JOURNAL OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE
ALL-PARTY PARLIAMENTARY GROUP

SCIENCE IN PARLIAMENT
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AUTUMN 2025

AUTONOMOUS INNOVATION

Re-imagining UK pubic services

The Parliamentary and Scientific Committee is an All-Party Parliamentary Group funded by Membership.

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Published by Parliamentary and Scientific Committee.
Correspondence to: karen@scienceinparliament.org.uk.
Published four times a year.
Editor: Leigh Jeffes, leigh.jeffes@scienceinparliament.org.uk
Design: Moncrieff & Co
Printed by Premier Print Group Ltd

SUBSCRIPTIONS

The 2025 subscription rate is £80. Single numbers £20.

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SCIENCE DIARY

Forthcoming discussion meetings

■ Monday 13th October 2025
DISCUSSION MEETING
Delivering the Industrial Strategy
In partnership with the Institution of Chemical Engineers
5.15pm to 6.30pm, Palace of Westminster
Chairman's Reception 6.45pm to 7.30pm, One Parliament Street

■ Monday 1st December 2025
DISCUSSION MEETING ONLINE
In partnership with the Centre for Climate Change, UCL
5.00pm to 6.00pm, online

■ Tuesday 20th January 2026
DISCUSSION MEETING
In partnership with the Newcastle Upon Tyne Hospitals NHS Foundation Trust and Newcastle University
5.15pm to 6.30pm, Palace of Westminster
Chairman's Reception 6.45pm to 7.30pm, One Parliament Street

EDITOR'S NOTE

The Parliamentary and Scientific Committee is delighted to welcome the following members who have joined us over recent months:

Parliamentary:
Ben Coleman MP
Julia Lopez MP (Shadow Secretary of State for Science, Innovation and Technology)
Lord Oates

Learned Societies/Universities:
Society for Endocrinology
Liverpool John Moores University

Individual:
Dr Stephen Byard
Joseph Greaves
Professor Virginia Murray
Dr Radouane Oudrhiri
Sylwia Wasiak

My thanks to all who have contributed to this Autumn edition of the journal.

Please can I ask members to promote STEM for BRITAIN 2026, our annual competition for Early Career Researchers, through your various networks and channels?
www.stemforbritain.org.uk

Many thanks,
Leigh

ISSN 0263-6271

George Freeman FRSA MP
Chair, Parliamentary & Scientific Committee

As I write on 21st September, the equinoctial winds are blowing and the weather changing – bang on time. A reassuring reminder of the reliable primacy of the planetary order in an era of tumultuous global geopolitical chaos.

We live in extraordinary times: as the planet faces existential challenges in climate, energy, biosecurity and agriculture, which demand huge deployment of science and capital to accelerate the discovery and development of technologies to meet the grand challenges, we see an American president trumpeting isolationism, protectionist tariffs, anti-science climate denial and withdrawal from a global stage in which the Chinese, Russians and Iranians are only too willing to replace a retreating West.

We are now at war in Europe. My teenage niece recently asked me nervously if we will see another world war. I explained that we are already in it – but because it's being fought in Eastern Europe, the Middle East and South China Sea, with satellites, drones and cyber-attacks, industrial espionage and Intellectual Property theft, energy and biosecurity supply threats it doesn't look like the wars in the old movies. But it's nonetheless real.

Which is also creating a new demand surge for defence science and technology – just as that which led to the creation of the P&SC in the 1940s as Churchill and Beaverbrook mobilised Science and Technology for the war effort.

For all the risks – there are also real opportunities for the UK to seize the opportunity to be a globalist convenor of allied nations who aren't and don't want to be members of the Beijing Brussels or Washington trading bloc: Canada, Norway, Switzerland, India, Japan, Singapore, Australia, New Zealand. We could mobilise a powerful New Commonwealth of countries still committed to defending the planet and the science. Research technology and innovation we all need for our shared security.

That's why as Minister of State for Science I headed straight to these nations to negotiate deeper Science + Technology collaborations.

And why as Trade Envoy to Singapore, Malaysia Brunei and Philippines I continue to push for deeper UK S&T partnerships.

Post-Brexit Britain has to define a new role in a dangerous new world.

Science and Technology are more vital than ever. Which makes the work of the Parliamentary & Scientific Committee even more vital.

We commenced our Autumn programme of discussions on 9th September when I was privileged to chair a wonderful meeting on 'Quantum Technlogies', with Professor Sir Peter Knight FRS and other distinguished speakers. Enormous thanks to the Institute of Physics for partnering with us in this event. We look forward to the 13th October and 17th November in cooperation with the Institution of Chemical Engineers and the National Measurement Laboratory at LGC, respectively.

I look forward to seeing you at the forthcoming AGM when I'm delighted to report that Sam Carling MP and I will be swapping roles, with Sam taking over as Chair and me stepping aside to become Co-Chair.

Very best,

George

SCIENCE IN PARLIAMENT
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Journal of the Parliamentary and Scientific Committee (All-Party Parliamentary Group)

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Science in Parliament has two main objectives:

Inform the scientific and industrial communities of activities within Parliament of a scientific nature and of the progress of relevant legislation

Keep Members of Parliament abreast of scientific affairs

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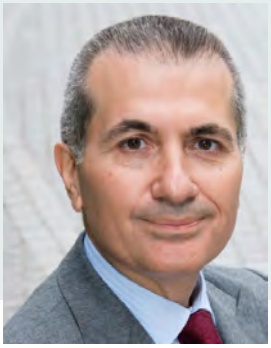

Professor Sam Medhat PhD MPhil CEng FIET FRAeS FRSC FCIM FCMI FRSA FIKE FIoD FIRL
Chief Executive, Institute of Innovation & Knowledge Exchange
Visiting Professor of Innovation and Digital Transformation, University of Westminster

Over the past 18 months, generative-AI agents, robotics and real-time digital twins have shifted the frontier from digital to autonomous public services. Governments are discovering that autonomy is no longer a moon-shot add-on but a cost-effective operating model.

Autonomous innovation – systems that can perceive, reason and act with minimal human intervention – is rapidly moving from laboratory pilots to mainstream operations inside UK public services. Where first-wave e-government digitised forms, new wave delegates an ever-larger slice of perception, reasoning and action to machines, while keeping humans in-command. Generative AI assistants draft procurement files, sensor-linked drones carry out bridge inspections, and city-scale twins simulate policy choices overnight.

Over the past two years the Government has tested large-language-model (LLM) 'copilots' with 20,000 officials, launched an AI Safety Institute, funded live autonomous-bus routes, and begun exploring national-scale digital twins for health and infrastructure. This article summarises the latest evidence, offers a detailed case study of the Civil Service 'Humphrey' AI suite, and proposes organisational models that could be considered as autonomy reshapes how the state is run.

A changing policy landscape

The UK has positioned itself as a 'safe-but-swift' test-bed for advanced autonomy:

Strategic leadership – the AI Safety Institute, the world's first state-backed frontier-model evaluator, launched in January 2024, signals the UK's intent to couple rapid deployment with rigorous risk science[1].

Responsible-use frameworks – the Central Digital & Data Office (CDDO) refreshed its Data Ethics Framework in March 2025, providing cross-Government guard-rails on transparency, accountability and fairness for AI projects[2].

Productivity mandate – Cabinet Office modelling suggests that generative AI could automate up to 41% of routine public-sector tasks – freeing roughly £45 billion by 2030[3].

Examples of world adoption patterns

The pilots outlined in the Table below show that autonomy is no longer a moon-shot add-on but an emerging default operating model for public services.

Trend	Public-sector use case	Why it matters (2025 view)
Generative AI copilots	Tokyo[4], Portugal[5] and Kelowna[6] civil-service teams use 'Copilot-style' assistants for citizen correspondence, code generation and benefits triage.	Early pilots show 30–60% cycle-time cuts on high-volume knowledge tasks.
Back-office Automation Surge	13–14% of OECD enterprises – and 39% of large firms– now deploy AI in core ops; Nordic public sectors exceed 25% adoption[7].	Adoption doubled in one year, widening capability gaps between leaders and laggards.
Urban digital twins (UDT)	Barcelona[8], Bologna[9] and Munich[10] run live UDT platforms that replay traffic energy and climate scenarios every hour.	Allows planners to test policies before spending, cutting modelling costs by 40%.
Autonomous public-works robots	EU PIPEON sewer-inspection robots kick off[11]; a market report charts 2025–35 growth[12]; Florida waste-management installs WatchBot™ patrols[13].	Robotics slashes human exposure to hazards and is forecast to lift waste-sector productivity by 20% this decade.
Driverless public transport pilots	Helsinki begins public trials of a driverless bus[14]; UK CAM Pathfinder funds bus pilots for 2026[15]; Singapore forms a committee to scale AV deployment[16].	Real-world data on safety and rider behaviour accelerates standards and insurance models.
Risk-based AI regulation	EU AI Act bans "unacceptable-risk" uses from February 2025 and fast-tracks innovation sandboxes[17].	Sets the compliance playbook others are copying, balancing trust and speed.
Geo-political deployment race	China prioritises AI application-at-scale (e.g., crime prediction dashboards, smart infrastructure)[18] versus the US model of pure frontier-model R&D issued by the White House America's AI Action Plan[19].	Signals that public-sector implementation capability is becoming a strategic asset.

Using AI and drones for bridge inspection

CASE STUDY – Humphrey: generative AI in the UK Civil Service

Humphrey shows that early productivity gains arise primarily from low-risk administrative tasks; the next frontier is policy simulation, where stakes around accuracy and accountability rise sharply:

Scope – a suite of LLM-powered assistants (Redbox, Consult and Lex) gradually rolled out across Whitehall.

Pilot cohort – 20,203 officials in 34 departments (Jan–Apr 2025).

Tasks automated – email summarisation, consultation analysis, benefits-case drafting.

Headline results – 26 minutes average daily saving, equivalent to ≈1,130 full-time equivalents annually; 82% of users reported higher job-satisfaction, while 9% flagged accuracy concerns around policy nuance.

Governance features – human-in-command override; token-level audit logs stored for five years in the Government's Secure Cloud; vendor-agnostic model-switching to avoid lock-in.

Near-term horizon (2025–2030)

Agentic 'mission pod – low-code platforms will let agencies spin-up specialised AI agents (e.g., tax-fraud hunters, permit reviewers, emergency-response coordinators) that learn and act continuously.

Policy-as-code feedback loops – sensor streams feed AI models that rewrite 'micro-regulation' nightly (e.g., dynamic congestion pricing), with elected officials approving deltas.

Swarm robotics for maintenance – fleets of ground and aerial bots will patch potholes, inspect sewers and clear debris autonomously after storms11.

Federated civic model – national 'sovereign models' fine-tuned on sensitive administrative data coexist with open-source community models, orchestrated through secure enclaves.

Quantum-boosted optimisation – pilots in revenue forecasting and grid management plug quantum annealers into AI agents for real-time scenario search.

Reimagined operating models for UK Government

In the UK there is a strong intent to convert the promise of autonomy into repeatable, accountable public value. The Table overleaf shows examples of patterns of newly reimagined operating models.

Challenges and possible actions

Digital skills gap – establish and launch a National AI Fellowship for mid-career civil servants, linking each fellowship project to a live departmental transformation goal.

Vendor concentration – bake open-standards APIs and independent model-audit rights into every AI procurement framework (e.g. the upcoming G-Cloud 14).

Ethical assurance – enact an Algorithmic Register covering all high-impact public-sector models, building on CDDO's ethics hub.

Regional inequality – create an "AI-as-a-Utility" marketplace through which smaller councils can procure shared autonomous capabilities.

Implementation guardrails

Human-in-command governance – pair every autonomous agent with an accountable official

Audit-by-design tool-chain – bias tests and red-team drills embedded in CI/CD pipelines.

Model pluralism – contractual right to hot-swap between GPT-4o, Claude 5 and Gemini 3 mitigates single-vendor risk.

Examples of patterns of newly reimagined operating models

Model	How it works	What it unlocks
Autonomous Service Cells (ASC)	Each high-volume service (licensing, benefit , tax refunds) wrapped in a bounded micro-agent that owns data ingestion → reasoning → action, supervised by a civil-servant "mission owner".	24/7 responsiveness, traceable decisions, plug-and-play upgrades.
Civic Digital-Twin Platform (CDTP)	A shared, GPU-accelerated twin spanning mobility, utilities and climate; agencies publish APIs, and AI agents run policy 'A/B tests' before roll-out[8 9 10].	Evidence-based budgeting and faster multi-agency coordination.
Adaptive Policy Loop (APL)	Edge sensors stream data to an AI policy engine that proposes rule tweaks; elected officials approve via a dashboard; changes go live automatically.	Shifts regulation from static to living, improving outcomes in weeks not years.
Swarm-as-a-Service (SaaS-Robotics)	Councils subscribe to a robot fleet marketplace (road-mending drones, refuse bots, park mowing, surveillance). Procurement handled by autonomous contracting agents[13].	Converts cap-ex to op-ex, broadening access for smaller councils.
Federated Procurement Copilot	Large-language-model agent ingests framework contracts, market prices and ESG rules to draft tenders and live-score bids for bias/compliance.	Cuts procurement lead times by >50% and reduces protest risk.
Public AI Operations Centre (AIOps-Civic)	Cross-Agency Command Hub monitors all autonomous assets (software, drones, robots), with real-time model-risk dashboards and a 'kill switch'.	Centralises assurance, incident response and citizen transparency.

Regional levelling mechanism – shared-service marketplaces to prevent a two-speed public sector.

Conclusion

Autonomous innovation is no longer a fringe experiment; it is fast becoming the default way governments Sense, Decide and Act. Today, leaders treat autonomy as an 'Organisational Redesign' challenge, not just a tech upgrade. By piloting the models above – guarded by robust governance – public sector administrations can move from incremental digitisation to truly adaptive, evidence-driven government. Select Committees could commission an annual "State of Autonomy" Report to track impact, ethics and regional equity, ensuring that technological progress deepens – rather than dilutes – democratic accountability.

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When systems crash:

How AI can help prevent widespread service failures

Roger Brown
Chief Consultant Officer – Technology,
CGS Global Services

Technology failures and cyber breaches increasingly intersect, threatening service continuity and public trust. We explore how Artificial Intelligence (AI) can enhance detection, response, and resilience, helping organisations prevent disruptions and recover faster.

The global impact of large-scale IT incidents

Several recent large-scale IT incidents have demonstrated the profound impact of technology infrastructure failures on daily life, affecting individuals, businesses, and public services across the UK and globally. These disruptions illustrate the critical role of IT systems in maintaining the smooth functioning of modern society – and the significant consequences when they fail (Box 1).

Collectively, these incidents emphasise that the resilience of IT infrastructure is not a niche technical concern but a foundational element of business continuity, public safety and societal stability. As technology becomes more embedded in everyday operations, organisations and governments must prioritise robust system design, continuous monitoring and proactive incident response to minimise the risk of widespread disruptions and ensure technology serves as a reliable enabler rather than a point of vulnerability.

Common causes of IT outages

IT outages often result from a combination of technical, human, and environmental factors. Understanding these root causes is essential for building resilient systems and minimising service disruptions. Below are the primary contributors to outages:

1. Hardware failures: Overheating, power faults, or storage malfunctions can interrupt services.

2. Software issues: Bugs, misconfigurations, and compatibility problems cause crashes and downtime.

3. Network failures: LAN/WAN issues, DNS failures, and traffic overloads disrupt connectivity.

4. Cybersecurity incidents: DDoS attacks, malware, ransomware, and breaches often lead to loss of data and shutdowns.

5. Power outages: Instability or natural disasters can overwhelm backup systems.

6. Human error: configuration or patching mistakes in can trigger failures.

7. Vendor issues: Cloud or third-party platform failures can cascade across services.

8. System overload: Traffic spikes and resource constraints degrade performance.

9. Maintenance errors: Poorly managed updates can introduce new issues.

10. Environmental factors: Poor data centre conditions or disasters can cause outages.

AI can play a key role in monitoring these factors in real-time, predicting failures, and enabling faster recovery.

Industry technology change

Organisations across industries face pressure to deliver seamless, reliable services in an environment where technology failures can rapidly escalate into widespread disruptions. Understanding the factors that drive successful technology change is critical to building systems that are not only efficient but resilient in the face of complexity and scale.

BOX 1: Cases of large-scale IT incidents

Microsoft Azure and CrowdStrike Falcon incident (July 2024)
A faulty update triggered widespread Windows device failures, disrupting healthcare, finance, and transport, and costing billions in lost productivity. It revealed the risks at the intersection of cybersecurity tools and cloud operations

Royal Mail cyberattack (January 2023)
A ransomware attack halted UK international mail services, exposing critical infrastructure vulnerabilities and emphasising the need for robust cybersecurity in essential services.

NHS IT outages
Ransomware and technical failures delayed appointments and disrupted hospital communications, demonstrating how IT failures directly impact patient care.

COVID-19 phishing and ransomware attacks
The shift to remote work exposed vulnerabilities, leading to a surge in targeted attacks, particularly against healthcare and critical infrastructure.

Facebook (Meta) global outage (October 2021)
A configuration error took Facebook, WhatsApp, and Instagram offline for six hours, disrupting communication for billions globally.

UK online banking fraud surge (2021)
A pandemic-driven rise in online banking led to a 117% increase in fraud, as cybercriminals exploited system gaps and digital illiteracy.

A consistent challenge for many organisations is the gap between strategic ambition and operational execution. While technology transformation projects often begin with clear goals, they frequently encounter misalignment between leadership expectations and the realities of implementation. Unclear objectives, poor stakeholder engagement, and inadequate change management are common contributors to delays, budget overruns and underperformance. Rigid project methodologies and a lack of adaptability further exacerbate these issues, leading to inefficiencies that can undermine the stability of critical services.

The rapid pace of technological advancement adds to this complexity. New systems are often adopted without fully assessing their long-term implications, resulting in fragmented infrastructures that are difficult to maintain and quick to become obsolete. This environment demands continuous adaptation and proactive planning to ensure technology investments contribute to long-term resilience rather than future vulnerabilities.

AI offers a powerful tool in addressing these challenges, particularly in preventing system failures before they disrupt services. AI can monitor vast amounts of operational data in real-time, identifying anomalies and predicting potential failures before they occur. It can help organisations prioritise maintenance, optimise resource allocation and streamline incident response, reducing downtime and mitigating the ripple effects of system outages. Additionally, AI-driven insights can inform decision-making, enabling leaders to address underlying structural issues rather than repeatedly responding to symptoms of failure.

