecasting methods typically process each driving scene independently, overlooking the interconnected nature of past and present contexts in continuous driving scenarios. This limitation hinders the ability to accurately predict the behaviours of surrounding vehicles, pedestrians and other agents in ever-changing environments.

In contrast, RealMotion creates a clearer understanding of different driving scenes. Integrating past and present data enhances the prediction of future movements, addressing the inherent complexity of forecasting multiple agents’ movements.

Extensive experiments conducted using the Argoverse dataset, a leading benchmark in autonomous driving research, highlight RealMotion’s accuracy and performance. Compared to other AI models, the framework achieved an 8.60% improvement in Final Displacement Error (FDE) – which is the distance between the predicted final destination and the true final destination. It also demonstrated significant reductions in computational latency, making it highly suitable for real-time applications.

Professor Adrian Hilton, Director of the Surrey Institute for People-Centred AI, said:

“With self-driving cars reaching British roads imminently, ensuring people’s safety is paramount. The development of RealMotion by Dr Zhu and his team offers a significant advance on existing methods. By equipping autonomous vehicles to perceive their surroundings in real-time, and also leverage historical context to make informed decisions, RealMotion paves the way for safer and more intelligent navigation of our roads.”

While researchers encountered some limitations, the team plans to continue its research to further improve RealMotion’s capabilities and overcome any challenges. The framework has the potential to play a critical role in shaping the next generation of autonomous vehicles, ensuring safer and more intelligent navigation systems for the future.

About the Surrey Institute for People-Centred AI (PAI)

Taking a different approach to much AI activity in the UK, the Surrey Institute for People-Centred AI puts the needs of individuals and society at the very heart of everything it does: we believe that the starting point for AI should be people rather than technology.

This people-centred approach drives our research and enables us to design AI technologies and systems that are ethical, responsible, and inclusive. The pan-University Institute brings together Surrey’s core AI-related expertise in vision, speech and signal processing, computer science, and mathematics, with its domain expertise across engineering and physical sciences, human and animal health, law and regulation, business, finance and the arts and social sciences. With this distinctive approach, PAI builds on Surrey’s track record of collaboration with industry, the public sector, government and other relevant institutions to develop solutions to shared challenges.

Image: Waymo self-driving vehicle. Credit Grendelkhan CC by SA 4

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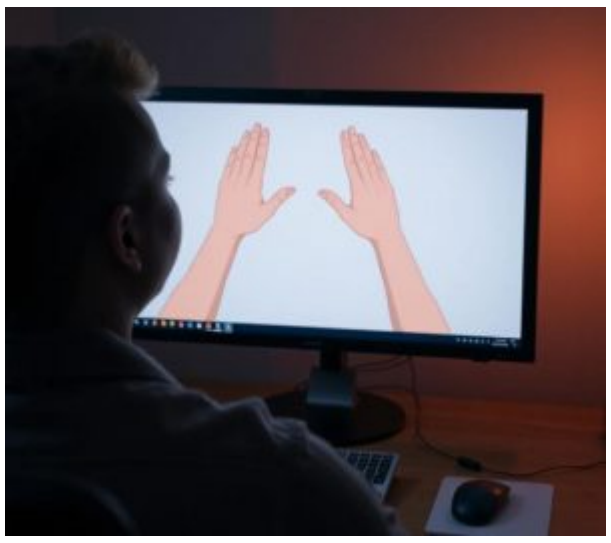
ISSN 2753-2771

Surrey Uni to lead on speech to sign GBT computer programme

8 February 2025



A large-language model (LLM) built to meet the needs of the Deaf community, translating between signed and spoken language, is the aim of a new project led by the University of Surrey.

SignGPT: Building Generative Predictive Transformers for Sign Language has been awarded £8.45m from the UK Engineering & Physical Sciences Research Council. The five-year project will build tools to allow spoken language to be automatically translated into photo-realistic sign language and video of sign language to be translated into spoken language – a complex translation problem that is yet to be solved.

Surrey will work alongside the University of Oxford, the Deafness Cognition and the Language Research Centre at University College London, key Deaf stakeholders, and the Deaf community.

Professor Richard Bowden, Principal Investigator of the project from the University of Surrey's Institute for People-Centred AI, said:

"Large language models such as those behind ChatGPT and Gemini are transforming many aspects of our personal and working lives – and that transformation is happening at a blistering pace. Our project, SignGPT, is not about replacing humans, but it is about ensuring the Deaf community is not left behind in this revolution.

"By creating technology that serves the community, we're enabling equal access to information, working towards seamless communication between the Deaf and hearing world, and demonstrating that AI can be a tool for inclusivity and empowerment. SignGPT isn't just about accessibility for Deaf people – it's about setting a standard for how innovation can address inequities, strengthen human connection, and build a more inclusive society. In a world shaped by rapid technological change, projects like this show that AI's potential is greatest when it uplifts everyone."