However, while AI has the potential to enhance resilience, it is not a universal solution. Over-reliance on AI without a clear strategy, coupled with challenges around ethics, data privacy, and workforce integration, can limit its effectiveness. AI should be viewed as part of a broader resilience framework, complementing strong leadership, transparent communication, and adaptive project management practices.

Preventing widespread service failures requires a holistic approach. Organisations must take a long-term view, continuously refining strategies and systems to minimise risk while maximising the value delivered to users. By investing in the right combination of technology, talent, and processes—and by learning from past disruptions – organisations can build systems that are capable of withstanding shocks and recovering quickly, ensuring that technology serves as a driver of stability rather than a source of disruption.

AI, when integrated thoughtfully, can play a pivotal role in this journey, transforming the way organisations predict, prevent, and respond to system failures. In doing so, it enables technology to fulfil its promise: supporting growth, reliability, and trust in an increasingly complex world.

How AI can minimise technology change failures in the UK

AI can play a pivotal role in reducing technology change failures across UK industries by leveraging predictive analytics, automation, and informed decision-making to address common challenges.

Risk assessment and prediction

- Change impact analysis: AI tools can analyse historical and real-time data to predict risks associated with technology changes, identifying potential points of failure before implementation.
- Scenario modelling: AI can simulate "what-if" scenarios to forecast the impact of new technologies or updates on existing systems, enabling proactive mitigation planning.

Improved decision-making

- Data-driven insights: By identifying patterns from previous transitions, AI can recommend optimal implementation strategies, reducing the likelihood of repeating past mistakes.
- Stakeholder analysis: AI can prioritise stakeholders affected by changes, supporting targeted communication and engagement to enable smoother transitions.

Automation of testing and deployment

- Automated testing: AI can conduct thorough testing to detect bugs and compatibility issues before deployment, reducing the risk of post-implementation failures.

BOX 2: Example sectors in the UK

Healthcare: Facilitating the rollout of electronic health records, AI diagnostic tools, and digital infrastructure while ensuring data integrity and continuity of care.

Finance: Enabling secure payment system migrations while minimising downtime.

Public sector: Enhancing the success of IT system upgrades and data-sharing initiatives across government departments to improve service delivery.

- Continuous Integration and Deployment (CI/CD): AI can automate repetitive deployment tasks, identify potential roadblocks, and optimise pipelines to accelerate delivery while maintaining quality.

Enhanced change management

- User readiness assessment: Using sentiment analysis and behavioural data, AI can evaluate user readiness for adopting new systems.
- Tailored training: AI can personalise training content based on team and individual needs, improving user adoption and system utilisation.

Proactive monitoring and support

- Real-time monitoring: AI can continuously monitor performance during and after implementation, detecting anomalies and resolving issues before they escalate.
- Virtual support tools: AI-powered chatbots and virtual assistants can provide instant user support, reducing downtime during transitions.

Cost and time optimisation

- Resource allocation: AI can predict where resources will have the greatest impact, ensuring optimal deployment across projects.
- Project scheduling: By forecasting potential delays, AI can refine project timelines, improving the likelihood of on-time delivery.

Regulatory and compliance assurance

- Policy alignment: AI can evaluate technology changes against UK regulations, such as GDPR, ensuring compliance and reducing legal and financial risks.

By leveraging AI effectively, organisations across many sectors in the UK (Box 2) can reduce the complexity, risks, and costs associated with technology change initiatives. This leads to more resilient, successful transformations and ensures that technological advancements translate into tangible improvements in service delivery and user outcomes.

Understanding the challenges of technology change delivery

Research across industries consistently reveals a gap between the intended outcomes of technology transformation and the results achieved. Many organisations embark on ambitious digital projects with high expectations, only to encounter roadblocks that lead to delays, budget overruns, or underwhelming outcomes.

A major issue is the absence of a streamlined, well-defined process for managing technology change. Organisations often struggle to set clear objectives and realistic timelines, underestimating the complexities of legacy systems and the true scope of resources required. This underscores the need for a structured roadmap to guide technology change, ensuring that all stakeholders understand the process from initiation to completion.

People and cost-related challenges also significantly impact technology change delivery. Resistance to change within the workforce can slow the adoption of new systems, particularly when employees receive insufficient training or communication about the benefits and practical implications of the change. This resistance often translates into decreased productivity and frustration, highlighting the importance of investing in effective change management and user readiness initiatives.

Securing strong business buy-in is another critical factor. Technology initiatives can stall when decision-makers do not fully support or understand the value of proposed changes, making it difficult to align transformation efforts with broader organisational goals. Without visible leadership endorsement and commitment, even well-planned initiatives may struggle to gain traction.

While AI and automation can help address some of these challenges, they are not universal solutions. Organisations need to evaluate where AI can deliver meaningful value – such as automating repetitive tasks, enhancing data analysis, and improving user experiences – while recognising where human oversight and nuanced judgment remain essential.

Ultimately, achieving successful technology change requires a balanced approach that integrates technological solutions with effective processes, engaged employees, and strong leadership support. By addressing these elements, organisations can improve the outcomes of technology transformations, reduce disruption, and ensure digital initiatives deliver tangible, long-term value.

Conclusion

The intersection of technology failures and cyber threats underlines the need for robust, adaptive IT systems. Major outages show that failures can ripple across economies and essential services, while poor technology change management introduces new risks.

AI, when thoughtfully integrated, helps predict, prevent, and respond to failures, transforming technology from a vulnerability into a driver of resilience. By combining AI with strong leadership, clear processes, and continuous monitoring, organisations can ensure critical services remain reliable in an increasingly complex digital world.

Acknowledgements

Jules Wenton-Parry, Programme Director, City Fibre
Ash Ohri, Client Director, Adarma
Lisa Moldau, Product Operation Lead, City Fibre
Stafford Hunt, Chief Technology Office , CGS Global Services
Michael Moran, Product Director, Floow Insurance
Steve Collier, Senior Project Manager, Retail Technology Services
Christian Bailey, Director, Zscaler
Peter Tarbitten, Service Delivery, LEK Midoch/CGS
Chris Finch, Director, SOM3
Eric Forcythe-Reid, CISO, CGS

British companies are falling behind in international patent filing:

Here's what we can do about it

Matt Dixon
Immediate Past President, CIPA
Executive Chair, Beck Greener LLP

British firms lag behind European ri als in securing international patents. CIPA calls for clearer public guidance to help businesses protect innovation globally, attract investment, and scale effectively.

The Chartered Institute of Patent Attorneys (CIPA) is the professional body and approved regulator for patent attorneys in the UK. Founded in 1882 and incorporated by Royal Charter in 1891, CIPA is one of the oldest intellectual property organisations in the world. With almost 5,000 members, including 2,900 Chartered Patent Attorneys, 1,000 student members on the route to qualification and 700 paralegal members, CIPA is the largest UK membership body in the field of intellectual property.

It is our members that support British SMEs, universities and large companies in protecting their innovative technology worldwide, either as private practice attorneys or as in-house attorneys with medium to large science and technology businesses. The reputation of the UK for IP advice draws work from around the world; only 11% of European patent applications by British representatives are for UK applicants. Consequently, the profession generates around £1 billion for the economy in gross value added and approaching £750 million in exports.

The international patent gap

Last year we published a report[1], in which we identified the worrying fact that, although British companies are filing patents to protect their technology, they are not extending that protection to the most important global territories, such as China and the European Patent Office (EPO), at the same rates as businesses in other European countries, particularly Switzerland and Sweden, who are consistently identified by the WIPO Global Innovation Index[2] as the most innovative economies in Europe.

We think there is an absence of guidance from government for businesses to help them understand the choices they should be making to build an international patent portfolio that is attractive to investors and supports the growth of the business. Our members provide this guidance to their clients, but clients of course recognise that our members generally have a commercial interest in filing patents. An independent voice from the public sector that echoes the patent strategy advice we provide would increase the confidence of business leaders in the patent filing strategies they adopt.

The role of the IPO

Within government, the Intellectual Property Office (IPO) has responsibility for most intellectual property matters, including patents. The IPO has a dual role: it is the government agency to which applicants apply to register their trade marks, designs and patents in the UK, but it is also responsible for supporting the government in matters relating to intellectual property policy.

> CIPA co-operates regularly with the IPO, but we need to do more together

The IPO is the obvious choice for providing the kind of guidance we think businesses need, but it is currently not doing this effectively, at least as far as international patenting is concerned. The dual operational and policy role can be an advantage in that the operational team has real expertise in intellectual property matters, but that operational expertise is only in relation to UK intellectual property rights and those rights are not enough for a business to be genuinely scalable.

CIPA co-operates regularly with the IPO, but we need to do more together, because the expertise in the UK on international patent strategy resides with our members and their experienced clients, as recognised in the government's Modern Industrial Strategy for Professional and Business Services.

The importance of early strategy

The international patent system is 'front loaded'. Patent applications must be filed before the protected technology becomes public. The filing of the initial patent application begins a time period, usually 2½ years, in which the countries in which patent protection is required must be chosen. The geographical scope of a patent portfolio is therefore determined at a very early stage of the 20-year life of the patents.

This system is well-established through international treaties and there are good reasons of legal certainty for it to continue. However, it is important that British businesses are educated, not only by professionals such as our members, but also by public bodies, such as the IPO, in how to use the international patent system most effectively.

Fundamentally, early-stage businesses are making decisions on the geographical scope of patent protection for the business that they are going to become over the next 20 years. This future business is the one in which investors are interested, and it is therefore important that the patent portfolio matches their expectations.

Turning insight into action

In our report, we highlighted the fact that, according to IPO data, 34% of all patent 'families'[3] with UK applicants include protection only in the UK. This is not good enough for investors seeking to grow a global business. Such investors want to see protection in the USA, China and the countries covered by the EPO. These three jurisdictions alone account for more than 50% of global GDP, compared to 2% for the UK alone.

British applicants file patents in the USA at a relatively high rate – second only to Swedish applicants (Figure 1) – indicating that UK businesses are active in international patenting. However, the USA represents only 13% of the UK's export value. By comparison, China and Hong Kong together account for 12% of export value, and countries covered by a European patent even more at 55%. Despite this, UK patent filings in China and the EPO are only about half those of Swiss and Swedish applicants, even after adjusting for size of manufacturing economy, and despite similar filing rates in the USA.

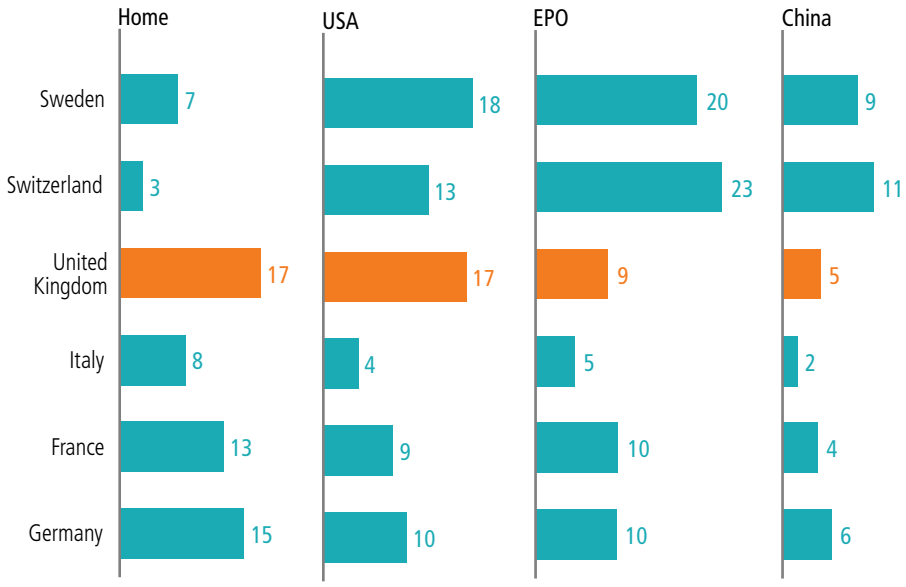
The European patent system is governed by the European Patent Convention (EPC), a self-contained international agreement independent of the EU. European patents cover all the EU countries, but also the UK, Iceland, Turkey, Switzerland and Norway, among an increasing number of states both in the European continent and beyond.

The UK is a significant member of the EPC with nearly 3,000 European Patent Attorneys (EPAs) in the UK, the second largest national grouping after Germany. In general, our members are dual-qualified as Chartered Patent Attorneys and EPAs. Nearly 2,000 British EPAs are also qualified to represent before the Unified Patent Court, which has now been running for just over two years to enable central enforcement of patents granted by the EPO. Like the EPC, the Unified Patent Court is governed by a self-contained international agreement, to which the UK was formerly a party.

> Government, via the IPO, needs to do more to support international patenting by British businesses. This does not require funding, but education and maximising existing relationships

The relationship between the EPO and the IPO is key to the British patent system. Nine out of ten patents in force in the UK were granted by the EPO not the IPO, and the annual IPO income from these European patents is £67 million, which dwarfs the £20 million income from the IPO's own patent operations.

Figure 1: Patent applications per £billion manufacturing turnover, 2023



Sources: OECD and WIPO data.

Many countries co-operate much more closely with the EPO than our own IPO. The French patent office, for example, subsidises an EPO search for new national patent applications, which means that French businesses can get to an international patent application for about £1,500. The same thing costs British applicants using the IPO over £3,000. A similar system has recently been adopted by the Irish IPO.

Some UK searches are already being subcontracted to the EPO. The IPO could allow applicants to choose an EPO search to reduce the initial cost of taking their patent applications international. Sadly, however, the IPO seems to view the EPO as a competitor, when in reality the UK's membership of the EPC is a huge benefit for the country.

A shared mission for global IP leadership

It is our view that the government, via the IPO, needs to do more to support international patenting by British businesses. This does not require funding, but rather education and maximising the benefit of existing relationships. In practical terms, businesses seeking international protection will be using the services of our members. We want to work with the IPO to provide that support.

In this issue of *Science in Parliament*, you will read stories of businesses who, with the help of our members, are engaging successfully in international patent filing to support their growth. We need these stories to become the norm for British technology businesses and to be trumpeted by public bodies, such as the IPO. If we do that, the UK will not only be seen as a global leader in creative innovation, but also a global leader in IP-rich, investable technology businesses.

References

[1] Dixon M (2024). Innovation and Patents in the United Kingdom. CIPA. www.cipa.org.uk/wp-content/uploads/2024/08/CIPA-Innovation-and-Patents-in-the-UK-2024.pdf

[2] www.wipo.int/en/web/global-innovation-index/2025/index

[3] A set of interrelated patent applications filed at one or more offices to protect the same invention

White Motorcycle Concepts:

Patent-led innovation in motorcycling

Robert White
CEO and founder of White Motorcycle Concepts

Patents aren't just legal protection – they are the foundation of our business strategy. They allow us to demonstrate the uniqueness of our designs, give investors confidence and open doors to partnerships with manufacturers who see the value in licensed innovation.

White Motorcycle Concepts (WMC) was founded to disrupt the motorcycle industry with efficiency-focused, market-changing technology. By combining radical aerodynamic design with cutting-edge engineering, the company aims to help major manufacturers transition toward net-zero mobility. Central to this ambition is a robust intellectual property (IP) strategy that protects breakthrough ideas, accelerates commercialisation, and sets new industry standards.

At the heart of WMC's innovations is the world-firs V-Duct (Venturi Duct) aerodynamic system. Protected by multiple global patents, this technology harnesses the Venturi effect to dramatically reduce drag by directing air through the centre of a motorcycle rather than around it. The result is improved performance, lower emissions and a platform adaptable to all powertrains – petrol, hybrid, electric, hydrogen, or future synthetic fuels. WMC's approach shows how patents can be more than defensive tools: they can be strategic assets for transforming an entire sector.

A strategic commitment to innovation

From its inception, WMC embedded innovation into its core organisational strategy. Its mission is clear: create motorcycle technology that is more efficient, safer, and more sustainable while pushing the boundaries of what is technically possible. Achieving this requires both engineering excellence and proactive IP protection.

The patented V-Duct is the first significant representation of this vision. Patent protection in key international markets gives the company a competitive advantage and supports diverse applications – from high-speed prototypes to electric police motorcycles.

Patents as an innovation accelerator

At WMC, patents serve a dual purpose: safeguarding novel ideas and driving further innovation. Each patent marks a milestone in R&D and provides a foundation for scalable commercial development. The company aligns its development roadmap with a robust patenting strategy, ensuring that every breakthrough is both protected and positioned for market adoption.

This approach supports global sustainability goals. By securing exclusive rights to its aerodynamic technology, WMC can license its designs to major motorcycle manufacturers worldwide, multiplying the environmental impact. Improved aerodynamics lower fuel consumption for petrol engines and extend range for electric motorcycles, directly contributing to emissions reduction targets.

Strong IP also strengthens investor confidence. Patents signal originality, technical credibility and long-term commercial potential, making WMC an attractive proposition for partners and funders.

Infrastructure for innovation

The company has invested significantly in the infrastructure needed to deliver transformative innovation. Its Northamptonshire research and development facility houses advanced prototyping equipment, computational fluid dynamics (CFD) capabilities and ready access to local testing environments. This infrastructure enables rapid progression from concept to prototype, with iterative design refinements made at speed.

Importantly, every stage of the development process is tightly integrated with the company's patenting strategy. Potential innovations are assessed for patentability at each stage of prototyping, ensuring no valuable IP is overlooked.

Complementing its physical facilities is a digital innovation ecosystem. WMC uses advanced simulation technologies and digital twins to model aerodynamic flows, energy consumption, and vehicle dynamics. These tools not only accelerate development but also generate quantifiable data that supports the company's patent applications, strengthening the company's IP claims with robust evidence of novelty and industrial applicability.

> "WMC is a textbook example of how SMEs can use patents strategically – going beyond invention to protecting, positioning, and leveraging IP. This underpins commercialisation, builds investor confidenc , and lays the groundwork for a major impact on motorcycle design and its environmental footprint."
>
> Dr Jon Markham, WMC's patent attorney and partner at Beck Greener

Commercialising innovation through patents

Patents are the foundation of WMC's commercial model. Rather than attempting to manufacture everything itself, the company focuses on licensing and partnerships. With patented designs as a secure base, WMC can collaborate confidently with major OEMs, component suppliers and fleet operators knowing that its core IP remains secure.

The WMC250EV high-speed electric prototype (Figure 1) serves as a 'halo project', demonstrating the dramatic aerodynamic gains achievable with the V-Duct. Rigorous testing has verified significant drag reductions, proving the concept to potential partners.

The company's technology is also being applied in practical fleet solutions. The WMC300FR hybrid three-wheeled scooter, developed with UK police and emergency services, uses patented aerodynamics to reduce drag, improve efficienc , and extend operational range. Patent protection allows WMC to scale discussions with public service bodies and fleet operators without risking its IP.

In collaboration with ZERO Motorcycles, the WMCSRS mid-sized electric sports bike shows that incorporating the duct into an existing motorcycle architecture can increase range by around 10% across a standard drive cycle.

WMC is also developing a petrol prototype to highlight the duct's∑ benefits across all powertrains. By cutting emissions while increasing acceleration and top speed, this project provides an important proof point at a time when the electric market is evolving more slowly than anticipated.

Foresight, collaboration and IP strategy

WMC's strategy is shaped by a clear understanding of the future mobility landscape. As the global market transitions to electric, hydrogen, and alternative fuels, efficiency will be a decisive factor. Patenting technologies that deliver measurable efficiency gains positions WMC as a key partner in this transition.

Collaboration is central to this approach. The company works with specialist engineering firms, manufacturers, and government bodies to validate and expand its technologies. All partnerships are structured with clear IP frameworks, ensuring knowledge sharing does not compromise core patent ownership. This careful balance of openness and protection enables the creation of optimal solutions without sacrificing competitive advantage.

Figure 1: WMC250EV aerodynamic assessment – track testing

At WMC, patents are not an afterthought; they are part of the company's culture. Engineers are trained to identify patentable opportunities as they develop new concepts, and regular engagement with patent attorneys ensures that inventions are framed for novelty and industrial application.

Because patenting competes with other priorities, WMC applies strategic discipline – investing where protection will create the greatest commercial opportunity.

Measuring impact: beyond the patent

While patents are crucial, WMC ultimately measures success by the real-world impact they enable. The company tracks both technical metrics – such as drag reduction, energy savings, and extended range – and commercial outcomes, including licensing agreements, investment secured, and partnerships formed.

Independent testing has confirmed aerodynamic improvements of up to 70% compared with conventional motorcycle designs. Such gains translate directly into lower carbon emissions for petrol engines and longer range for electric motorcycles – outcomes that align with global net-zero ambitions.

Commercially, WMC's patent portfolio has already attracted international interest from manufacturers and governments seeking efficient, scalable mobility solutions. Patents give WMC a strong negotiating position, maximising both revenue potential and environmental impact.

Looking forward

As WMC advances its mission, its patent-led model demonstrates how a focused SME can lead in a fie cely competitive global industry. Patents provide the foundation for scaling innovation, attracting investment, and securing influence far beyond the company's own products.

WMC's vision is centred on practical, real-world impact: improving efficiency across the entire motorcycle sector, from conceptual design to production models. Every step of this journey is guided by a single principle – innovation must be protected to be transformative. Without patents, breakthroughs risk being commoditised; with them, innovation can reshape markets and accelerate the path to a sustainable future.

In an era of rapid technological and environmental change, WMC shows that patented innovation is not just about defending ideas. It is about enabling transformation – advancing engineering excellence, fostering strategic partnerships, and unlocking a cleaner, more efficient future.

Biologicals without refrigeration:

Patenting a solution to the cold-chain problem

Dr Stephen A Wells
Co-Founder of EnsiliTech

From securing early protection in 2016 to leveraging patents for spinout funding, growth and partnerships, IP has been integral to translating our academic research into viable solutions for the cold-chain challenge.

At EnsiliTech® (Ensilicated Technologies Ltd), the development of our technology and our company have been deeply intertwined with intellectual property (IP) development from the very beginning. Our patent attorneys at HLK have provided us with expert professional support and advice at every stage of the journey, from the moment in 2016 when we realised that we had an invention that needed IP protection, through the grant of our first patent in 2020, and spinning out EnsiliTech in 2022, to the present day.

Our business is biologicals without refrigeration, and we aim to solve the cold-chain problem. Simply put – many of our most valuable modern medications, in particular vaccines and antibodies, are very sensitive to temperature. If they are not kept refrigerated, or in some cases even frozen in liquid nitrogen, at every stage of their production, transportation, and storage until use, they can spoil even at room temperature, losing their effectiveness. This causes enormous practical difficulties for global vaccination efforts, especially in reaching deprived and remote areas, and it requires a huge and costly cold-chain refrigeration infrastructure.

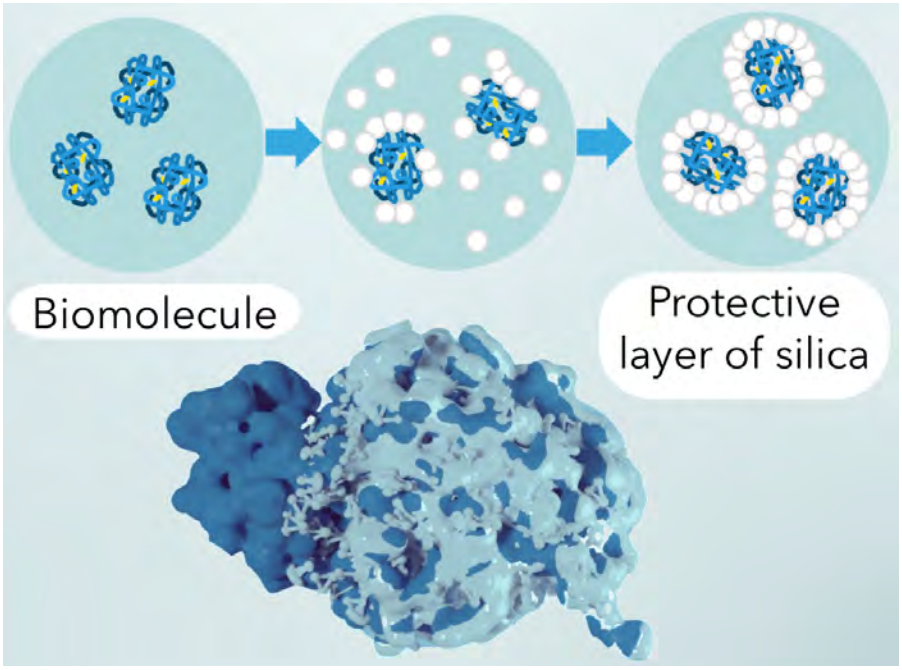
We have found a solution by considering the fundamental physical cause of the problem. The proteins in a biopharmaceutical are long, chain-like molecules which, in their native, effective form, are folded up into a very specific three-dimensional shape. The irreversible damage is done when these proteins unfold ('denaturation') and stick together ('agglomeration') – processes which you can easily witness just by frying an egg!

Our Ensilication® approach is to swathe each individual biomolecule in its own protective hard shell – composed of silica, an inexpensive and biocompatible mineral material (Figure 1). As the shell uniquely grows around the protein in aqueous solution, it captures and holds its shape, by creating a tailor-fit silica shell around individual proteins. Since the proteins now physically cannot unfold or stick together, they are no longer vulnerable to temperature and need not be refrigerated.

This approach has several features that make it widely applicable to all kinds of biopharmaceutical products. The biomolecule is chemically unchanged by our process – no chemical bonds form between the silica and the protein – and the silica layer is easily dissolved away to release the payload. This has the potential to completely alter the landscape of vaccine and antibody accessibility – transforming these vital medications into a compact, shelf-stable solid form that can be taken anywhere. It is very exciting to consider that this fundamentally very simple approach, invented as a piece of pure blue-skies speculative thinking in academia, could have such wide-ranging and valuable practical applications.

With our first patent as an investable asset, we were able to spin Ensilitech out of the Department of Chemistry at the University of Bath with an oversubscribed pre-seed funding round in 2022. This let us expand from the founding group of four scientists – Dr Sartbaeva, Dr Doekhie and Dr Slade and myself – to a company with a dozen employees. The work of our research team, in our laboratory at Science Creates in Bristol, has already led to exciting advances in Ensilication technology, with several new patent

Figure 1: Encasing thermally unstable biomolecules within a silica network to prevent degradation at temperatures from –80 to +50 °C, and improving shelf-life



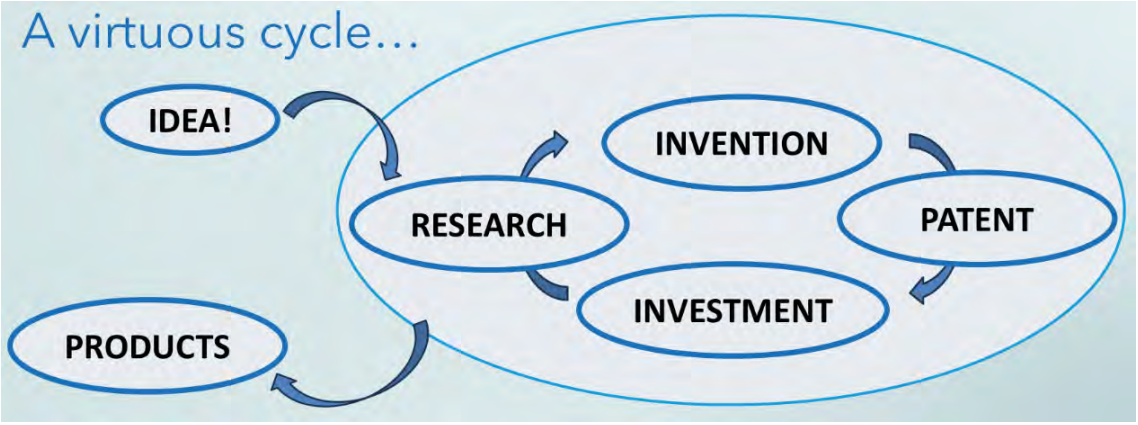


Figure 2: How research leads to innovation, innovation generates patents, patents attract investment, and investment allows further research; completing the cycle and bringing innovative products to market

applications already filed and more innovations in development. We have been able to win competitive government grants and contracts for strategic research in novel biotechnologies and establish ourselves as commercial partners to the large-scale manufacturers of biopharmaceuticals, whose products we can render stable by Ensilication. In 2025 we have closed our second oversubscribed funding round and have exciting plans – watch this space! None of this would have been possible without the IP protections offered by the UK and international patent system.

In our journey as a company, we have been able to directly experience the 'virtuous cycle' of innovation as shown in Figure 2. We have had a great deal to learn about the patent process, both domestically and internationally, in the course of this work. Scientists in general do not get any instruction on intellectual property during our studies, so the learning curve was, especially at the beginning, very steep. We have also had to navigate the transition from a university context to a commercial one, with very different decision-making processes, institutional habits and constraints.

We would like to thank the Parliamentary and Scientific Committee APPG and Chartered Institute of Patent Attorney (CIPA) for the opportunity to present Ensilitech's IP journey to policymakers at the UK Parliament. We are very proud of our game-changing Ensilication technology, and it was a great opportunity both to raise Ensilitech's profile and to discuss our experience of the IP and innovation landscape with a diverse range of stakeholders – including policymakers, IP professionals, academics, and fellow inventors.

The APPG event itself was a fascinating event in many ways. It was slightly nerve-racking to enter a Parliamentary committee room – "as seen on TV", as it were – and be called upon to discuss IP, when it seems only a few years since we were first nervously asking our attorneys to explain what a patent is! However, the support of HLK and CIPA was very reassuring. The attendees were diverse, with representatives from Westminster, IP professionals, academia, charities, learned societies, professional bodies and industry – not quite the stereotypical 'Westminster bubble' of politics. The case studies presented were likewise varied – Ensilitech, as an example of the academic research/spin-out path being flanked by examples of industrial research, and of a private individual pursuing a bright idea.

The discussion at the event was wide-ranging. A few learning points that come to mind that are worth sharing.

- The purpose of patents is to reveal, not to conceal, technological innovation. Filing a patent requires that the invention be fully and publicly described for it to be valid. This is with a trade-off that any monopoly is lost after a period of within twenty years.
- As a corollary, there is no advantage to be gained by not filing in a jurisdiction –out of concern that the technology might be copied. This is because a patent published anywhere can be read everywhere.
- By contrast, while international IP protection is important, one can be selective in which jurisdictions to consider. In technology patents, the concept of the "Big Five" jurisdictions (US, Europe, China, Japan and South Korea) covers a sufficiently large section of the world economy that any supply chain might be expected to start, end or pass through at least one of those territories. Depending on the specific nature of a business, other jurisdictions might be appropriate for individual reasons.
- Start-ups, spinouts from academia and SMEs can benefit from support and guidance concerning IP. Indeed, academia is not a monolith in this regard – different universities have very different levels of experience and engagement with IP creation and the development of spinout companies. Wider knowledge of the support available from both government and NGO sources, such as Innovate UK, the IPO and CIPA would be beneficial to UK IP development.
- There is a need to align intellectual property with real business strategy to create lasting commercial value.
- The companies attending were diverse in nature and yet shared that patents have become one of the most important assets driving their growth and success.

We would particularly like to thank Viscount Stansgate, President of the Parliamentary and Scientific Committee, for both running a well-managed discussion session, and for being a very gracious host at dinner, where the conversation was even more wide-ranging.

Overall, it was a genuinely fascinating event, positive and productive in the tone of the discussions arising, which we were very happy to have taken part in.

From domestic frustration to policy influence:

The SNOAP story and the critical role of intellectual property in sustainable innovation

Lisa Hicks
Founder & CEO, SNOAP HQ

A firsthand case study of how patent protection can unlock investment build commercial value, and support the UK's shift to a greener, more resilient economy.

In March 2020, as the world entered lockdown, households across the UK were forced to adapt to new routines. For my own family – three children, a husband who usually worked away, and the chaos of homeschooling – it was a time of disruption but also reflection

One of the most pressing realisations came not from the news, but from our own kitchen and bathroom. I noticed just how much single-use plastic we were consuming every week, especially through personal hygiene products: hand wash, shampoo, shower gel. Like many families, we had shifted to liquid formats for ease and hygiene – but at enormous environmental cost.

I tried switching to solid soap bars, but encountered resistance from every member of the household. With two sons and a daughter in the middle, sharing bars was out of the question. My daughter refused to use a bar if her brothers had touched it. My teenage son's bar was often covered in hair, and my youngest had made up a game called "Where will it land". He would squeeze the bar until it flew from his hands, and it would land, down the toilet, on his head, on the dog, you name it

Eventually, my husband said what we were both thinking: "Lisa, I love what you're trying to do, but this just isn't practical – and when life returns to normal, it'll be even less so."

Before returning to single-use plastic, I decided to investigate the full extent of the problem. The figu es exposed the stark disconnect between daily convenience and long-term environmental sustainability. In 2019 alone, UK households discarded: 686 million hand wash bottles, 617 million shower gel bottles, 520 million shampoo bottles. This added up to almost 1.8 billion single-use plastic containers – and that did not include the additional 2.9 million tonnes of single-use plastic generated by the hospitality sector.

Concept to creation: a new type of dispenser

I began to search for a solid soap dispenser that could deliver the cleanliness and dosage benefits of a liquid system without the plastic waste. When my search yielded nothing, I resolved to create it myself.

That decision marked the beginning of what would become SNOAP – a new kind of personal care system built around solid formulations and a patented, refillable dispenser. What followed were several years of product development, prototyping, and iteration. As soon as our technical drawings were complete and we could demonstrate functional proof-of-concept, I knew we had to protect the innovation.

IP as a strategic foundation

I initially registered the SNOAP trademark and, upon recommendation, was introduced to Ilya Kazi at IK-IP Ltd, an IP specialist with a deep understanding of both legal protection and commercial strategy.

Together, we worked to develop a comprehensive patent strategy. Ilya's approach – rooted in both legal rigour and real-world application – ensured that we not only protected a physical product, but a system of use, a user experience, and future product extensions.

We rapidly secured four granted patents on the dispenser, covering the following innovations (Figure 1). In parallel, we filed and secured patents for our solid soap and shampoo bars.

Figure 1: Patents granted on the dispenser in 2023

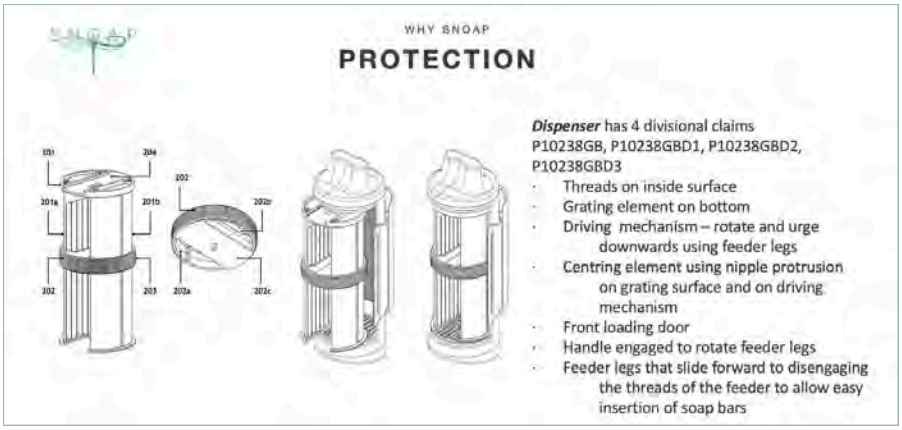
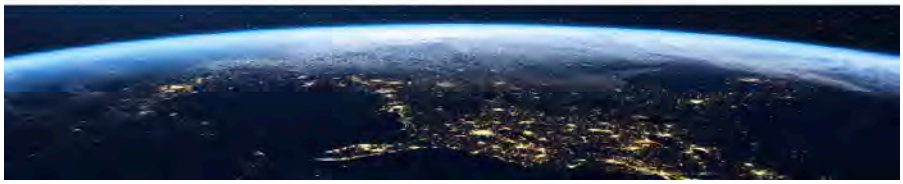


Figure 2: SNOAP strategic patenting

Case Code	Status	Inventor Nat	Filing Number	Filing Date	Territory	Nat/Reg entry Date	Pub/Adv Number	Pub/Adv Date	Grant/Reg Number	Grant/Reg Date
P10238GB	Granted (active)	LISA HICKS	2114658.4	13 Oct 2021	UK		2611772	19 Apr 2023	2611772	07 Nov 2023
P10238GBD1	Granted (active)	LISA HICKS	2216161.6	13 Oct 2021	UK		2612197	26 Apr 2023	2612197	07 Nov 2023
P10238GBD2	Granted (active)	LISA HICKS	2216163.2	13 Oct 2021	UK		2611890	19 Apr 2023	2611890	07 Nov 2023
P10238GBD3	Granted (active)	LISA HICKS	2216164.0	13 Oct 2021	UK		2612198	26 Apr 2023	2612198	07 Nov 2023
P10238WO	PublishedAdvertised	LISA HICKS	PCT/GB2022/052611	13 Oct 2022	EU/USA		2023/062379	20 Apr 2023		
P10239GB1	Granted (active)	LISA HICKS	2215146.8	13 Oct 2022	UK		2611883	19 Apr 2023	2611883	07 Nov 2023
P10239WO	PublishedAdvertised	LISA HICKS	PCT/GB2022/052614	13 Oct 2022	EU/USA		2023/062382	20 Apr 2023		
P10238WOUS	Pending	LISA HICKS	PCT/GB2022/052611	13 Oct 2022	EU/USA	12 Apr 2024	2025/0000307A1	02 Jan 2025		
P10239WOUS	Pending	LISA HICKS	PCT/GB2022/052614	13 Oct 2022	EU/USA	12 Apr 2024	2025/0000308A1	02 Jan 2025		
P10238WOEP	PublishedAdvertised	LISA HICKS	PCT/GB2022/052611	13 Oct 2022	EU/USA	10 May 2024	4415595	21 Aug 2024		
P10239WOEP	PublishedAdvertised	LISA HICKS	PCT/GB2022/052614	13 Oct 2022	EU/USA	10 May 2024	4415596	21 Aug 2024		



This IP framework ensured that the entire SNOAP system – hardware and consumables – was protected not only from imitation but from market encroachment, enabling us to build a scalable and defensible business model.