Globally, there are around 70 million Deaf or hard-of-hearing individuals, many of whom use sign language as their primary form of communication. For many, written/spoken languages serve as a second or third language, and proficiency in these languages can vary. There is no universal sign language: sign languages are natural human languages created over centuries by Deaf communities and are not derived from spoken languages. Their underlying rules and structures remain a rich area of linguistic study. Each sign language has its own unique grammar and lexicon, relying on both manual gestures (hands) and non-manual expressions (body and face), along with spatial elements, to convey meaning.

Professor Bencie Woll, sign linguist, co-investigator of the project, and founder of the Deafness Cognition and Language Research Centre at UCL, said:

"This project is a unique collaboration between vision scientists and sign linguists with Deaf and hearing researchers working together towards our common goals."

Mark Wheatley, CEO of the Royal Association for Deaf People (RAD), said:

"I am pleased that this important grant will empower the Deaf community to have further equal access by harnessing AI and large language models. We will ensure that the University of Surrey, Oxford University, and the Deafness Cognition and Language Research Centre at UCL, alongside Deaf-led stakeholders such as RAD, take a people-centred approach to ensuring ethical responsibility and the accuracy of translations so that we, the Deaf community, can use them for everyday purposes."

Professor Kearsy Cormier, one of the Co-Investigators on the project from University College London, said:

"So much work in sign language technology is undertaken by researchers with no understanding of how sign languages work, nor any lived experience of deafness themselves. This project will allow real co-creation/co-development of this technology with Deaf and hearing researchers in linguistics and deaf studies working alongside computer vision specialists – with each group learning from each other – and, importantly, building capacity amongst Deaf researchers so they may lead this field in the future."

SignGPT's research team will produce the largest sign language dataset in the world and use it to build a sign language LLM that can provide the breadth of application to the Deaf community that current LLMs provide for written/spoken languages. In doing so, the project will also generate tools for data annotation that will be released for use by the wider community. The project already has Deaf members within both the research team and wider partners, but it is hoping to recruit more staff for whom British Sign Language is their primary language.

ISSN 2753-2771

The challenge of automatically translating between sign languages and spoken languages is highly complex and remains unsolved. SignGPT will produce open-source toolkits for linguistic use, web-based demonstrations for accessible knowledge exchange and run outreach programmes alongside collaborative workshops.

Surrey University leading on alternative ADHD treatment

8 February 2025

A multisite clinical trial has launched in the United States to investigate whether non-pharmaceutical methods can be used to treat attention deficit hyperactivity disorder (ADHD) in children ages 7-12. This trial is currently recruiting new patients and seeking FDA clearance.

The trial uses a wearable device – Novostim 2 – developed by Innosphere Engineering Ltd. The company anticipates FDA clearance by Q3 of 2025 and has already received approval for sales in Israel.

The novel treatment builds upon years of research into non-invasive brain stimulation techniques led by the University of Surrey's Professor Roi Cohen Kadosh. The research team carried out multiple studies in which children with ADHD were treated with transcranial Random Noise Stimulation (tRNS) coupled with cognitive training (CT).

tRNS is a non-invasive technique that delivers a weak and painless electrical signal to the brain to enhance activity in regions associated with attention. In the studies, children who received tRNS and CT experienced significant improvements in their ADHD symptoms, working memory, and processing speed, along with changes in their brain activity, which could be linked to the improvement of their symptoms in the long-term.

Two clinical trials have been completed using Novostim 2 at Hadassah Medical Center in children aged 7-12, which showed significant improvement in ADHD symptoms, including a 43% reduction in ADHD symptom severity and overall symptom alleviation.

The trial, over a two-week period, involves 20-minute treatment sessions in which Novostim 2 is used to deliver tRNS over specific regions in the brain associated with ADHD and during which participants engage in attention-based digital games.

For more information on the latest trial, visit ADHDtrial.com

Professor Roi Cohen Kadosh, Head of the School of Psychology at the University of Surrey, said:

"We were thrilled by the success of the previous clinical trials, which brought us one step closer to providing a safe and effective non-pharmaceutical option for children with ADHD. The device's ability to modulate brain activity and enhance cognitive functions may hold the key to long-lasting benefits, potentially reshaping the landscape of ADHD treatment. By harnessing the power of psychology, neuroscience, and technology, we can empower young patients to improve their focus, attention and overall wellbeing. The need continues to grow, and I hope to see this technology become available to many children and their families soon."

Rami Shacour, co-Founder and CEO of Innosphere, adds:

"For decades, stimulant medications have been the cornerstone of ADHD treatment. At Innosphere, we're parents first, driven by a mission to give families more personalized, effective options for their children. With Novostim 2, we're redefining what's possible in ADHD care. We're thrilled to announce sales approval in Israel and eagerly anticipate FDA clearance this year. This is just the beginning, as we explore Novostim 2's potential to complement existing therapies and transform lives."

Image: Professor **Roi Cohen Kadosh**

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ISSN 2753-2771

Surrey Uni Doing the maths on virus transmission

8 February 2025

How prepared are we for another pandemic? Mathematical insights pinpoint lessons on airborne viral transmission

Half a decade on from the start of the COVID-19 pandemic, a study by the **University of Surrey** highlights the significant impact of combined public health measures in reducing airborne viral transmission. High-quality face masks were shown to reduce transmission risk by ninefold, while doubling indoor air ventilation cut the risk by nearly a third, providing valuable insights to support future prevention strategies for respiratory diseases.

In 2020, the world came to a near standstill as rising COVID-19 cases prompted unprecedented lockdowns, travel restrictions and widespread public health measures. The World Health Organization estimates that more than three million deaths were directly attributed to the virus during the first year of the outbreak, underscoring the devastating toll of the pandemic on global health and economies.

To better understand the dynamics of airborne transmission and inform future preparations, **Dr Richard Sear**, Associate Professor at Surrey's School of Mathematics and Physics, explored how the virus spreads during contact and the role of protective measures in reducing risk.

Dr Sear said:

"I've tried to measure how effective strategies, such as mask-wearing, are for the transmission of airborne viruses. This is both for any future pandemic, and for seasonal flu. I combined modelling with data from the UK's NHS COVID-19 app. While these estimates are highly approximate, they provide guidance on the value of measures such as face masks, social distancing and improved indoor air quality, which could be tested in the future."

Factors such as viral load, ventilation and individual susceptibility are likely to influence a significant variability in COVID-19 transmission rates, with some contacts posing a much higher risk than others. These findings highlight the importance of addressing environmental and behavioural factors in public health strategies.

In terms of personal protective equipment (PPE), high-quality face masks, such as N95/FFP2, were found to be particularly effective in reducing transmission risk, decreasing the effective reproduction number for COVID-19 transmission by a factor of approximately nine when worn by the entire UK population. Even individual use of N95 masks can lower transmission risk by threefold, no matter the duration of contact, whereas surgical and cloth masks are much less effective.

Ventilation also plays a critical role in controlling airborne transmission, as viral particles linger in poorly ventilated spaces, compounded by individual behaviours, such as close-contact interactions, speaking or coughing. By doubling the air turnover rate indoors, whether that's through open windows and doors or increasing speed on air conditioning systems, transmission can be reduced by as much as 30%. Complementing good ventilation with physical distancing further minimises the risk.

Dr Sear added:

"The COVID-19 pandemic was terrible for many of us, which is why it's important that we learn from our experiences. It also demonstrated how quickly we can develop and roll out vaccines when faced with a global health crisis. Moving forward, both we as individuals and our leaders have an opportunity to apply these lessons to better control respiratory diseases – not only to head off any future pandemics, but to also manage seasonal diseases such as flu and RSV."

The study has been published in Physical Review E.

Plant-based meat alternatives might be depressing

8 February 2025

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There is mounting evidence suggesting that ultra-processed foods (UPF) are bad for our health, but if you stick to a vegetarian diet, is that still the case? Plant-based meat alternatives (PBMA) are considered to be ultra-processed foods and may be associated with similar harms.

In the first study of its kind, published in Food Frontiers, researchers from the University of Surrey found that vegetarians who consumed PBMAs had a 42% increased risk of depression compared to vegetarians who refrained from PBMAs.

The study analysed data from the UK Biobank and found no notable differences in intake of sodium, free sugar, total sugar, or saturated fatty acids between those vegetarians who ate PBMA and those who did not.

The researchers did find, however, that those who eat PBMAs had higher blood pressure and C-reactive protein (CRP) levels, a marker of inflammation, and lower levels of apolipoprotein A, a protein associated with HDL, a “good” cholesterol; PBMA consumption was, however, also linked to a reduced risk of irritable bowel syndrome (IBS) by 40%.

Professor Nophar Geifman, from the School of Health Sciences at the University of Surrey and senior author of the study, said:

“The overall findings are reassuring, suggesting that plant-based meat alternatives may be a safe option when they are part of an overall balanced diet. However, the potential link between these types of food, inflammation and depression warrants further investigation.”

The study presented some limitations due to the data collected, which was predominantly from a white population in the UK, and dietary information only being gathered at the beginning of the study, not accounting for potential changes over time.

Professor Anthony Whetton, co-author of the study from the School of Veterinary Medicine at the University of Surrey, said:

“Ultra-processed plant-based meat alternatives can be a useful way for people to transition to a vegetarian diet effectively, and that helps with sustainable agricultural practices. Further research, including longitudinal studies and trials with more diverse populations, is necessary to confirm these findings and the relationship between vegetarian foods and mood.”