Given that SNOAP was 'bootstrapped' from day one, resources were limited. Ilya's support was pivotal in prioritising essential protections while remaining cost-conscious – advising against unnecessary filings and helping to stage our strategy for global expansion.

Commercial validation: IP as an investment magnet

The strength of our IP was tested – and validated – on national television when we appeared on BBC Dragons' Den.

During our pitch, Sara Davies, herself a patent holder, immediately recognised the value of our granted UK patents and pending EU and US applications. She explicitly stated that our IP significantly elevated the company's valuation and investment attractiveness. The speed at which we had got patents granted (as opposed to merely filed) impressed – the IP process is often expensive and drawn out and smaller clients at larger firms tend to be handled by trainees. IK-IP's team are all experienced attorneys specialising in getting commercially useful patents rapidly to grant cost-effectively for clients big and small.

That moment changed everything. All five Dragons offered investment. After consideration, we chose to partner with Deborah Meaden – for her sustainability credentials and business acumen – and Peter Jones, who brought retail and international distribution expertise.

Following the broadcast in February 2025, we have experienced exponential growth:

- 851 orders in the first four hours post-airing
- We now supply over 3,500 households and 220 businesses
- International expansion inquiries from multiple markets
- Job offers, distribution partnerships, and investor interest from around the world

This success was not accidental. It was built on the foundation of strategic IP protection.

Policy engagement: sharing the story in Parliament

In June, I was invited to share SNOAP's journey – from a kitchen epiphany to a Dragons' Den success and multi-award-winning sustainable enterprise – at the All-Party Parliamentary & Scientific Committee meeting, "Innovation Unlocked: How Patents Power SME Growth". I was one of just three SMEs chosen to present, each from different sectors, united by one common factor: intellectual property at the heart of the business.

The feedback from policymakers was encouraging and energising. The event was followed by a networking reception and dinner hosted by Viscount Stansgate, where the conversation around IP continued in earnest. What was most heartening was the genuine interest from parliamentarians in understanding IP not just as a legal formality, but as a strategic lever for innovation, investment, and sustainable economic growth.

Implications for UK innovation policy

Despite progress, the UK still lags behind many of its European counterparts when it comes to patent filings. British SMEs file international patents at a rate up to 40% lower than companies in France and Germany. The reasons are well-documented: lack of awareness, perceived costs, and difficulty accessing trusted IP advice.

If the UK is to foster a globally competitive, innovation-led economy, policy must evolve to:

1. Demystify IP for entrepreneurs and start-ups
2. Improve access to quality patent advice through publicly supported schemes
3. Integrate IP strategy into business mentoring and accelerator programmes
4. Incentivise IP adoption through R\&D tax credits and funding eligibility
5. Encourage female-led innovation and inclusivity in the patent space (I was the only female on the panel in Parliament).

Conclusion

SNOAP is, at its core, a solution to a real-world problem. But without intellectual property protection, it would remain just an idea. Through strategic patenting (Figure 2), we were able to commercialise, scale, and attract investment – transforming an eco-conscious vision into a business with real-world impact.

Our story is not unique. It is a case study in what's possible when innovation is supported with the right IP foundations. With continued support from policymakers and professional organisations like CIPA, more UK businesses can follow a similar path.

Let this be a call to action to:

- Amplify the voices of real innovators.
- Embed IP in our national innovation strategy.
- Build a more sustainable, competitive, and intellectually empowered future for the UK and the businesses within it.

A proud legacy:
75 years of protecting the UK

Professor Andrew Randewich CBE FREng
Executive Director Science, AWE Nuclear Security Technologies

Professor Randewich celebrates AWE's role over the last 75 years and explains how its rich heritage in defence nuclear science and technology can play a critical role the UK's defensive capability for decades to come.

Five years after the end of the Second World War, a former RAF airfield in Berkshire was re-purposed to become the home of the UK's atomic weapons programme. Initially named "High Explosive Research" and led by a veteran of the Manhattan project, William (later, Lord) Penney, AWE was founded with a single, clear mission: to play a part in keeping the nation safe.

75 years later, AWE's mission remains the same but the world around us has changed. We now operate in a complex, rapidly changing global environment where security, technical excellence and resilience are more important than ever. Even today, no other organisation can do what we do, protecting the UK through nuclear science and technology.

Our role – the nation's nuclear deterrent

The UK's independent nuclear deterrent exists to prevent the most extreme threats to our national security and way of life, helping to guarantee both our safety and that of our NATO allies. Although the risk of nuclear conflict is remote, the threats we face are increasing in scale, diversity and complexity – so the need to deter the most extreme acts of aggression against us and our allies remains paramount.

AWE's mission is to design and manufacture warheads and provide nuclear services to meet the needs of defence. Since 1945, UK voters have elected governments that have maintained a policy to have a nuclear deterrent. AWE is proud to play its part in the Defence Nuclear Enterprise (DNE), delivering its product for the Defence Nuclear Organisation (DNO), and working in partnership with the DNO Warhead Group. The success of the UK's Continuous At Sea Deterrent (CASD) requires a stockpile of UK-manufactured warheads of sufficient quantity, reliability, safety, and effectiveness to achieve deterrence – AWE delivers this mission through its expertise in nuclear science, technology, and manufacturing.

Steeped in science and engineering

AWE is home to around 9,000 highly-skilled people – with a core of approximately 4,500 scientists and engineers working with industrial, government and academic partners. We manage some of the most sensitive nuclear materials on Earth and AWE is the only organisation in the UK that do science and manufacture of warhead fissile materials. We need to work at the extremities of science and engineering to understand the performance of nuclear warheads and assure the safety, security, and effectiveness of our stockpile.

Our people support a wide range of activities: from warhead engineering, and novel nuclear forensics capabilities that can deduce the design of a weapon post-detonation, to using state-of-the-art 3D virtual imagery to visualise the complex engineering behaviours and characteristics found in a warhead.

AWE's mission in national defence and security is built on firm foundations – made up of the expertise of our people coupled with the strength of our partnerships with academia and industry.

These collaborations help to leverage our capability and are fundamental to developing technologies, enhancing our research and growing a talent pool that will support AWE's ongoing contribution to STEM in the UK.

Over the academic year 2022/23, we supported almost 100 PhDs (a 15% increase over three years), which saw students undertaking valuable work sponsored by AWE and spanning an array of STEM subjects. We engaged with 37 universities, including 5 strategic alliances, had 42 AWE members holding honorary academic positions at 12 universities and another 42 AWE members holding industrial advisory positions at 17 universities and 5 Centres of Doctoral Training. These partnerships were integral in 205 papers being published in academic journals – an increase of almost 10% on the previous year.

World class facilities

World class scientists and engineers need world class facilities, and our experts work with advanced experimental and modelling capabilities to keep the nation safe and secure. The Orion Laser Facility, the size of a football stadium, is a critical component of our partnerships with academia (approximately 15% of its usage ring-fenced for academic collaborations). Orion enables our teams to replicate the conditions found at the heart of a nuclear explosion – ensuring the safety, reliability and performance of warheads throughout their lifecycle. This high-energy-density plasma physics capability underpins not only our weapons research but also provides fundamental scientific insights for astrophysicists studying star formation and researchers working on nuclear fusion.

Orion Laser Facility at AWE's Aldermaston site

Alongside this is AWE's high-performance computing (HPC) programme and a unique scientific computing platform on a scale that few can match. Our current supercomputers named Damson, Vulcan and Valiant can perform more than 36 quadrillion (a million billion) calculations every second. This computer power is essential for 3D modelling and simulation capabilities to support our research into the performance and reliability of nuclear warheads.

Wider nuclear capabilities

Since 1950, AWE has been keeping the nation safe, protecting the UK through nuclear science and technology. This expertise – refined over three-quarters of a century – enables us to play a critical role in helping to keep the UK safe and goes beyond the design and manufacture of the nuclear warhead. This includes providing unique technical assistance with nuclear security, including a planned response to nuclear or radiological accidents.

At AWE Blacknest, our experts support nuclear threat reduction by using forensic seismology and infrasound analysis to detect potential detonations and tests by other countries, shaping the global approach to nuclear test monitoring and supporting the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

We advise the UK government on a range of national security issues related to radiological and nuclear materials. For example, as the technical authority for the UK's radiological and nuclear portal detection network we support the UK Government in its defence against the smuggling of nuclear and radiological materials into the country.

We employ more radiation protection experts than anywhere else in the UK – delivering essential services to UK defence companies. Finally, our Nuclear Threat Reduction specialists provide training to the police and military responders, ensuring that they are equipped to deal with the high-threat environment presented by an Improvised Nuclear Device.

Preparing for the next 75 years

AWE remains steadfast in its commitment to protecting the UK through world-class nuclear science and technology. Our anniversary this year marks not just our past achievements, but our vision for the future, as we continue to evolve and adapt to meet the changing needs of national security.

We are building on our heritage by safeguarding the future of the nation's nuclear deterrent, on which the UK's national security depends. In 2021, the UK committed to a replacement warhead programme, which will see the first UK warhead developed under the UK's voluntary moratorium on nuclear weapon test explosions.

This is made possible by the long history of technical expertise and extensive investment in UK modelling and simulation, supercomputing, materials science, shock and laser physics at AWE. The Orion laser helps our scientists research the physics of the extreme temperatures and pressures found in a nuclear explosion, whilst supercomputing can run simulations that allow us to develop a safe, assured warhead without detonation. All these facilities will enable AWE to bring the UK's next warhead into service whilst upholding our moratorium.

Investing in Britain's future

To underpin our mission, AWE is undertaking a multi-year, multi-billion-pound programme of infrastructure investments across our sites. We are modernising our facilities through a comprehensive programme to ensure sustained capability. This will see us decommission obsolete infrastructure and equipment, whilst creating new infrastructure and facilities to support our long-term capabilities.

The Future Materials Campus sits at the core of this programme, representing £3 billion in infrastructure investment. The FMC will include facilities that advance nuclear science and drive innovation in construction, science, technology and other areas, helping the UK maintain its position as a world leader in new nuclear technologies.

This multi-year portfolio will renew manufacturing and storage facilities, improve scientific capabilities, and develop new nuclear material recovery technologies. To support this expansion, we are growing our workforce to build capability for future programme delivery and continuing our commitment to innovation through strategic partnerships with industry and academia.

In the coming years, the postwar buildings that helped to deliver AWE's mission for the last 75 years will start to disappear. In their place a vibrant manufacturing and science campus will arise, with an environment to attract, develop and retain our current and future STEM talent, who together with our partners will pioneer the future of the UK's nuclear defence.

Forensic science under the microscope

Darrell Matthews
CEO of The Chartered Society of Forensic Sciences

Recent announcements from the Home Office are aimed at improving the landscape for forensic science and its practitioners. Darrell Matthews welcomes the initiatives and explains what is needed to reduce the possibilities of miscarriages of justice and to develop a more healthy forensic industry for all of the stakeholders.

The role and reach of forensic science

Forensic science is a key part of the judicial system and usually appears in the headlines for the extremes – where forensic evidence 'cracks a high-profile case' or where mishandling of evidence causes a miscarriage of justice. Thankfully, the latter are few, but still too many.

Behind this lies a diverse, complex industry that contains many differing skills. Forensic scientists are an eclectic group and it is always a vocation that draws people to the work, to find the truth and assist the criminal justice system.

Apart from the well-known areas of forensic science (crime scene examination, fingerprints, DNA, digital forensics for example) there are numerous other areas that don't get the press or recognition they deserve; blood pattern analysis, collision investigation, fi e investigation, victim identification to name a few. Throw in the day-to-day work of the larger commercial labs which may be engaged in blood toxicology testing and sampling for cases of sexual assault and you will see that the forensics 'landscape' is complex and requires different needs.

There are also numerous types of roles; from working within police Forces or fi e & rescue services as a scene examiner, independent self-employed Experts working with Defence and/or Prosecution, working for a cutting-edge technology SME, as a faculty member of staff in higher education, or as a researcher – and in some cases a combination of the above.

All are experienced, knowledgeable experts that in my dealings are extremely dedicated and nearly everyone stays in the industry for life, in some way or another.

Education and recruitment trends

There are many different University forensic courses in the UK and they have seen a healthy flow of applicants for undergraduate courses, possibly inspired by the 'CSI effect' created by the litany of crime investigation based dramas on our screens (I will leave others to comment as to whether these programmes paint an accurate picture of the working life of anyone involved in forensics. Spoiler alert; They don't!) but now increasingly due to the recognition of the quality of the courses and the opportunities a career in forensic science offers. Combined with the brand of our excellent UK universities, this has also attracted overseas students, bringing in income to the UK.

However, forensic science has many challenges at present. Much needed regulation has been introduced and the outgoing Forensic Science Regulator, Gary Pugh OBE, has been sympathetic and flexible to the resource issues faced by forces and operators. Most in forensics see the benefit, and the UKAS accreditation model is not always fit for smaller organisations which make up a large component of those that serve the criminal justice system. Non-compliance with the Code is currently being tested in courtrooms, and the judiciary will decide what they accept as 'mitigating factors'. This uncertainty is not conducive to long term planning for any business whether an SME or sole trader.

Systemic challenges and financial pressures

The Legal Aid system produces most traffic to my email inbox. Members are not getting paid on time (or at all) and there is a race to the bottom on obtaining quotes for work. The Chartered Society is currently carrying out some assessments of this which will lead to policy work – but many of our members work in an SME in this field and cannot afford to carry out work to be told that the case has been moved and payment will only happen once it comes to court. Cash flow issues will lead to experts moving away from Legal Aid work and this will be a poor indictment of the system and lead to less choice as experts reluctantly stop serving victims and suspects in this way.

The whole legal eco-system needs to be healthy for all of the elements to thrive, and this is currently not the case. Larger laboratories have failed due to inconsistencies in police procurement (see Cellmark) – it is impossible to trade and scale up if the capacity that is predicted falls way short in reality, as some forces are allowed to opt out of national agreements. NPCC and Police chiefs need to come together to continue to bring efficiencies

Practically, massive investment is required in areas such as evidence storage and it is encouraging to see the current government's progress in this area and


the proposed formation of a Centre of Policing. Forensic science changes and progresses, as new technological breakthroughs come into practice. New ways of separating DNA samples from historic cases requires professional storage of the samples to avoid and rectify miscarriages of justice or to reopen 'cold cases' – you cannot test what isn't stored and the benefits of this cannot be measured in financial cost alone but reflects the society we aspire to be.

Workforce sustainability

In recent years, we have had a surplus of applicants for CSI roles but this is changing. There is growing concern around the financial future of some universities, as numbers of overseas students may diminish and for universities that need to consider their finances, science courses are more expensive to run than courses that don't need labs or technicians. A smaller pool of graduates is not healthy, and we inevitably lose some of the best overseas students – any police-related roles usually require vetting and for applicants to have been resident in the UK for five years, normally beyond the time that students will be here, resulting in them considering other options and not staying and contributing to the UK economy.

Any visa limits for minimum salaries for specialist roles are typically too high for roles in forensics, and again we lose the 'cream' to other destinations. I am not aware of any forensic roles that are on the Immigration Salary List.

Professional standards

As the professional body for Forensic Science in the UK, we have a thriving membership and a sound financial base. Unfortunately, there is no mandatory requirement to belong to a professional body for forensic scientists, as there is for legal, accountancy, engineering, financial… I could go on. This means the checks and balances are weaker and rely on the courts to test credibility. All professional bodies have a code of conduct and varying professional grades of membership, and this would be easy to implement for relatively little cost to the individual. It would ensure each expert or practitioner kept up to date and acted in the best interests of the judicial system. Anyone can currently call themselves a forensic expert and appear in court, and this situation has already led to formation of 'ambulance chasers' who advertise to the public in terms of "have you ever been let down by forensic evidence?" and charge great sums with little impact and little hope of discovering a miscarriage of justice.

Our members become frustrated when they are assessed by their peers to become a Chartered Forensic Practitioner under our scheme and then appear in court with experts that have questionable skills and very little current knowledge, but "have been an expert witness for decades" and seem to be accepted by the courts.

There has recently been a report from the Westminster APPG on miscarriages of justice which outlines the issues in more detail although this report has not gained universal agreement from within our membership. The proposed formation of a National Institute would be duplication of some of the roles that the Chartered Society already fulfils and it would be a more efficient and a better use of taxpayers' money to invest in an established organisation than create anew.

The future?

The UK needs to consider more separation of police funding and funding of the forensic industry. Police chiefs are under pressure to deliver and I can understand why any new spending would be focused on more PCs rather than forensic resources. It can also be questioned whether a regional or national service would be more efficient than 43 separate forces in England and Wales, and there are already signs of collaboration in groups of forces, which is bringing success. We await more detail on the Centre of Policing and are happy to continue to work alongside the dedicated teams in the Home Office and the Ministry of Justice as we already do.

A mandatory requirement for expert witnesses to hold a senior membership grade of any recognised professional body will greatly increase the standard and set the bar for those working with the courts. This will also complement the new regulatory environment through codes of conduct leading to recourse, where issues, and ensuring professionalism throughout.

The Legal Aid system clearly doesn't work for anyone involved and delays in the judicial system amplify these problems. This is already resulting in loss of skilled experts and a smaller choice when it comes to all areas of forensic support for witnesses and victims.

Universities in the UK have an excellent reputation across the world, and anything that can be done to support the attraction and retention of the best students from the UK and the rest of the world should be a priority.

The Chartered Society is keen to work with all parliamentarians to improve all of these aspects, so please contact me if you would like to discuss any of the issues mentioned in this article or need more information:

Email: Darrell.Matthews@csofs.org

Dr Simon Opher MP
invites you to

Pathology Solutions

On behalf of

The Royal College of Pathologists
Pathology: the science behind the cure

in the
Terrace Pavilion,
House of Commons

on
Tuesday 4 November 2025
from 14:30 GMT

RSVP: publicengagement@rcpath.org

This special National Pathology Week event will shine a spotlight on pathology and why it is essential for healthcare, vital for patients, and key to the successful delivery of the NHS 10-year plan.

National Pathology Week 2025
3–9 November

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Declaration: Novo Nordisk has provided sponsorship to the Royal College of Pathologists to support the cost of this meeting, alongside Illumina and Roche Diagnostics. None of these sponsoring companies have any influence over the meeting agenda or arrangement.

We can't afford to treat ethics as an afterthought in innovation

Danielle Hamm
Director of the Nuffield Council on Bioethics

As the UK Government puts innovation at the centre of its mission to drive economic growth, its more important than ever to consider the ethical consequences of changes, not only to ensure responsibility, but also to help establish public trust.

Ethics and innovation?

The UK's Life Sciences Sector Plan and 10-year health plan put innovation at the centre of the national mission to drive economic growth and improve health outcomes, harnessing technologies such as genomics, AI, and robotics. Yet despite the UK's world-class research, challenges remain in effectively translating breakthroughs into tangible benefits for society.

Bridging this gap requires a new approach to innovation policy – one that embeds ethics at the heart of every decision on emerging technologies.

History shows that failing to do so leads to costly mistakes. It can erode public trust in otherwise safe and beneficial innovations, widen social inequalities and waste public money.

The backlash against GM crops in the early 2000s remains a stark warning. Despite scientific consensus on their safety, public mistrust – fuelled by weak engagement and a lack of ethical foresight – brought the rollout to a halt. Similarly, NHS England's Care.data project collapsed after millions were spent, undone by unresolved concerns about consent and privacy, and a failure to bring the public along.

By contrast, when ethics and public engagement guide thinking from the outset – as with mitochondrial donation – the UK has developed permissive yet robust regulation that truly reflects public values, standing us at the global fore of innovation and providing patients with access to pioneering treatment.

Ethics and policy making

Despite the clear benefits, ethics is still not consistently embedded in policymaking. This is creating significant blind spots.

Take engineering biology, identified as a critical technology. On paper, you can foresee technologies like lab-grown meat and synthetic plants helping to boost our country's food security. However, ethical exploration of the governance structures required to instil public trust is currently lacking, and meaningful engagement about people's attitudes to products often happens too late to address fundamental concerns.

Navigating the trade-offs that emerging technologies create is never simple. But ethical foresight can make the process more effective – helping to ensure regulation is proportionate and truly reflective of social expectations, as well as providing innovators with clear, responsive frameworks.

The Nuffield Council on Bioethics (NCOB) is working to help strengthen the UK's approach to responsible innovation by providing Government with advice on specific technologies, as well as through the development of ethical tools.

In our work, we see four ethical 'tipping points' where the fate of new technologies is decided:

1. Foresight
   Horizon scanning and foresight are essential to identify emerging trends and their potential ethical and societal impacts. We are developing a 'moral deliberation tool' to help policymakers integrate ethical questions and public values into these exercises.
2. Funding
   Every funding decision is an ethical choice: backing one area means leaving another behind. Ethical assessment allows for a more considered weighing of benefits and harms.
3. Translation
   At the translation stage – when discovery findings move from the lab into real-world applications and product designs –a question emerges over how the innovation should be governed. In this pro-innovation era of Government, we are seeing an increasing enthusiasm for biomedical regulatory sandboxes as an agile testbed for regulation. All future sandboxes should routinely embed ethical foresight and meaningful public engagement from the outset, ensuring societal concerns about emerging technologies are robustly considered.
4. Implementation
   Finally, at implementation – when innovations are rolled out into real-world settings – ethical consideration ensures they are deployed equitably, transparently, and in a way that secures public trust.

If the UK is to secure its place as a leading life science economy, Government must ensure ethics is not an afterthought. We cannot afford to wait for the next controversy to prove that point again.

The eyes have it:

How vision science can help policymakers

Dr Tobiasz Trawinski
Senior Lecturer in Psychology,
Liverpool Hope University

Eye movement research reveals how people allocate attention and interpret visual information. For policymakers, it can provide insights into how policies are experienced.

When we think about human vision, it is tempting to imagine a continuous and complete picture of the world around us. Yet our eyes and brains work in a far more dynamic and selective way. Vision is built on a compromise: we enjoy a wide field of view, but only a tiny part of it offers sharp, detailed perception. To compensate, our eyes constantly move, selecting fragments of the visual field to build a coherent sense of the whole.

Understanding this process of visual exploration is not only of scientific interest, but also has profound implications for how people engage with information, society, and civic life. For policymakers, who depend on effective communication with the public,

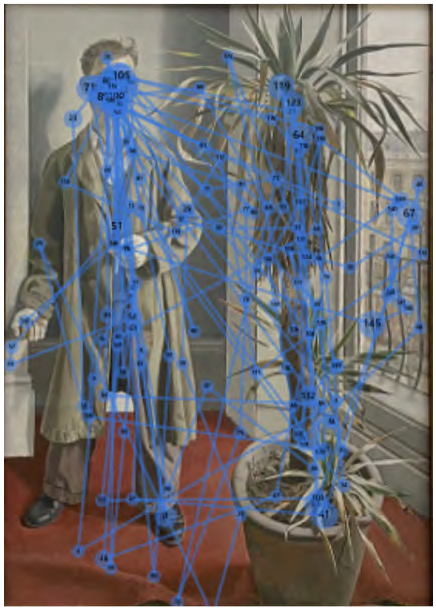

Figure 1 Fixations (numbered dots), indicating points that attracted the viewer's attention, and saccades (lines connecting dots), representing rapid eye movements between fixations, ecorded while viewing *Interior at Paddington* (1951) by Lucian Freud, the Walker Art Gallery, Liverpool

appreciating how vision really works can shape how messages are designed and delivered across health, education and culture.

Why we move our eyes?

Eye movements arise from the eye's biological structure: while peripheral vision detects broad shapes and motion, fine detail is confined to the fovea, a tiny central region of our eyes. This architectural arrangement ensures that while we remain broadly aware of our surroundings, we can also scrutinise fine details when needed. For example, to fully appreciate a painting (Figure 1), read a document, or interpret a conversation partner's face, we must shift our eyes, on average, every quarter of a second.

The movement of our eyes is far from random. It reflects both the design of our visual system and the priorities of our attention. Our eyes alternate between two main behaviours: fixations, when the eyes stay still to capture detail, and saccades, rapid jumps between points of interest. This pattern occurs thousands of times a day, over 300,000 effortless movements on average, allowing our brain to transform a constantly reframed, mosaic-like view into a complete image.

What eye movements reveal?

Far from being purely mechanical, eye movements reflect our cognitive priorities: what captures attention, what we ignore, and what we consider important. They serve as a key mechanism for balancing broad awareness with precise perception. By tracking where and for how long people look, we can uncover how attention is allocated. Eye-tracking technology (Figure 2) makes it possible to capture these subtle patterns. Using infrared cameras, eye trackers measure gaze direction and duration with high precision. The method is non-invasive, increasingly accessible, and suitable for laboratories, classrooms, galleries and clinical settings. In controlled experiments, observing how different groups view the same stimulus reveals not only biological processes but also the influence of cultural background, knowledge, experience, and personality on visual perception.

Eye movements are also influenced by the types of objects we see in front of us. Our research[1] has shown that when people view human portraits, they are almost 200 times more likely to look at human faces than at any other area of the painting. At first glance, this may seem paradoxical: although artists paint the whole scene, viewers' eyes are drawn most strongly to the faces. From a socio-cognitive perspective, however, this makes sense: faces are unique because they reveal others' emotions, intentions, and identities.

The story that emerges from eye movements is one of both commonality and diversity. Universally, faces attract attention. From infancy, humans are drawn to eyes, mouths, and expressions, reflecting the centrality of faces to social life. Yet cultural background, social experience, and personal traits modulate these tendencies. In a set of studies[2,3], we found that White participants were more likely to focus on White faces, while East Asian participants tended to look longer at East Asian faces. These attentional biases demonstrate that while eye movements are universally necessary, the way they are expressed is individual.

Figure 2

Left: Example of using a mobile eye tracker in research on Castlefield iaduct, Manchester

Right: Stationary eye tracker used to study the perception of social scenes by children

Crucially, they highlight that our experiences may lead us to overlook (or fail to "see") other people.

In a globalised world, where communities interact across cultures, this has pressing implications. In series of studies[4,5] we asked whether positive social experiences could reduce these attentional biases. Using figurative paintings as stimuli (thus avoiding priming participants with explicit social cues) the study found that positive interactions with people from other communities reduced racial bias in attentional patterns. This shows that attention is malleable: positive social experiences can reshape how we see others.

Finally, context also matters. In gallery settings, personality traits such as extraversion or aversion to ambiguity predict eye movement behaviour, influencing how much people enjoy the art they are looking at[6]. Studies of visual exploration of natural and urban scenes have shown that natural environments promote broader, more restorative attention, whereas urban environments often elicit narrower and faster fixation [7]. These insights reveal how environmental design influences not only what people look at but also how they may feel in those spaces.

Policy relevance

The science of eye movements is far from a niche academic pursuit. Eye-tracking research provides policymakers with a window into how people view, interpret, and respond to visual information. By revealing what captures attention, what is overlooked, and how social and environmental contexts shape perception, these insights can guide interventions, communications, and public services that are evidence-based, inclusive, and effective.

Key applications to government priorities include:

Strong foundations: attention is selective and context-dependent, meaning critical public information can be missed or misunderstood. Eye-tracking identifies which elements of public information naturally attract attention. Aligning communications with natural gaze patterns can improve accessibility, comprehension, and public trust.

Kickstarting economic growth: businesses thrive when they can capture consumer attention effectively. Eye-tracking reveals how customers engage with products, websites, and adverts, helping firms refine design and marketing. Supporting this science within innovation ecosystems can boost productivity and global competitiveness.

An NHS fit for the future: patient safety depends on effective communication. Attention biases influence the interpretation of health messages, warnings, and digital tools. Eye-tracking can show which instructions are noticed or overlooked, guiding the design of layouts for clarity and safety. It can also support medical training by improving understanding of visual attention patterns relevant to diagnostic accuracy.

Safer streets: road safety relies on visual attention. Attention in different environments affects the perception of signage and road features. Eye-tracking evidence can identify which cues are noticed or missed, enabling the design of road layouts, signals, and campaigns that reduce accidents.

Breaking down barriers to opportunity: successful learning depends on the effective allocation of attention. Eye-tracking-informed technologies can help students with learning difficulties succeed in educational settings. Adaptive educational tools can use gaze tracking to direct attention to critical information, supporting engagement and equitable access to learning.

Making Britain a clean energy superpower: public acceptance of green technologies depends on clear communication. Eye-tracking can evaluate how people interpret climate campaigns, energy labelling, or consultations on infrastructure. Ensuring that sustainability messages resonate effectively builds support for the transition to clean energy.

Conclusion

In today's information-rich, visually complex world, eye movement research reveals how people perceive and process their surroundings. For policymakers, it provides evidence of how policies are experienced. Integrating these insights ensures that communication strategies, cultural initiatives, and public information campaigns are both scientifically grounded and socially responsive.

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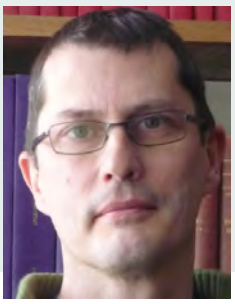
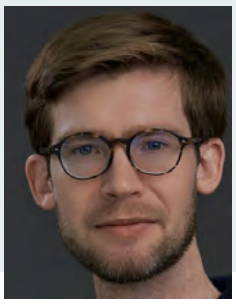
A century of chemistry at Leicester:

Past, present and future impact





Professor Karl S Ryder
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Dr Alexander (Sandy) Kilpatrick
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…imagine, for a moment, a world without cleaning products and sanitation, a world without healthcare, drugs, without smart-phones, fuels, transport and batteries. This would be your world without chemistry!

In May 2025, the University of Leicester marked the centenary of its School of Chemistry with a major celebration. Alumni, staff, students, and friends of the department gathered in the George Porter Building for a family-friendly day of talks, interactive demonstrations, and hands-on activities that showcased a century of achievement and looked ahead to chemistry's future. At the centre of the day was alumnus Professor Peter W. Atkins (BSc Chemistry, Leicester, 1961), the world-renowned physical chemist and author whose textbooks have educated generations of students. His keynote lecture drew a capacity audience and was the highlight of a programme that blended history, science, and lively discussion.

Why chemistry matters to parliament

The Leicester celebration was more than nostalgia. It highlighted a pressing national issue: chemistry is central to the UK's future, yet university departments are under growing pressure. Imagine, for a moment, a world without cleaning products and sanitation, a world without healthcare, drugs, without smart-phones, fuels, transport and batteries. This would be your world without chemistry!

Chemistry is not simply another academic discipline – it is the enabling science that underpins progress in energy, climate, health, materials, and technology. The Royal Society of Chemistry's Future Workforce and Educational Pathways report (2024) projects that chemistry-related jobs will grow by 6.5% in the next decade, around 30% faster than the average for the UK workforce. These skills are needed not only in pharmaceuticals, energy, and manufacturing, but also in emerging sectors such as diagnostics, clean technologies, and advanced materials.

Yet universities across the UK are struggling financiall , and chemistry departments are closing. The risk is clear: the emergence of "chemistry deserts" in some regions, leaving local businesses without access to the skilled graduates they need. As Jonathan Oxley of the Confederation of British Industry has argued, this is not simply an academic concern but one with direct implications for local economies, industrial competitiveness, and national resilience.

The policy stakes are therefore high. Chemistry sits at the heart of the UK's government priorities, from securing energy independence, to delivering sustainable technologies strengthening healthcare innovation or tackling climate change. Chemistry is a discipline that consistently provides the essential innovations and game-changing breakthroughs. Without strong university chemistry departments to sustain the skills pipeline and research base, the UK will be poorly placed to meet these challenges.

From a living memorial to a scientific powerhouse

The University of Leicester was founded in 1921 as a living memorial to those who had fallen in the First World War, supported by donations from the people of Leicester. Our motto, Ut vitam habeant ("so that they may have life"), continues to shape our mission.

Chemistry arrived four years later, in 1925, when Dr Louis Hunter converted parts of the Fielding Johnson Building into makeshift laboratories. Despite limited facilities, enthusiasm for chemistry was strong: over 100 students applied in those early years. The first graduates included pioneering women such as Florence Marjorie Elkins, who completed her degree in 1934 and went on to postgraduate work, and the School appointed its first women lecturers, Dr Florence Shaw and Dr Brenda Prestt, shortly after the Second World War.

From these modest beginnings, Leicester Chemistry grew into a department known internationally for innovation. The 1960s and 70s brought world-class research in fluorine chemistry and gas-phase spectroscopy. The 1980s and 90s saw advances in materials science, catalysis, and electrochemistry. More recently, Leicester has been a hub for sustainable synthesis, green technologies, molecular diagnostics, and atmospheric chemistry.

Science that matters

One theme that runs throughout the century is the ability of Leicester chemists to apply their science in unexpected and impactful ways.

Diagnostics: spin-out companies such as MIP Diagnostics (now Tozaro) design molecularly imprinted polymers that can act as synthetic antibodies, with applications from healthcare to food safety.

Green batteries: ultrasound and even vegetable oil are being explored as tools to recycle and reuse lithium-ion batteries.



Celebrating 100 years of chemistry at Leicester, from founding graduates, through famous alumni, to chemists of the future
(From left to right: Marjorie Elkins ca. 1934; Professor Peter W Atkins; Professor Alison Thompson; Dr Richard Blackburn and son, Rory)

Climate and health: Professor Paul Monks, once head of College (science and engineering) at Leicester, is now the UK Government's Chief Scientific Adviser at the Department for Energy Security and Net Zero, a clear example of Leicester chemistry directly influencing policy.

Forensics: researchers here developed methods to reveal fingerprints on bullet casings, a breakthrough recognised in Time Magazine's "Best Inventions" list.

Chemistry here has never been confined to the laboratory bench. It reaches into forensic science, archaeology, space research, healthcare, and climate solutions - demonstrating again and again that chemistry underpins progress across science, industry, and society.

The Centenary Event: a day of science and storytelling

The Centenary Event in May 2025 brought together multiple generations of Leicester chemists. Visitors toured laboratories, explored hands-on experiments, and saw how chemistry has evolved across the decades.

The keynote lecture by Peter Atkins was both dramatic and deeply personal. He spoke candidly about how "Leicester lifted me out of the gutter." As a teenager, his A-level grades had not been strong enough for his first-choice universities, and he described feeling like a reject. Yet Leicester gave him a chance, which proved transformational. He stayed on after his BSc to complete a PhD in electron spin resonance spectroscopy (1964), then went Stateside as a postdoctoral researcher at UCLA. On his return to the UK, he joined Lincoln College, Oxford, eventually becoming Professor of Chemistry in 1996 and remaining at Oxford until his retirement in 2007. Since then, he has worked as a full-time author, his chemistry texts becoming the standard works worldwide. For the audience, his story was more than autobiography: it embodied the role of STEM education in social mobility – how a second chance at university entry can unlock global impact. The theme of providing opportunity for our students in the face of adversity remains at the very core of our ethos.