Surrey first in image AI

8 February 2025

Surrey announces world’s first AI model for near-instant image creation on consumer-grade hardware

A groundbreaking AI model that creates images as the user types, using only modest and affordable hardware, has been announced by the Surrey Institute for People-Centred Artificial Intelligence (PAI) at the University of Surrey.

The model, NitroFusion, represents a world first and has been made open source by its developers – SketchX, a lab within PAI – a move that fundamentally transforms access to AI-enabled image creation models for creative professionals.

Professor Yi-Zhe SonG, Director of SketchX and Co-Director of PAI, said:

“NitroFusion represents a paradigm shift in making AI accessible to everyone, eliminating the need for large compute resources and the long waiting times between prompt and result that are common with most image generation platforms.”

Typically, similar technology is available only to corporate giants with vast computing resources. However, NitroFusion runs on a single consumer-grade graphics card – marking a decisive step forward in bringing advanced AI capabilities to individual creators, small studios, and educational institutions. The almost instant creation of images allows rapid artistic iterations and greater control over the generated imagery.

Dar-Yen Chen, the PhD researcher who helped to develop the project at PAI, said:

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"NitroFusion leverages a novel dynamic adversarial framework that works like a panel of specialised art critics, each evaluating different aspects of the generated image to ensure high quality in a single step. The system's flexible architecture allows users to optionally use between one to four refinement steps, providing direct control over the balance between generation speed and image quality."

Professor SonG added:

"With NitroFusion, we're not just releasing another image generation model – we're pioneering an entirely new approach which democratises AI interaction.

"Following our DemoFusion release last year, which provided a new way to upscale AI-generated images, this innovation further establishes our position at the forefront of making powerful AI technology accessible to all."

This breakthrough delivers multiple leaps for the users and industry:

- Instant image generation that responds as users type – a first in the field – enabling rapid iteration, greater control and better experimentation
- Improved sustainability through greatly reduced energy consumption
- Consumer-grade affordable hardware requirements (e.g. a single high-performance GPU) that mean individuals and small studios can create imagery affordably
- Open-source availability enables global innovation, adaptation and variations
- No cloud dependencies or subscription fees.

Professor Adrian Hilton, Director of the Institute for People-Centred AI at the University of Surrey, said:

"We believe we're the first in the world to achieve interactive image generation at this scale and efficiency. This opens up access to state-of-the-art AI for image generation and is just the beginning of our commitment to democratising creative AI tools. Our Institute will continue to develop open-source, groundbreaking technologies that put professional-grade AI capabilities into the hands of creators everywhere.

"We're particularly proud of the great work that our SketchX Lab, creating new concepts and advancing the science of generative AI. Our research is focused on ensuring that the future of creative AI technology is inclusive, responsible and accessible to all, and we're keen to continue to work with organisations that share this ethos."

The technology is available immediately through https://chendaryen.github.io/NitroFusion.github.io/, with comprehensive documentation and community support resources.

Call to address mental health of health workers

8 February 2025

Only a system-wide overhaul of the NHS that invests in staff wellbeing can address the psychological ill-health crisis amongst healthcare workers, according to research led by the University of Surrey in partnership with the University of Exeter. The research, which is funded by the National Institute for Health and Care Research (NIHR), focussed on nurses, midwives and paramedics who are disproportionately affected by psychological ill-health, which leads to significant consequences for both individual wellbeing and patient care.

The study found that whilst high-pressure environments, heavy workloads, and chronic staff shortages are key drivers of stress and anxiety among healthcare professionals, it is the features of the work environment, such as lone working and career stage, such as being newly qualified, that can be key. The NHS staff survey reports that almost half of all NHS staff reported feeling unwell due to work-related stress in the past year (47%), with many experiencing unrealistic time pressures and inadequate staffing levels.

The researchers identified several key findings, including:

- An underlying blame culture undermines staff psychological wellness by creating a toxic work environment.
- A prevalent "serve and sacrifice" culture prioritises institutional needs over individual wellbeing.

ISSN 2753-2771

- Healthcare professionals often experience moral distress and emotional exhaustion due to the tension between upholding professional values and the realities of clinical practice.
- A more comprehensive approach is needed to address the cumulative effects of workplace stressors rather than only focus on individual-level strategies and acute stressors.
- Developing effective psychological wellbeing interventions for diverse healthcare workers is complex.

Professor Jill Maben OBE, Professor of Health Services Research and Nursing at the University of Surrey, said:

" By addressing these systemic issues, the NHS will not only improve the psychological health of its workforce, but will also enhance the quality of patient care and reduce costs associated with turnover and absenteeism".

A series of recommendations emerged, aiming to improve staff wellbeing and create a healthier workplace culture. First and foremost, prioritising staff wellbeing is crucial. This involves addressing essential needs such as providing access to food and hydration, break rooms, staff parking (including disabled parking), and financial security.