Among the other highlights was the Science Kitchen, led by Great British Bake Off finalist Dr Josh Smalley. In collaboration with the University, his project blends culinary creativity with scientific exploration. Through demonstrations that merge beakers and baking, the Science Kitchen aims to inspire young minds to see science and cooking in a new light – showing that chemistry is both accessible and fun.

Talks throughout the day spanned subjects from climate change to catalysis, from forensic science to pharmaceuticals. Alumni swapped stories of their student days, while current students showcased their own research.

A fund for the future

One of the most tangible legacies of the Centenary has been the launch of the Chemistry Centenary Fund, which has already raised over £10,000 through alumni and supporter donations. These funds will support undergraduate prizes and summer research placements for students from all backgrounds, with a particular focus on widening inclusion and participation.

This initiative builds on Leicester's PolyMErise Project, a three-year pilot funded by the Royal Society of Chemistry's Missing Elements scheme. The Missing Elements report revealed a stark issue: while undergraduate chemistry cohorts in the UK are highly diverse, this diversity declines steeply through postgraduate and academic stages. The result is a loss of talent that the discipline (and society) cannot afford.

Leicester, as one of the UK's most ethnically and socially diverse cities, is uniquely placed to respond. PolyMErise provides ring-fenced funding for paid undergraduate research placements, giving students valuable experience to compete for top careers in academia and industry. The aim is simple but vital: to turn the abundance of raw talent in Leicester into the next generation of chemistry leaders.

Looking ahead

As Leicester Chemistry looks to its second century, its priorities remain as bold as ever:

- Advancing sustainable synthesis and catalysis for a low-carbon future
- Developing new materials for energy storage and clean technologies
- Innovating at the interface of chemistry and life sciences to improve healthcare
- Continuing to inspire the next generation through education and outreach.

The Centenary celebrations made one thing clear: chemistry is not a niche subject, but a central pillar of science and society. It is the discipline that explains the material world, that fuels innovation, and that equips students with logical, quantitative skills prized across the economy.

For Leicester, chemistry has always been about more than atoms and molecules. It is about discovery, opportunity, and the ability of science to change lives - in Leicester, across the UK, and around the world.

Touch down for the UK's new industrial strategy

Roger Casale
Member of Parliamentary and Scientific Committee

What does the UK government need to do to ensure that innovations lead to investment, new businesses, employment and skills growth in Britain?

There's a famous story about President Kennedy visiting NASA in 1962 and having a casual conversation with a cleaner on his way into the building. "What are you doing?" asked the President. "I'm helping put a man on the moon" came the reply.

We all have a mental picture of the moon landing. What would it mean to 'land' the Government's new industrial strategy? What would success look like? What difference would it make to our lives now and in the future? How can we make sure it touches down safely and gains traction?

At a recent meeting of the Parliamentary and Scientific Committee APPG, the Institute of Quantum Technologies made a presentation about the importance of these new technologies to the UK economy. We heard about the most extraordinary potential for growth if the UK could grasp the opportunities available. We also learned that in one city in the north of England there were so few physics teachers that they were actually outnumbered by the city's handful of MPs.

Bridging the gap between potential and reality

There is a gap between what is possible and what is actually achievable in Britain today. We have some of the best research institutions in the world. We also have a school system that lacks the capacity to educate a new generation of scientists. So we need a quantum leap in our school system, not just a quantum jump in investment in new technologies.

The UK's industrial strategy excites because it speaks to the bold new frontiers of science. It is both ambitious and practical in scope. It is selective, focusing on eight main areas covering a total of 37 industrial sectors. It does not, however, as previous strategies have done, try to have something to say about everything to everyone.

A broader vision for sustainable growth

What the strategy lacks, is a broader vision of the UK's future which sets it in a social context. Business investment is identified as the key metric to drive the UK economy towards a bright green, digital future. We also need investment in the social fabric, in education and health as well as transport and energy. We need an inclusive vision of Britain in which no one is left behind.

Unless the Government is going to invest more than it has already committed, these resources will need to come predominantly from the private sector. How are such resources to be unlocked in the context of a risk averse investment climate, where returns are uncertain due to slow or stagnant growth in productivity? What is the role of the government going to be in mitigating risk?

One of the key drivers of productivity is breakthroughs in science and research. Some of the UK's universities are world leaders in this area. The Oxford Science Park at Harwell and the Cambridge Cluster of world-beating companies, research institutions and hi-tech start ups are outstanding examples of how government, science and industry can come together to drive UK investment, skills, and employment. Rachel Reeves calls it "Europe's Silicon Valley". In January 2025, she placed the concept at the heart of the UK's Growth Strategy and it is a prominent component of the new industrial strategy.

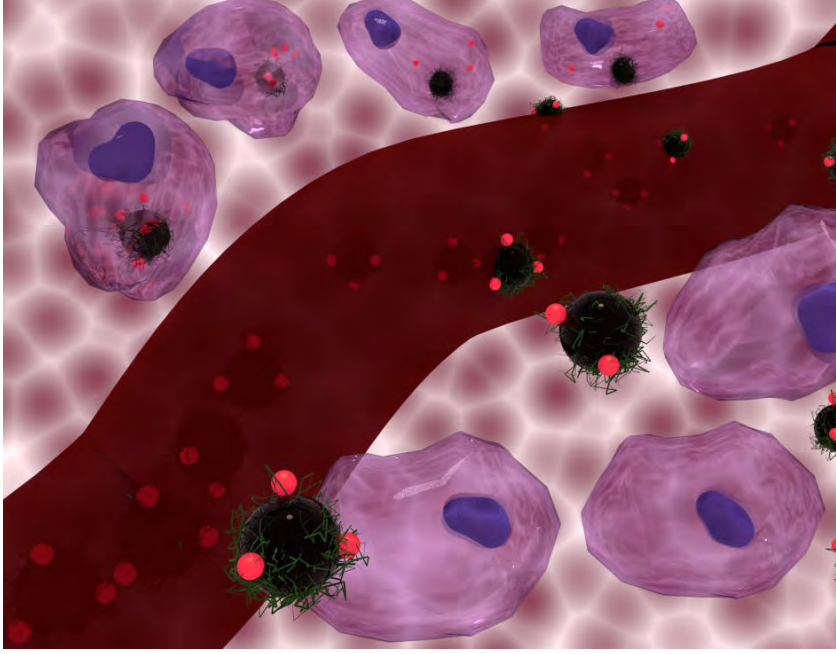
Innovation hubs and the power of collaboration

UCL's Innovation hub should also be highlighted in this connection. This is taking shape at a dedicated space near to Kings Cross, which brings together life science, technology, healthcare and academia. Part of the Knowledge Quarter, it promises to be one of the world's largest innovation districts. It is part of the UK Innovation Corridor.

The hub is already attracting investment into two world-leading research centres, one linked to Moorfields Eye Hospital and another to the UK Dementia Institute. Initial results have been very promising. Overall, more than 540 new student startups and over 70 spinouts have been launched at UCL. Together they have raised over £3.8 billion in investment and they currently employ over 4,300 people. Between 2018 and 2021, five life sciences companies, Meira, Orchard, Achilles, Autolus and Freeline listed on NASDAQ. Collectively they raised over $800m of investment.

Nguyen TK Thanh is a Professor of Nanomaterials at UCL and winner of the Royal Society's Rosalind Franklin prize. One of Thanh's innovative projects involves the use of nanoparticles (iron oxide) for cancer treatment. The particles can be injected into tumours and heated up in a way that limits damage to surrounding tissues. The technology is ripe for commercial development. The only question is whether this will happen in the UK or elsewhere.

What does the UK government need to do in order to ensure that innovations such as Thanh's and others like them lead to investment, new businesses, employment and skills growth in Britain?



Left: Professor Nguyen TK Thanh in conversation with the late Andrew Miller MP, former Chair of the Parliamentary & Scientific Committee, in 200

Right: Chemotherapy technique using magnetic nanoparticles to heat cancerous cells to more than 104°F while delivering drugs

Toward a common purpose for industrial strategy

There is no simple answer. Perhaps the best we can do is to use the question to spark a new kind of conversation. One between politicians, researchers and industry that can lead to a deeper understanding of the factors that lead to success.

We also need to develop a wider public debate about the purpose and value of innovation. The UK doesn't just need more innovations like Thanh's with a pathway to commercialisation. The UK also needs more physical scientists like Thanh, more scientists, more researchers in general. That conversation is all the more urgent now that migration and closer links with Europe, the two most tried and tested pathways to growth, have been shut down by immovable political roadblocks.

It's hard to imagine a better place to start the conversation about how to land the UK industrial strategy than the UCL innovation hub. Recent months have seen visits to UCL's East London campus by the Prime Minister to launch the UK's AI strategy, as well as Peter Kyle in his then role as Secretary of State for Science, Innovation and Technology and Pat McFadden, in his then role as Minister of Intergovernmental relations.

Such high profile visits invite a wider discussion with industry and the public about the role of universities and innovation in driving forward the UK's industrial strategy. China spends 2% of its GDP on its industrial strategy. The USA channels hundreds of billions of dollars to industry through its National Defence Industrial Strategy and Department of Commerce and Energy. The UK's strength is world class universities and research. These should be backed to the hilt.

Regrettably many of the UK's universities are under increasing pressure financially. Undermining the sustainability of the UK's university sector will compromise the effectiveness of the new industrial strategy just as much as a shortage of physics teachers. A joined up, in fact a bottom up approach to implementation is needed as well as the top down vision of the strategy itself. Local and regional governments have a key role to play here in implementing the strategy and contributed influentially to its formulation.

This is also why the conversation between politicians, business and universities is critically important if the new industrial strategy is not to go the way of its predecessors. A deeper understanding is needed. This can help create the kind of permissive environment necessary to deliver increased productivity, higher investment and tangible benefits in all UK regions.

It can also create the sense of common purpose that helped to put a man on the moon and that can lead the UK economy onto a trajectory of sustainable, high value-added growth.

A good example is another UCL initiative, the London Quantum Technology Cluster" launched in May 2025 and backed by a £500,000 investment from the Mayor of London. The initiative aims to create a thriving ecosystem that will accelerate the commercialisation of quantum research.

The Parliamentary and Scientific Committee

The Committee has a key role to play in holding the space for these conversations to take place. The interface between politics, business and science is not easy to navigate. Success depends on building long-term relationships across different domains which deepen understanding and connection. Only then can a sense of common purpose emerge of the kind which puts men and women on the moon.

Let's hope the same spirit can also put physics teachers into classrooms, public money back into research programmes and investment into high value UK start ups. This and more needs to be done, if we want a successful industrial strategy. One that can deliver sustainable growth across the regions. One that is as inclusive as possible so each of us can make a contribution and feel the benefit both today and in the years to come.

NPL at 125:

Reflecting on the role of National Metrology Institutes

Professor Richard Brown
NPL Senior Fellow and Head of Metrology, NPL

Dr James Claverley
Head of Government Relations and Partnership, NPL

As the National Physical Laboratory (NPL) celebrates its 125th anniversary, it is an opportune moment to reflect on its role as the UK's National Metrology Institute and its support to UK economic growth, prosperity, productivity and quality of life.

Metrology is the science and application of measurement. It encompasses the definition of units of measurement and the best-practice and accurate use of those measurement units in the real world.

It is not just about the routine making of measurements, it's about the infrastructure that ensures that we have confidence in the accuracy of the measurement. It establishes a common understanding of units and measurement processes, crucial to human activity.

Metrology is the science of accurate, precise, and repeatable measurement. It ensures traceability to standards and addresses all theoretical and practical aspects of measurement, regardless of uncertainty or field

If philosophy is 'thinking about thinking', then metrology is 'measuring measurement'. In short, many people do measurement, but few do metrology.

The role of NPL and NMIs

A National Metrology Institute (NMI) is an organisation responsible for developing, maintaining, and disseminating national measurement standards that ensure traceability to the SI units (International System of Units)[1]. NPL is the UK's NMI.

NMIs such as NPL are central to the global measurement infrastructure. They ensure that measurements are accurate, comparable across borders, and traceable to the SI units. This is vital for international trade, manufacturing, healthcare, environmental monitoring, and scientific research. NPL's work supports these sectors by providing high-level calibrations, developing measurement techniques, and conducting research to improve measurement accuracy.

A brief history of measurement and NPL

The roots of modern measurement trace back to the French Revolution, which led to the creation of the first metric system. Recognising the need for international consistency, 17 countries signed the Metre Convention in 1875, establishing the International Bureau of Weights and Measures and laying the foundation for SI units. The UK signed the Metre Convention in 1884.

NPL was founded on 1 January 1900, as the UK saw a growing need for a dedicated organisation to develop, safeguard and apply national measurement standards. Initially located at the Kew Observatory, under Director Richard Tetley Glazebrook FRS, NPL soon moved to Bushy House in Teddington. Its early activities were to standardise and verify instruments, test materials, and determine physical constants.

This was seen as a way to unite science and commerce, a vision articulated by HRH The Prince of Wales in 1902 when he formally opened NPL:

> "I believe that in the National Physical Laboratory we have the first instance of the State taking part in scientific research. The object of the scheme is, I understand, to bring scientific knowledge to bear practically upon our everyday industrial and commercial life, to break down the barrier between theory and practice, to effect a union between science and commerce."

Throughout NPL's history, it has made, and been instrumental in, many world-changing scientific discoveries and technological developments

1930s: Radar is invented at NPL

In February 1935, Robert Watson-Watt presented his report, *The Detection of Aircraft by Radio Method*, to the newly formed committee for the scientific survey of air defence. Robert Watson-Watt was the Superintendent of a new radio department at NPL.

A trial followed using the BBC's short-wave (about 50 metres wavelength) radio transmitter at Daventry against a Heyford Bomber. The trial was a success and resulted in the design and installation of a chain of radar stations along the east and south coast of England in time for the outbreak of war in 1939.

1940s: The world's first Automatic Computing Engine

Alan Turing was part of a group formed in 1949 for the design, construction and use of the world's first Automatic Computing Engine (ACE), with the final improved version going into service in 1958. During his time at NPL, Alan Turing made the first plan of the ACE and carried out a great deal of pioneering work in the design of subroutines. It was soon used for solving partial differential equations for use in applications including the design of aircraft, ships and electronic apparatus.

[1] The International System of Units (SI) is the globally agreed system for measurement, ensuring consistency and accuracy worldwide.

1950s: First accurate caesium atomic clock

NPL developed the first accurate caesium atomic clock in 1955, which led to the internationally agreed definition of the second being based on atomic phenomena.

The clock was developed by Louis Essen. Following a trip to America to see early versions of atomic clocks, he designed and built one that delivered much greater accuracy and stability, based on transition between the two hyperfine levels of the ground state of the caesium-133 atom.

Successive developments of this have remained the fundamental standard up to the present day.

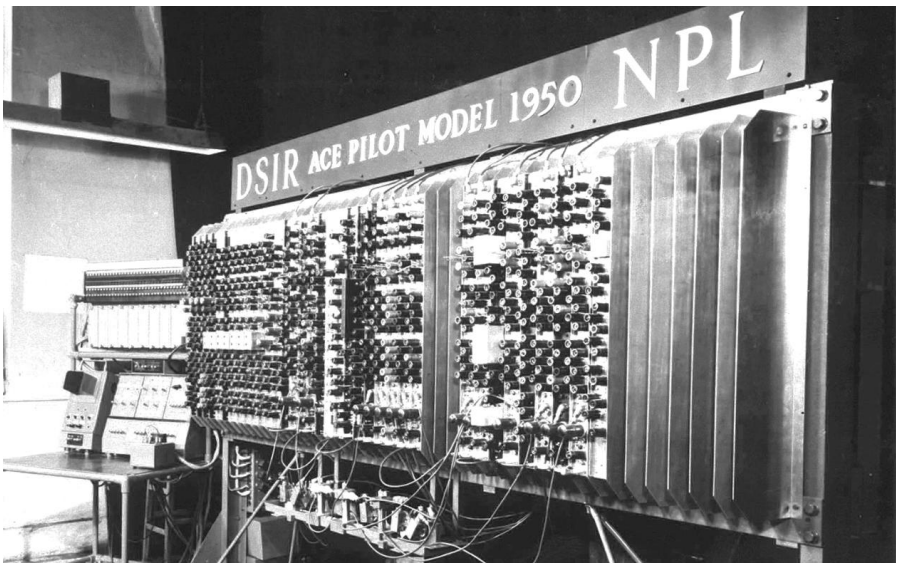


Figure 1: The NPL Pilot ACE – which you may recognise from the £50 note!

1960s: Packet-switching

In 1966, NPL began developing 'packet-switching', a method of splitting messages into chunks and temporarily storing them at computer nodes. Created by Donald Davies, it forms the basis of the worldwide complex of computer communications systems today.

The first practical networks using packet-switching were introduced to the NPL local network and, by the early 1970s, this was providing a range of on-line services to some 200 users. This demonstration provided a much-needed steer to the development of the ARPANET, which would evolve into the Internet we know today.

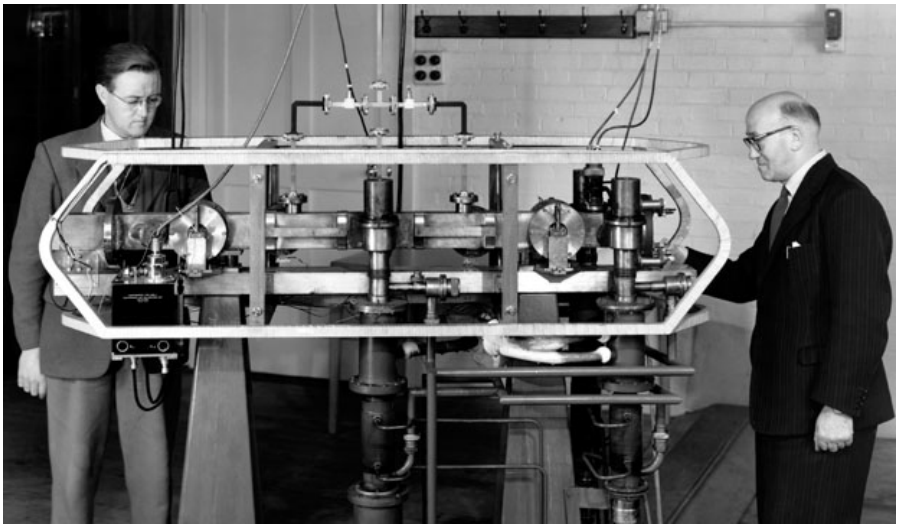


Figure 2: Louis Essen (right) and Jack Parry (left) standing next to the world's first caesium-133 atomic clock, which you can now see at the Science Museum

Modern contributions and collaborations

In recent decades, NPL has expanded its role beyond traditional measurement standards. It now engages in collaborative research addressing societal challenges such as climate change, healthcare, and digital infrastructure. For example, NPL leads the UK's National Timing Centre, which is developing the UK's first nationally distributed time infrastructure and will enable the UK to deliver a more resilient time and frequency service to accelerate innovation in new technologies, such as 5G/6G, smart cities, satellite communications and autonomous vehicles.