A holistic and collaborative approach to staff wellbeing is also recommended. By focusing on both prevention and intervention, organisations can adopt a systems-level strategy to promote and protect wellbeing effectively.

Other key recommendations include:

- Normalising and proactively managing psychological ill-health: Recognising that psychological stress and burnout are common challenges in healthcare is essential.
- Giving equal consideration to psychological safety alongside physical safety within the healthcare workplace.
- Developing compassionate leaders for the future: Investing in leadership development fosters a compassionate and supportive work environment.
- Fostering a learning culture and encouraging open communication: Creating a psychologically safe environment where staff feel empowered to speak without fear of retribution is vital.

Professor Cath Taylor, Professor of Healthcare Workforce Organisation and Wellbeing, said:

"We have produced a comprehensive guide to assist NHS leaders and staff in implementing our recommendations. This resource provides practical advice on how to address poor psychological wellbeing in nurses, midwives and paramedics to create a more supportive healthcare system, allowing staff to thrive and deliver excellent care for patients".

For more information, and to view the guide, visit: https://workforceresearchsurrey.health/projects-resources/cup2/

This project was supported by the NIHR HS&DR programme with grant number 129528. The views and opinions expressed herein are those of the authors and do not necessarily reflect those of the HS&DR programme, the NIHR or the Department of Health and Social Care.

Surrey academic to lead plastic pollution fight

8 February 2025

Tackling the plastic pollution crisis: Legislation must evolve to address challenges for our climate, ecosystems and human health

Urgent legislative action is needed to stop the imminent threats of environmental harms caused by plastics. To help find solutions, Dr Noreen O'Meara from the University of Surrey has been awarded a prestigious Mid-Career Fellowship by the British Academy to lead vital research that seeks to reshape how we govern the lifecycle of plastics through effective legislation and policy.

Dr O'Meara's project aims to support national, European, and global efforts to combat plastics pollution at a time when negotiations for a Global Plastics Treaty are intensifying. This treaty represents the first international legally binding framework aimed at addressing the plastics crisis, and Dr O'Meara's research will play a crucial role in informing its development and implementation.

Dr Noreen O'Meara, Associate Professor (Reader) in Human Rights, European and Environmental Law at the University of Surrey said:

"Plastics pollution is a toxic contributor to the triple planetary crisis of climate change, ecosystem degradation, and

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environmental pollution. Plastics production accounts for a rising proportion of the global carbon budget, which undermines states' net-zero goals and action under the Paris Agreement to achieve a safer climate. The plastics lifecycle creates serious risks to human rights and human health which must be mitigated in governance efforts to tackle plastics pollution.

"We must mitigate the serious risks to human rights and health that arise from the plastics lifecycle in our governance efforts. This fellowship gives us the opportunity to advocate for a rights-oriented model that not only addresses pollution but also respects human dignity."

With a strong background in EU and European Human Rights Law, Dr O'Meara's research delves into pressing challenges in climate law and environmental justice. She has been actively involved in the Intergovernmental Negotiating Committee (INC), which is working towards finalising the Global Plastics Treaty by mid-2025. As United Nations negotiations resume, her insights will be invaluable as states navigate the complexities of this treaty.

Image: Muntaka Chasant Creative Commons Attribution-Share Alike 4.0 International licence.

X-Ray vision wins Surrey Uni "spin-off" a prize

8 February 2025

Silveray, the digital X-ray film company and Surrey spinout, wins coveted Institute of Physics award with a new approach to X-ray imaging

Innovation in X-ray technology could be key to detecting cancer more accurately than ever before, says the CEO of a startup that has won this year's Institute for Physics Business Startup Award.

Silveray, a spinout from the University of Surrey, has invented a flexible, reusable, and cost-effective Digital X-ray Film (DXF) that is transforming industrial radiography for weld inspection. In the long term, the ground-breaking technology offers the promise of more accurate diagnostic X-ray imaging at lower radiation doses for earlier and more accurate tumour detection, leading to better patient outcomes.

Silveray's nanoparticle-based material for X-ray imaging is made of a semiconductor ink that is coated on to a flexible electronic backplane with pixels that captures the X-ray image. Unlike the current X-ray market status quo, Silveray's technology enables enhancements in image quality on a physically flexible medium at a cost-effective price point.

Dan Cathie, CEO and Co-Founder of Silveray, said:

"The X-ray imaging sector has seen relatively few revolutionary innovations since the advent of digital imaging. Our vision at Silveray is to develop technology that disrupts this way of thinking by creating financially sustainable, reusable, physically flexible Digital X-ray Film (DXF).

"We know there is more to be done but this award from the Institute of Physics is a recognition of the valuable potential of our technology for the industrial non-destructive test (NDT) market. Furthermore, our vision is to become game changers for mammography and other areas of X-ray imaging with our high-sensitivity, high-resolution, Digital X-ray Film invention.

"This award comes as fantastic recognition for the team at Silveray following the close of our recent funding round, led by Northern Gritstone."