NPL also collaborates with industry and academia to develop new measurement technologies and standards. These partnerships help accelerate innovation, improve product quality, and support regulatory compliance. Examples include research into battery ageing, hydrogen gas quality, and nuclear material monitoring.

Future challenges and opportunities

As the pace of change increases and problems become more complex, NMIs will be at the forefront of helping to unravel complex interconnected systems, such as disease pathways, quantum technologies, weather and climate.

Innovation in measurement science and agile thinking will enable future scenarios and challenges to be tackled with confidence

NPL's 125-year legacy demonstrates the enduring importance of metrology in scientific and societal progress. As the UK's NMI, NPL provides trusted, independent expertise that underpins confidence in data and measurement. Its work ensures that scientific discoveries can be translated into real-world benefits, supporting economic growth, public safety, and environmental sustainability.

The work of NPL and the broader NMI community is essential to maintain the integrity of the global measurement system and to address emerging challenges. Metrology may not always make headlines, but it is the quiet force that ensures our measurement – and by extension, our decisions – are accurate, reliable, and trusted.

NPL at 125 years:

Supporting UK economic growth and quality of life

Dr Andrew Pollard
Science Area Leader of the Surface Technology Group, NPL

Dr Ana Lourenço
Leads work dose measurement in cancer radiotherapy. NPL

This year the National Physical Laboratory (NPL) celebrates 125 years of delivering impact from its world-leading measurement science, research and development.

Metrology – the science of measurement – underpins all technology around us and is critical to many aspects of our life, ranging from enabling industry innovation, to demonstrating the quality of products, to ensuring a safe and robust health service.

The UK spends £58 billion every year on measurements, most of which are associated with quality assurance, safety and trade, and which bring untold benefits to people's lives and to the economy. Metrology the foundation upon which all these measurements are made.

During NPL's recent session at the Parliamentary and Scientific Committee we presented two examples of the importance of metrology and how standardisation impacts our everyday lives: new materials innovation and cancer treatment.

Materials metrology enabling innovation and growth

Materials are all around us in our everyday lives and have played a pivotal role in the advancement of society and our quality of life.

Innovation in materials over time is important for products such as electronic devices, batteries that power those devices, and the technology behind renewable energy supplies that we all rely on. At the same time, there is a focus upon improving the sustainability of materials, requiring materials with the potential for reuse, lighter in weight or produced through a sustainable route, all whilst still achieving the same or improved performance to incumbent materials.

Metrology underpins this materials innovation. You cannot innovate a material if you do not accurately know its properties, or you cannot reliably compare one material to another through robust measurement.

> "Materials innovation businesses are key to the UK's economy, contributing an estimated £45 billion each year and employing over 635,000 people"

Graphene

What is required to develop the metrology for a new material? We can take graphene as a recent example. This 'wonder material' is only one atom thick, consists of a lattice of carbon atoms and has amazing electrical and thermal conductivity, strength and transparency.

Moving material such as graphene out of the laboratory and onto the factory floor is challenging. New materials typically take decades to make this transition, requiring metrology and standardisation. During this transition there are many supply chain risks which hamper uptake and scale-up.

One of the crucial issues for the graphene supply chain is that there are many producers selling material called 'graphene' but these materials can have different material properties, with most not being 'graphene' at all.

Supporting UK SMEs

NPL recently supported a UK-based SME that was endeavouring to print electrically-conductive electrodes using graphene bought from a range of suppliers. They found that the 'graphenes' bought from different suppliers behaved differently, sometimes even in completely opposite ways – degrading rather than improving performance of their product.

NPL supported the company by developing new and robust measurement methodologies to show why the two seemingly similar materials had very different material properties. These new measurement methodologies have led to internationally agreed measurement standards, providing robust, reliable and comparable measurements that instil trust in a supply chain. This allows companies to innovate, scale-up, trade internationally and grow.

International standardisation

International standards, such as those coordinated by the International Organization for Standardization (ISO), require international consensus on protocols and best practice, and rely on dedicated metrology research and large and complex international interlaboratory comparisons. This can take up to 10 years, involves a large number of collaborators and partners, and is not easy to achieve. International coordination by trusted organisations such as NPL or VAMAS (The Versailles Project on Advanced Materials and Standards) is key to success. The process is shown in Figure 1.

NPL has been leading international standardisation efforts for graphene. We partnered with the University of Manchester to develop a freely-available, independent guide allowing companies to access test protocols in the interim whilst international standards were agreed. Good Practice Guides from NPL

Figure 1: Key stages of the international documentary standardisation process

Figure 2: NPL and NHS clinical scientists during testing of the NHS's first high-energy clinical proton radiotherapy equipment at The Christie NHS Foundation Trust Hospital, UK

and other pre-standards activities benefit UK companies directly by providing a competitive edge, giving the UK first mover advantage, and form the basis of national standards, which in the UK are coordinated by the British Standards Institution (BSI).

Three UK SMEs that worked directly with NPL to robustly describe the properties of their newly innovated materials were able to secure £60 million of private investment and employ more skilled technical staff – in some cases growing by a factor of 10!

Cancer treatment

Another example of how metrology and standardisation impact on our everyday lives is in the area of cancer treatment.

> "One in two people will be diagnosed with cancer in their lifetime, and around 50% of patients will require radiotherapy at some stage of their treatment"

Despite being central to cancer care, radiotherapy accounts for only 5% of the NHS cancer budget. This makes it not only a life-saving treatment but also a highly cost-effective one.

Safe and accurate radiotherapy

Radiotherapy works by targeting tumours with high-energy radiation to destroy cancer cells. For treatment to be safe and effective, patients must receive the correct radiation dose – too low a dose may leave cancer cells behind, reducing treatment success, and too high a dose can damage healthy tissues and cause long-term side effects like cognitive decline or organ damage. Precision in measuring and delivering radiation is essential to improving patient outcomes.

Since 1913, NPL has played a pioneering role in radiation measurement. Early methods focused on the strength of the radiation source and for how long it was applied during treatment. Over time, NPL developed new methods to improve treatment accuracy and, in 1988, launched the world's first calibration service for measuring absorbed radiation dose, setting global standards for accuracy in cancer treatment.

NPL is at the heart of the UK's efforts to deliver safe and effective radiotherapy. Every NHS radiotherapy centre is traceable to NPL's standards, ensuring every patient receives the correct dose.

New technique safety

NPL also plays a vital role in supporting the NHS to adopt new advanced radiotherapy techniques.

While conventional radiotherapy uses high-energy X-rays, more advanced approaches such as proton radiotherapy enable tumours to be targeted more precisely, reducing damage to healthy tissue. This is especially beneficial for paediatric patients and for tumours near critical organs. For example, in paediatric brain tumours, proton radiotherapy offers unparalleled precision, reducing radiation exposure to developing organs and thereby minimising long-term side effects that can affect a child's growth, cognition and quality of life. To support the safe delivery of these treatments, NPL has developed the world's first dedicated measurement standard for proton radiotherapy.

The NHS has now established two high-energy proton radiotherapy centres, marking a significant step forward in expanding access to cutting-edge cancer treatments (Figure 2).

Another promising new development is FLASH radiotherapy. This uses shorter, higher doses, and has the potential to treat certain cancers more quickly and with fewer side effects than current methods. NPL recently conducted the first-ever absolute radiation dose measurements of a FLASH proton beam in the USA. This breakthrough supported the first in-human clinical trial using this new treatment modality, helping to accelerate the safe adoption of future therapies for UK patients.

By 2040, cancer cases in the UK are projected to rise by nearly one-third, reaching over 500,000 new cases annually. Accurate measurement and validation will be vital to delivering safer, faster, and more personalised treatments.

Conclusion

From advanced materials to cutting-edge cancer therapies, the UK's innovation landscape continues to evolve rapidly, driving improvements in economic growth and quality of life.

As new materials emerge and technologies become more complex, the need for trusted measurement standards becomes ever more critical.

This is a journey NPL has been on for 125 years and one that will continue well into the future.

NPL's expertise in developing robust measurement and documentary standards will remain central to building trust in these transformative technologies. In a world shaped by rapid change, NPL ensures that progress is not only possible but reliable, safe, and impactful.

NPL for the next 125 years:

Delivering the metrology of the future

Professor Josephine Bunch
NPL Fellow in Biomolecular Analysis
Head of Science, Chemical and Biological Sciences Department, NPL
Chair of Biomolecular Mass Spectrometry, Imperial College London

From our early days as the UK's National Metrology Institute, we have closely supported industry to encourage innovation and played a vital role in translation of scientific expertise into economic prosperit , skilled employment and improved quality of life.

Metrology – the science and application of measurement – will always play a key role in innovation. At NPL, we are constantly reviewing which emerging trends might change why and how we perform measurements.

Since our inception in 1900, the world has changed significantl , and we have evolved at pace to support it. In this digital age, we are proud that our world-leading measurement science continues to provide confidence in data and enables innovation and international trade to flourish.

The enduring role of a National Metrology Institute (NMI) is to introduce, improve and disseminate the metrological approaches and measurement solutions which can be used to save lives, monitor and protect the environment and enable citizens to feel safe and secure.

To support the UK in its ambition to achieve a sustainable healthcare system and reach key environmental targets, such as management of the earth's rising temperature, NPL will play a vital role in using existing and new metrology for increasingly complex challenges.

Measuring complexity

A key trend for the future is the growing need to understand more and more complex systems and scenarios. Scientists continue to investigate these complex systems to understand them better (such as cells) or improve their operation (such as batteries). Where scientists once might have sought to model these systems or investigate them in a well-controlled environment, they now want to do this in situ or in operandi - adding to the complexity of the investigation.

The complexity of the measurements themselves is also trending towards the more complex: scientists across disciplines understand the need for analytical and computational pipelines which can measure and analyse many things at once. In the future, we also expect an increasing amount of information to be derived or predicated from indirect or proxy measurements.

We anticipate that measurement techniques will continue to become more sensitive and faster, generating ever increasing volumes of data. In turn, we expect rapid advances in the computational platforms, strategies and tools which will allow us to store, share, mine or interrogate these increasingly large datasets. The desire to integrate many disparate and large datasets will naturally follow. At the heart of our ability to infer useful new knowledge from these data, will be the metrology underpinning the measurements themselves and the methods we use to review the data.

Globally, we will apply these advanced, often indirect measurement technologies to highly complex natural and artificial systems which are defined by interdependencies that cannot be simply measured, modelled or interpreted. This brings new challenges and will require us to develop new approaches and principles to allow us to measure and interpret this multi-dimensional, often poorly defined 'cross-talk'.

We must develop the ability to understand, interpret and measure the relationships these data points have to each other - and do so in a way that delivers measurement traceability – a challenge we are already working on.

Whether it's driving green growth or ensuring intelligent use of health data, the UK's position as a global science leader can be accelerated, protected and maintained by applying metrology.

Measuring with 'big data' and AI

In our digitally enabled infrastructure, it is commonplace to rely upon machine learning approaches for data reduction and review of complex datasets. Artificial intelligence is already transforming many processes across all sectors. NMIs across the globe, such as NPL, are working to ensure confidence in results from AI and ensure development and deployment of 'trustworthy' AI.

The UK maintains a leading position in establishing large-scale reference data from population genotyping and phenotyping exercises. These vast data provide invaluable insights into basic biochemistry and the health of a nation. Further scale up of these initiatives will require new metrics and methods to ensure equivalence between measurements – e.g. to review many features, between patients or many features from a single patient over time, or both.

A metrology mindset

We are confident that with the right 'metrology mindset', we can start to envisage a future of streamlined, efficient and harmonised measurements within all sectors.

For example, in healthcare, combining advanced molecular imaging with molecular assisted robotic surgery, is an exciting possibility which could pave the way for unifying measurements across a patient journey. Several innovative new methods have been introduced over the last two decades, but it will take dedicated metrology efforts to enable their evaluation, standardisation, regulation and assessment. Without metrology, new healthcare solutions cannot be reliably adopted.

Engineering biology

Another example is in engineering biology, also known as synthetic biology, which involves designing and building new biological systems, including new cells, with specific functions. The factories of the future will use these biological systems to produce therapies, food, chemicals and fuels. It is a rapidly growing area with the potential to address global challenges and drive economic growth. This field leverages advancements in DNA sequencing, manufacturing and editing and is completely reliant on metrology. The promise is there, but the scale up will be critical. New measurement science is needed for Eng Bio to flourish, especially through the design and preparation of new reference materials and metrics for characterisation and comparisons of efficiency and performance.

The complex earth system

My last example covers the earth, both natural and built environment, our atmosphere and our oceans, which represent a vastly complex and interconnected suite of systems.

Earth Observation is the process of gathering information about the Earth's surface, waters and atmosphere via ground-based, airborne or satellite remote sensing platforms. Of particular importance will be our ability to deliver quality assurance and traceability of climate data providing the confidence needed to make climate data actionable.

With NPL's continuing work to deliver new approaches for determination and reporting of uncertainty in complex, indirect measurements, these pioneering endeavours will provide clues to how to tackle the challenges we face in our vast and interconnected earth system.

Conclusion

Each of these examples illustrates NPL's leading role in establishing new metrology associated with distributed, sometimes indirect or proxy measurements of vastly complex systems.

As the pace of change increases and problems become more complex, NMIs will be at the forefront of helping to unravel complex interconnected systems, such as disease pathways, quantum technologies, weather and climate. Innovation in measurement science and agile thinking will enable future scenarios and challenges to be tackled with confidence

DISCUSSION MEETINGS

17 JUNE 2025
IN PARTNERSHIP WITH THE CHARTERED INSTITUTE OF PATENT ATTORNEYS

Innovation unlocked: how patents power SME growth

Left to right: **Leigh Jeffes**, Chief Executive, Parliamentary & Scientific Committee; **Daniel Chew**, Partner, Head of Asia Group at HLK **Dr Stephen Wells**, Co-Founder of EnsiliTech; **Dr Claudia Duffy**, European Patent Attorney; **Ilya Kazi**, Founder at IK-IP Ltd; **Lisa Hicks**, CEO of SNOAP; **Viscount Stansgate**, President, Parliamentary & Scientific Committee; **Neil Lampert**, Deputy Chief Executive, Chartered Institute of Patent Attorneys (CIPSA; **Matt Dixon**, Immediate Past President of CIPA; **Ian Hird**, Commercial Director, White Motorcycle Concepts and **Dr Jon Markham**, Partner, Beck Greener LLP

9 SEPTEMBER 2025
IN PARTNERSHIP WITH THE INSTITUTE OF PHYSICS

Quantum technologies

Left to right: **Professor Sir Keith Burnett CBE FRS**, President of the Institute of Physics; **Professor Sir Peter Knight FRS**, Chair of the Quantum Metrology Institute, National Physical Laboratory; **Tom Grinyer,** Chief Executive Office , Institute of Physics; **Dr Najwa Sidqi,** Harwell Campus Cluster Manager; **Viscount Stansgate**, President, Parliamentary & Scientific Committee; **Jonathan Legh-Smith MBE**, Executive Director, UKQuantum; **Anne Crean**, Associate Director of Science and Innovation, Institute of Physics; **Louis Barson**, Director, Science, Innovation and Skills, Institute of Physics

SELECT COMMITTEES

HOUSE OF COMMONS BUSINESS AND TRADE COMMITTEE

The Business and Trade Committee scrutinises the policy, spending and administration of the Department for Business and Trade and its public bodies.

CURRENT INQUIRIES

Financing the real economy
Opened: 4 August 2025

Small business strategy
Opened: 18 June 2025

US trade with the US, India and EU
Report 14 September 2025

Industrial strategy
Report 6 June 2025

Export-led growth
Report 29 June 2025
Government response: 19 September 2025

The work of the Business and Trade Committee
Opened: 20 November 2024

Business and Trade Committee priorities
Report published: 13 February 2025

MEMBERSHIP

Rt Hon Liam Byrne MP, Labour (Chair)
Antonia Bance MP, Labour
John Cooper MP, Conservative
Sarah Edwards MP, Labour
Alison Griffiths MP, Conservative
Sonia Kumar MP, Labour
Charles Maynard MP, Liberal Democrat
Gregor Poynton MP, Labour
Joshua Reynolds MP, Liberal Democrat
Matt Western MP, Labour
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HOUSE OF COMMONS ENVIRONMENTAL AUDIT COMMITTEE

The Committee's remit is to consider the extent to which the policies and programmes of government departments and non-departmental public bodies contribute to environmental protection and sustainable development, and to audit their performance against sustainable development and environmental protection targets.

CURRENT INQUIRIES

The Environment in Focus
Opened: 5 September 2025

Addressing the risks from Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)
Opened: 10 April 2025

Airport expansion and climate and nature targets
Opened: 28 March 2025

Governing the marine environment
Report: 5 June 2025
Government response 9 September 2025

Flood resilience in England
Opened: 10 December 2024

The UK and the Antarctic Environment (revived)
Report: 9 June 2025
Government response 22 July 2025

Environmental sustainability and housing growth
Opened: 18 November 2024

The role of natural capital in the green economy (revived)
Report: 7 May 2025
Government response: 22 July 2025

MEMBERSHIP

Toby Perkins MP, Labour (Chair)
Olivia Blake MP, Labour
Julia Buckley MP, Labour
Ellie Chowns MP, Green Party
Barry Gardiner MP, Labour
Anna Gelderd MP, Labour
Sarah Gibson MP, Liberal Democrat
Alison Griffiths MP, Conservative
Chris Hinchliff MP, Labour
Martin Rhodes MP, Labour
Dr Roz Savage MP, Liberal Democrat
Blake Stephenson MP, Conservative
Alison Taylor MP, Labour
Cameron Thomas MP, Liberal Democrat
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Rt. Hon Sammy Wilson MP, Democratic Unionist Party

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SELECT COMMITTEES

HOUSE OF COMMONS ENERGY SECURITY AND NET ZERO COMMITTEE

The Energy Security and Net Zero Committee scrutinises the policy spending and administration of the Department of Energy Security and Net Zero and its public bodies, including Ofgem and the Committee on Climate Change.