Silveray was founded in 2018 by Professor Ravi Silva, Director of the Advanced Technology Institute (ATI) at the University of Surrey. Since then, Silveray and the ATI have painstakingly worked on the technology that incorporates high-Z elements (heavy atoms known for their ability to absorb X-rays) into semiconductor polymer materials, creating flexible X-ray detectors that are both sensitive and adaptable to curved surfaces.

Professor Silva said:

"Traditional indirect conversion X-ray detectors are stiff, costly, and inherently force a trade-off between image quality, speed, and dose, but our innovation at Silveray changes that.

"Our direct conversion technology is flexible, reusable, and closely mimics human tissue, making it perfect for medical uses like accurate diagnosis for early tumour detection. Because it doesn't require complicated processing, this could make a real difference in improving medical X-ray imaging and radiotherapy."

Image: the Silveray team with the IoP award.

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12th February 2026 weekly

ISSN 2753-2771

Surrey strategist secures stardom in Space Science

8 February 2025

Renowned astrophysicist Professor Adam Amara, Director of Space Strategy and Head of the School of Mathematics and Physics at the University of Surrey, has been appointed as the UK Space Agency's (UKSA) new Chief Scientist.

While remaining at Surrey, Professor Amara will split his time between his space strategy role at the University and his new role at the UKSA, in which he'll offer independent expert advice and strategic guidance on all scientific areas within the Agency's remit.

Professor Amara said of his appointment:

"I am honoured to be appointed as the UK Space Agency's Chief Scientist during such an ambitious and exciting time for the UK's space industry and its contributions to the UK economy. My role is to work with the space community across academia, government, and industry to ensure the UK seizes the opportunities ahead."

Professor Amara will now oversee a broad range of disciplines, including astronomy, astrophysics, planetary science, solar physics, space weather, lunar and Mars exploration, International Space Station experiments, and Earth and climate science. In addition to building relationships across the UK space community, Professor Amara will also be working closely with global agencies, including the European Space Agency (ESA) and NASA, to promote the UK's space priorities.

Professor Tim Dunne, Provost and Senior Vice-President at the University of Surrey, said:

"I want to congratulate Adam on this exciting opportunity to lead the UK Space Agency's scientific work. His appointment highlights the University of Surrey's lasting strength and rich heritage in space sciences, centred on the discoveries, innovation and industrial impact of the Surrey Space Centre."

The Surrey Space Centre, founded in 1979 by Professor Sir Martin Sweeting, pioneered small satellite technology, which is credited with changing the economics of space and laid the foundations for much of today's space industry. The Surrey Space Centre led to the creation of the hugely successful spin-out company Surrey Satellite Technology Ltd (SSTL) in 1985.

As we look to the future, Surrey has ambitious plans for Professor Amara and his outstanding team of researchers and educators, to once again propel the institution to the frontier of space science.

Surrey Uni to research mono-syllabic complexity

8 February 2025

The University of Surrey is part of an international team of researchers that has been awarded £8.3 million to better understand human language by researching one of the world's most complex linguistic systems.

Thanks to a prestigious Synergy Grant from the European Research Council, the project will explore the West Nilotic languages of East Africa. These languages are able to pack more information into a single syllable than any other known language family. Exactly how such systems could have evolved remains a mystery.

The project brings together experts from the Surrey Morphology Group, the University of Edinburgh, and France's CNRS, in partnership with institutions in the USA, and will engage stakeholders in South Sudan, Ethiopia, and Kenya to ensure wide-reaching impacts, including literacy initiatives.

Professor Matthew Baerman, who leads the project at the Surrey Morphology Group at the University of Surrey, said:

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"Our aim is to discover how West Nilotic languages evolved structures of such complexity, and just as importantly, why other languages did not. It's a puzzle that could reshape how we think about the cognitive limits of human language."

The team's approach combines traditional fieldwork with cutting-edge experimental techniques to reconstruct the historical evolution of these languages. The findings promise to have far-reaching implications, offering new insights into the possible and impossible in human language evolution.

Professor Erich Round, Research Centre Leader of the Surrey Morphology Group. said:

"The Surrey Morphology Group has carried out world-leading research into the wonders of human language for over thirty years. We are delighted to have secured our second major grant from the European Research Council in two years, and our third since the Council's establishment in 2007. Most of all, we're thrilled to bring to the world's attention some of humanity's most astounding and illuminating linguistic systems."

Professor Baerman continued:

"The languages we find in the world today represent just a small fraction of what must have existed over the course of history, meaning much remains to be discovered about the full potential of human language. West Nilotic gives us the means to uncover this potential."

Faces and People (Sudan) a west-Nilotic language

License details

Surrey student satellite stars

8 February 2025

Meet DARWIN – the award-winning, small satellite that could detect and track wildfires, built by students from the University of Surrey.

Surrey's Peryton Space team has won the prestigious UK Students for the Exploration and Development of Space (UKSEDS) satellite design competition, beating teams from around the country for the second year in a row.

DARWIN – also known as Detection, Analysis and Research for Wildfire Investigation Network – is just 10cm x 10cm x 30cm.

Team leader Mya White, who recently finished the second year of her BEng degree in Aerospace Engineering and who has started a year-long industry placement, said:

"We used a thermal camera to detect heat spots and an optical camera to determine distance so that we could calibrate th e temperature readings. We also wrote software to split the area we monitored into a grid so we could pinpoint exactly wh ere the simulated fires were."

Peryton Space also enjoyed success at other UKSEDS competitions.

They won the In-Orbit Servicing and Manufacturing competition, which gives students experience in mission design, engineering, business development, and other industry-relevant skills.

Peryton students came second at the competitive Mach-24 rocketry competition, where their high-powered rocket reached an altitude of 2.5km, Peryton's highest rocket launch to date. It successfully launched and deployed the CanSat built by the team.

Away from UKSEDS, Peryton Space also won an award for the best presentation at the Race2Space National Propulsion competition, which challenges students to design, manufacture and test rocket engines.

Harvey Nixon, who leads the research and development branch of Peryton Space and who is studying for an MSc in Space Engineering at Surrey, said:

"We are delighted with our 2024 results and really proud of the team at the University of Surrey's Peryton Space. On our team, there are students of all backgrounds and disciplines, which ensures we have a range of expertise, and our members get invaluable experience ready for careers in the space sector.

"Some members of Peryton Space are working on the Jovian-1 satellite project here at the University of Surrey. This involves collaborating with industry professionals and students from partnering universities and applying the skills learnt

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from Peryton Space to working on a space-bound project."

Art, culture, and science collide in Surrey

8 February 2025

This November, the **University of Surrey** will open its doors to the public as it hosts two prominent research festivals: the **Being Human Festival** and the ESRC Festival of Social Science. As part of the Being Human Festival, the UK's only national festival dedicated to the humanities, Surrey will explore key themes related to identity, culture, and the human condition. This year's festival features a number of intriguing events, including:

- Landmarking through Music: Early Recordings Revealed: Listen to early recordings as heard by your great-grandparents! Connect with early 20th century music through wax cylinders and develop an understanding of their role within society at the time.

- Poetry Play! Performances and Workshops: Think you might be a poet? Do you love poetry? Or maybe you just don't get it. Are you puzzled or excited by the weird ways words work in poems? If you appreciate the power of language, we made this for you.

- Landmarking Surrey's Musical Heritage: Dame Ethel Smyth: Dame Ethel Smyth was a pioneering composer of the late nineteenth and early twentieth centuries, a prolific author of biographical writing about herself and others, a leading suffragette, and for the majority of her life a resident of the county of Surrey.

Running concurrently is the ESRC Festival of Social Science, which focuses on the real-world impact of social science research. This year's festival at Surrey tackles a wide range of urgent societal issues, including:

- Green Means Go? Tackling Surrey's climate emergency through deliberative democracy: Discover the latest sustainability-focused research and innovation initiatives being led by the University of Surrey.

- Bridging Digital Divides: Building dialogue on online safety between youth and parents: Discover what the evidence really says about young people's digital lives and the challenges of online safety, parenting and digital citizenship.

- The Role of AI in Modern Policing: Key topics will include risk assessment, facial recognition, robotics, data mining, and cybercrime detection, offering a deep dive into the current applications of AI in policing.

- Eco-Logic: How Can We Make Green Living Easy? Discover surprisingly simple strategies that transform your daily routine into a sustainable one, without sacrificing comfort or convenience.

Professor Annika Bautz, Pro-Vice-Chancellor and Executive Dean of the Faculty of Arts, Business and Social Sciences said:

"Both festivals are designed to be interactive, accessible, and thought-provoking. They offer attendees the chance to engage directly with cutting-edge research in ways that are relevant and relatable to all aspects of life. From workshops that let you create your own art or stories to expert panels exploring societal challenges, the festivals are an invitation to explore, question, and rethink the world around us.

"Whether you're passionate about the arts and humanities, curious about the social sciences, or simply looking to engage in meaningful conversations, these events offer something for everyone. The University of Surrey is proud to be a hub for these conversations, and we invite the public to participate in these exciting and enriching festivals."

Key dates:

- ESRC Festival of Social Science: 19 October – 9 November 2024

- Being Human Festival: 7–16 November 2024

ISSN 2753-2771

For more information, a full list of topics and events, and to book your free tickets for any of the events, please visit: https://buytickets.at/universityofsurrey3

Surrey scientists invite children to reach for the stars

8 February 2025

Children need to dream big and reach for the stars to become the country's future space engineers and budding astronauts, say the organisers of Guildford's World Space Week High Street Takeover.

Scientists from the University of Surrey and the Institute of Physics are encouraging young people, who may one day want to build the rockets and technology that make their way to space, to join them at Guildford High Street and Tunsgate Quarter, all day on Saturday, 5 October.

Event-goers will have the chance to get up close and personal with a miniature version of the Mars Rover and find out how it works on Mars; thanks to the Observatory Science Centre, there will be a state-of-the-art pop-up planetarium. Researchers from Surrey will be on hand to showcase the range of fascinating space-based work taking place at the University, and employers from the local space sector will be on hand to answer any questions that young people may have about working in the field.

Professor Adam Amara, Head of the School of Mathematics and Physics at the University of Surrey, who is also an astrophysicist, said:

"Our primary goal as educators is to inspire people – and that is why our University is delighted to once again host this event with our partners from the Institute of Physics.

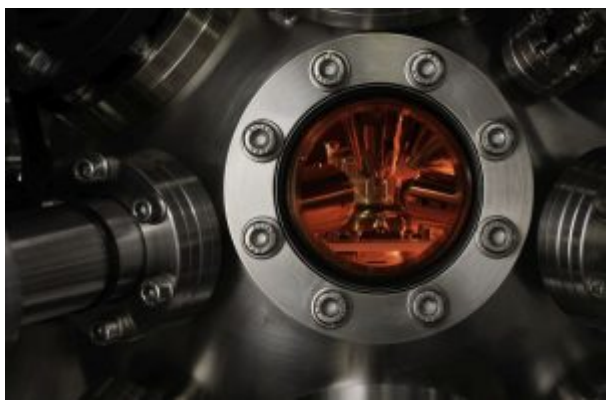
"The space sector in our region is a truly exciting, forward-thinking place and the goal of events like this is to ensure that the sector has a pipeline of skilled young people who dream big and reach for the stars."

For more information on other activities happening at the World Space Week High Street Takeover, visit our website.

Image: credit: Grant Pritchard / University of Surrey

Surrey Uni joins top beam team

8 February 2025



The creation of a first-of-its-kind imaging system at the **University of Surrey** could help the UK lead a revolution in materials sciences. The new facility promises a better understanding of the effects of pharmaceuticals and could eventually lead to better drug development.

Thanks to a £3 million grant from the Engineering and Physical Sciences Research Council, Surrey will work with the UK SME Ionoptika and the University of Manchester to deliver a new Multimodal Ion Beam Imaging Facility, which will allow researchers and businesses to understand materials at an unprecedented microscopic level.

Professor **Melanie Bailey**, Principal Investigator of the project from the University of Surrey, said:

"The fact that Surrey and, indeed, the UK has the ambition to build this truly unique facility should not only excite researchers in academia and industry, but it signals that we are serious about breaking new ground in a range of scientific areas."

12th February 2026 weekly
ISSN 2753-2771

The facility will house a “multimodal 3D elemental and molecular imaging system at a sub-micron scale”. This highly advanced system, similar to a powerful microscope, will be able to see the tiniest details of materials and molecules, smaller than a speck of dust.

The new system will be the first in the world to use beams of charged particles at high and low energies to measure biological systems and materials. The high-energy beams will be delivered by a particle accelerator at the UK National Ion Beam Centre, a national research facility funded by EPSRC and led by Professor **Roger Webb** at Surrey. The system will produce X-rays, gamma rays, and particles, and the combination of this information will give a detailed map of the elemental and molecular makeup of materials.

Professor Roger Webb, co-investigator of the project and Director of the Surrey Ion Beam Centre, said:

“This is a really exciting development for the Surrey Ion Beam Centre. We have been a national research facility since 1979, and we support over £100 million in funding from more than 30 universities. This is one of several upgrades to our centre, and we are looking forward to opening our doors to researchers across the UK to make the most of this investment.”

Surrey’s new facility is expected to benefit more than 25 UK universities and companies in health, energy, technology, and engineering.

Professor **Paul Townsend**, co-investigator of the project, said:

“There is currently nothing in the world quite like this new facility of ours. It signals to the global scientific community that the UK means business. We are confident that we will attract researchers worldwide to use this facility, giving the UK an edge in materials science.”

Along with medical breakthroughs, Surrey’s researchers believe the facility could help the energy sector create more efficient solar cells and durable batteries. The team also hopes this project will allow them to understand pollutants better and develop new ways to reduce climate change.

Paul Blenkinsopp, Managing Director of Ionoptika, said:

“Ionoptika is delighted to have been chosen to build the new imaging system in collaboration with Surrey. Whilst an SME, we have established ourselves as global experts in ion beam technology over the past 30 years and will be very proud to bring our decades of imaging expertise to this unique facility.”

This project contributes to the United Nations Sustainable Development Goals (SDG), especially SDG 3 (Good Health and Wellbeing), SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).

Image of Ionoptika’s J105