CURRENT INQUIRIES

National planning for energy infrastructure
Report 7 July 2025

Revisiting the nuclear roadmap
Opened: 20 February 2025

Building support for the energy transition
Opened: 19 February 2025

The cost of energy
Opened: 18 February 2025

Industrial strategy for clean power
Opened: 5 February 2025

Retrofitting homes for net zero
Report 22 May 2025
Government response 18 August 2025

Unlocking community energy at scale
Opened: 11 November 2024

Work of the Department of Energy and Net Zero
Opened: 11 November 2024

Workforce planning to deliver clean, secure energy
Opened: 11 November 2024

MEMBERSHIP

Bill Esterson MP, Labour (Chair)
Polly Billington MP, Labour
Sir Christopher Chope MP, Conservative
Torcuil Crighton MP, Labour
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HOUSE OF COMMONS SCIENCE, INNOVATION AND TECHNOLOGY COMMITTEE

The Science, Innovation and Technology Select Committee examines the expenditure, administration and policy of the Department for Science, Innovation and Technology, and associated public bodies. It also exists to ensure that Government policies and decision-making across departments are based on solid scientific evidence and advice.

CURRENT INQUIRIES

Innovation and global food security
Opened 21 July

Science diplomacy
Opened 3 April 2025

Digital centre of government
Opened 3 February 2025

Under the microscope
Opened 13 January 2025

Innovation, growth and the regions
Opened 6 December 2024

Innovation showcase
Opened 4 December 2025

Social media misinformation and harmful algorithms
Report: 11 July 2025

MEMBERSHIP

Dame Chi Onwurah MP, Labour (Chair)
Emily Darlington MP, Labour
George Freeman MP, Conservative
Dr Allison Gardner MP, Labour
Tom Gordon MP, Liberal Democrat
Rt Hon Kit Malthouse MP, Conservative
Jon Pearce MP, Labour
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SELECT COMMITTEES

HOUSE OF COMMONS HEALTH AND SOCIAL CARE COMMITTEE

The Health and Social Care Committee. Its responsibility is to scrutinise the work of the Department of Health and Social Care and its associated public bodies. The Committee examine government policy, spending and administration on behalf of the electorate and the House of Commons.

CURRENT INQUIRIES

Food and weight management
Opened: 17 July 2025

Healthy ageing: physical activity in an ageing society
Opened: 26 June 2025

The first 1000 days: a renewed focus
Opened: 21 March 2025

Community Mental Health Services
Opened: 17 December 2024

The 10 Year Health Plan
Opened: 13 November 2024

Adult social care reform: the cost of inaction
Report: 5 May 2025
Government response: 9 July 2025

MEMBERSHIP

Layla Moran MP, Liberal Democrat (Chair)
Danny Beales MP, Labour
Ben Coleman MP, Labour
Dr Beccy Cooper MP, Labour
Jen Craft MP, Labour
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HOUSE OF COMMONS ENVIRONMENT, FOOD AND RURAL AFFAIRS COMMITTEE

Looking at issues from the air we breathe to the food on our plates, Parliament's Environment, Food and Rural Affairs Committee (EFRA) exists to scrutinise the administration, spending and policy of the Government's Department for Environment, Food and Rural Affairs.

CURRENT INQUIRIES

Climate and weather resilience
Opened: 9 September 2025

Preventing waste and enabling a circular economy
Opened: 20 May 2025

Fisheries and the marine environment
Opened: 23rd January 2025

Animal and plant health
Report: 15 September 2025

Fairness in the food supply chain
Opened: 20 December 2024

Reforming the water sector
Report: 16 June 2025

The future of farming
Report: 16 May 2025
Government response: 3 September 2025

Work of the Department and its arm's-length bodies
Opened: 6 November 2024

MEMBERSHIP

Rt Hon Alistair Carmichael MP, Liberal Democrat (Chair)
Sarah Bool MP, Conservative
Charlie Dewhirst MP, Conservative
Helen Dollimore MP, Labour
Sarah Dyke MP, Liberal Democrat
Jayne Kirkham MP, Labour
Josh Newbury MP, Labour
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SELECT COMMITTEES

HOUSE OF COMMONS EDUCATION COMMITTEE

The Education Committee scrutinises the work of the Department for Education, covering children's social care, schools, colleges, the early years and higher education. The Committee also holds regular hearings with DfE's arms-length bodies, including Ofsted, Ofqual and the Children's Commissioner.

CURRENT INQUIRIES

Early years: improving support for children and parents
Opened: 4 September 2025

Higher education and funding: threat of insolvency and international students
Opened: 12 June 2025

Further education and skills
Opened: 29 January 2025

Solving the SEND crisis
Report: 18 September 2025

Children's social care
Report: 10 July 2025

MEMBERSHIP

Helen Hayes MP, Labour (Chair)
Jess Asato MP, Labour
Sureena Brackenridge MP, Labour
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Dr Carolone Johnson MP, Conservative
Amanda Martin MP, Labour
Darren Paffey MP, Labour
Manuela Perteghella MP, Liberal Democrat
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THE HOUSE OF LORDS SCIENCE AND TECHNOLOGY COMMITTEE

The Committee is appointed to consider science and technology. It does this principally through undertaking inquiries.

CURRENT INQUIRIES

Financing and scaling UK science and technology: innovation, investment, industry
Opened: 20 March 2025

MEMBERSHIP

The Lord Mair CBE, Chair, Crossbench
The Lord Berkeley OBE, Labour
The Lord Borwick, Conservative
The Rt Hon. the Lord Drayson, Labour
The Lord Lucas, Conservative
The Baroness Neuberger, Crossbench
The Rt Hon. the Baroness Neville-Jones, Conservative
The Rt Hon. the Baroness Northover, Liberal Democrat
The Lord Ranger of Northwood, Conservative
The Viscount Stansgate, Labour
The Lord Stern of Brentford CH, Crossbench
The Baroness Walmsley, Liberal Democrat
The Baroness Willis of Summertown, Crossbench
The Baroness Young of Old Scone, Labour

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THE HOUSE OF LORDS ENVIRONMENT AND CLIMATE CHANGE COMMITTEE

The Environment and Climate Change Committee was appointed to consider the environment and climate change.

CURRENT INQUIRIES

Nitrogen
Opened: 30 January 2025
Report: 24 July 2025

MEMBERSHIP

The Baroness Sheehan, Liberal Democrat, Chair
The Lord Ashcombe, Conservative
The Lord Duncan of Springbank, Conservative
The Lord Jay of Ewelme, Crossbench
The Lord Krebs, Crossbench
The Lord Layard, Labour
The Earl of Leicester, Conservative
The Lord Lennie, Labour
The Lord Mancroft, Conservative
The Rt Hon. the Lord Rooker, Labour
The Earl Russell, Liberal Democrat
The Lord Trees, Crossbench
The Baroness Whitaker, Labour

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UK Parliament POST

The Parliamentary Office of Science and Technology (POST) is an impartial research and knowledge exchange service based in the UK Parliament. POST connects members of parliament with cutting-edge research and evidence. We publish evidence-based, peer-reviewed briefings on a wide range of subjects and have a UK-wide network of researchers and academics ready to share their expertise with parliamentarians. We also help researchers understand parliament and contribute to its work.

NEW POST RESEARCH

POST research is available to all at **post.parliament.uk**. Recent briefings include:

CYBER RESILIENCE OF UK DIGITAL INFRASTRUCTURE

POSTnote
published 11 September 2025

Explore how the UK can protect its essential digital systems against cyberattacks, environmental hazards and technology failures. This briefing looks at approaches such as 'Secure by Design', workforce training, supply-chain mapping, and fostering a positive cyber security culture, while highlighting barriers including skills shortages and legacy systems. With a new Cyber Security and Resilience Bill on the way, the paper provides a timely overview of how far the UK has come – and where the biggest vulnerabilities remain.

WINTER MORTALITY

POSTnote
published 10 September 2025

Why does the UK see more winter deaths than colder countries? This briefing explores the complex mix of cold weather, infections, fuel poverty and housing quality that contribute to excess winter mortality. It highlights vulnerable groups, reviews long-term trends, and outlines cross-sector interventions to reduce risks, spanning health, housing and energy policy.

NEUROTECHNOLOGY: WHAT IT IS AND HOW IT IS USED?

Rapid response
published 9 September 2025

Neurotechnologies, from cochlear implants to brain-computer interfaces, are advancing rapidly with potential to transform medicine, communication and even entertainment. This rapid response article introduces the science behind devices that record, stimulate or modulate brain activity, and reviews applications ranging from treatment of Parkinson's disease to thought-driven mobility aids. It highlights the UK's strong research base and economic potential, alongside key challenges around safety, ethics, data privacy and regulation. The paper underscores that as innovation accelerates, effective oversight will be essential to balance opportunity with public trust.

DEFENDING UK AIRSPACE

POSTnote
published 8 August 2025

Missiles, drones and hostile aircraft pose complex challenges for UK air defence. This POSTnote reviews current systems – from Typhoon jets and Sea Viper systems on destroyers, to Sky Sabre missiles – and highlights significant gaps including early warning, ground-based defence and hypersonic interception. The briefing also outlines modernisation plans including Wedgetail aircraft, directed-energy weapons and deeper NATO integration, which signal a shift towards more integrated, tech-enabled protection of UK airspace.

VIOLENCE AGAINST WOMEN AND GIRLS IN SCHOOLS AND AMONG CHILDREN AND YOUNG PEOPLE

POSTnote
published 7 August 2025

What does violence against young women and girls look like in schools, online and other spaces – and what works to prevent it? This briefing examines prevalence data, key laws and policy, and the challenges of underreporting, gaps in data monitoring, fragmented services and low trust in authorities. It highlights prevention tools from whole-school approaches to digital literacy, and asks: how can policy and practice evolve to protect girls and young women more effectively?

TREATING RARE DISEASES: THE CHALLENGE OF ORPHAN DRUGS

Rapid response
published 24 July 2025

Orphan drugs target rare conditions which individually affect fewer than 5 in 10,000 people, but which combined are estimated to apply to 3.5 million people in the UK. This briefing explains the barriers to developing and approving orphan drug treatments, including small clinical trials, high costs and strict evaluation thresholds. It summarises the UK's regulatory framework, compares it with EU and US pathways, and explores how NICE appraises orphan drugs. Read the briefing for a concise overview of ethical debates, patient access challenges, and recent proposals such as the Rare Cancers Bill 2024.

GEOGRAPHICAL DIFFERENCES IN HEALTHY LIFE EXPECTANCY

POSTbrief
published 21 July 2025

Across England, people in some local authorities experience nearly 18 more years of good health than others. This POSTbrief examines what drives that gap, including long-term conditions, lifestyle risks such as smoking and obesity, and the wider effects of poverty, housing and employment. Policy responses are considered from national legislation to local initiatives. The analysis highlights that tackling health inequalities plays a role in both prevention and attention to the wider determinants of health.

ELECTROMAGNETIC (ELECTRONIC) WARFARE

POSTnote
published 10 July 2025

Electromagnetic warfare (EW) is an essential element of modern military operations. This briefing explains how EW works by using radio waves, microwaves, infrared and other signals to disrupt adversaries or protect forces. It outlines offensive and defensive methods, from jamming and spoofing to stealth and directed-energy weapons, and places UK capability in a global context alongside Russia, China and the US. With plans for a new CyberEM Command in 2025 and fresh investment, the briefing asks whether the UK can seize the opportunities and challenges that EW presents.

HORIZON SCANNING

POST carries out horizon scanning research to help parliamentarians identify and understand emerging issues which parliament may need to address in the next five years. Over the summer, we published our final articles for the 2024-29 Parliament:

Head over to **post.parliament.uk/post-horizon-scanning** to browse our huge range of quick-read articles.

- Maternal, newborn and infant health: priorities for improved outcomes
- Public health: inequalities and prevention
- Children and young people's health and social care

UPCOMING RESEARCH

Keep an eye out for exciting new POST research being published over the next few months, on topics including:

- Multifunctional land use decisions: what role could collaborative governance models play?
- The effects of artificial intelligence on UK employment
- Data centres and their sustainability
- Management of legacy landfill pollution
- Access to justice: legal aid and services
- Improving outcomes and support for looked after children and their families
- Surrogacy – current practice and proposed reforms
- Technology alternatives to animals in life sciences research
- Diagnosis and treatment of rare genetic diseases

If you'd like to be notified when new POST research is published on topics you care about, sign up for POST email updates at **post.parliament.uk/subscribe**.

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You can receive the latest research updates from the Commons Library, on the topics you care about, with alerts sent straight to your email inbox. Sign up at **commonslibrary.parliament.uk/subscribe**.

NEW COMMONS LIBRARY RESEARCH

We publish a range of topical and business-related research online each month. Read about our latest research on science, health, the environment and technology below – you can find more recent research, as well as the full briefings for everything in this article, on our website at **commonslibrary.parliament.uk/scienceinparliament**.

Digital Assets

Research Briefing CBP 10329
published 8 September 2025

This briefing provides a comprehensive overview of digital assets, including cryptocurrencies and non-fungible tokens (NFTs), and examines how UK policy and regulation are evolving to address their rapid growth. It explores the risks and opportunities presented by these technologies, the implications for consumers and businesses, and the government's approach to fostering innovation while ensuring financial stability. Read the full briefing for a detailed analysis of the history and functioning of digital assets, the current landscape and future prospects.

Data centres: planning policy, sustainability, and resilience

Research Briefing CBP 10315
published 27 August 2025

Discover how data centres underpin the UK's digital infrastructure. This briefing explores planning policy, environmental sustainability, and the resilience of these critical facilities. It covers government targets, the challenges of energy and water consumption, and the sector's response to increasing demand. Find out how policy is shaping the future of data centres and what steps are being taken to achieve their long-term viability and security.

Rural mobile coverage in the UK: Not-spots and partial not-spots

Research Briefing SN 07069
published 21 August 2025

This briefing examines the persistent gaps in mobile coverage across rural areas of the UK, known as 'total not-spots' and 'partial not-spots'. It reviews the impact on local communities and businesses, outlines government initiatives to improve connectivity, and presents the latest data on coverage improvements. Explore the challenges faced in delivering reliable mobile services and the policy measures designed to close the digital divide.

Droughts in England

Insight
published 13 August 2025

Explore the causes, impacts, and policy responses to droughts in England. This quick-read article analyses recent drought events, their effects on water supply, agriculture, and the environment, and the strategies being developed to improve resilience. It highlights the role of climate change, infrastructure planning, and government action in managing future risk and preparing for water scarcity.

Clean power targets

Research Briefing CBP 10182
published 11 August 2025

This briefing explains what the UK government means by 'clean' power and outlines its ambition to meet annual electricity demand with low carbon sources by 2030. It explores regional differences in clean energy generation – including where in the UK generates more clean energy than it uses – and tracks growth in different technologies, providing a clear overview of this key policy area.

Patient health records: Access, sharing and confidentialit

Research Briefing SN 7103
published 28 July 2025

This briefing examines the management of electronic patient health records in the UK, focusing on access, data sharing, and confidentiality in light of government plans for a single patient record. It covers the legal frameworks governing health information, recent policy developments, and the challenges of balancing patient privacy with the need for effective care. The paper also discusses trials using AI technology with health records and the implications for patients and healthcare providers.

Economic regulation of the water industry

Research Briefing CBP 8931
published 22 July 2025

Gain a detailed understanding of how the water industry is regulated in the UK. This briefing explains the roles of key regulators, the framework for economic oversight, and the mechanisms used to ensure fair pricing and service standards. It also addresses recent challenges, such as investment needs and environmental concerns, and outlines current debates about the future of water sector regulation.

Heatwaves in the UK

Insight
published 14 July 2025

This quick-read explains how heatwaves are defined and explores their increasing frequency and impact in the UK, including risks posed to infrastructure, public health and ecosystem dynamics.

Rights of Way

Research Briefing CBP 9952
published 10 July 2025

Explains the legal framework and practical issues surrounding rights of way in England and Wales. It covers the process for recording, modifying, and extinguishing public paths, as well as recent legislative changes and ongoing debates about access to the countryside. The paper also highlights the responsibilities of local authorities and landowners, providing a clear overview for those interested in land management, recreation, and rural policy.

Developments in dementia treatments

Research Briefing CBP 10117
published 9 July 2025

Explore the latest advances and remaining barriers in dementia treatment and care. This briefing summarises two new drug therapies and the challenges of diagnosis and support for patients and families. It also examines government policy, funding for research, and the wider implications for health and social care services.

Antimicrobial resistance

Research Briefing CBP 8141
published 19 June 2025

This briefing investigates the growing threat of antimicrobial resistance (AMR) and its implications for public health in the UK. It outlines the causes of AMR, current trends, and the government's strategy to tackle the issue. The paper also discusses the impact on healthcare systems and the importance of international collaboration.

Cybersecurity in the UK

Research Briefing CBP 9821
published 1 May 2025

This briefing explores the UK's cybersecurity landscape, from the nature of cyber threats to how attacks are carried out and who is behind them. It outlines government policy, regulatory frameworks, and proposals for reform such as ethical hacking. Ahead of the upcoming Cyber Security and Resilience Bill, learn about the key cyber threats and what's next for cyber resilience.

BRIEFINGS ON LEGISLATION

Our legislative briefings help you understand the content and journey of bills as they pass through parliament. Latest updates include:

Animal Welfare (Import of Dogs, Cats and Ferrets) Bill 2024–25

Research Briefing CBP 10294
last updated 2 July 2025

This bill would raise the minimum age for imported dogs and cats, ban imports of pregnant or mutilated animals, and limit the number of animals per vehicle, aiming to improve welfare standards for imported pets in the UK.

Dogs (Protection of Livestock) (Amendment) Bill 2024–25

Research Briefing CBP 10297
last updated 1 July 2025

The bill aims to strengthen enforcement against dogs worrying livestock by expanding police powers, updating definitions, and improving investigation procedures. It seeks to reduce harm to animals and financial losses for farmers through clearer legal provisions and enhanced penalties.

DATA DASHBOARDS

The Library also produces a range of interactive data dashboards, helping you find data at constituency, regional and national levels. Our most recently-updated dashboards are:

Constituency data: Health conditions

Data last updated 29 August 2025

Track estimated prevalence in England of 20 health conditions including diabetes, depression and dementia.

Constituency data: GPs and GP practices

Data last updated 5 August 2025

Find a map and list of GP practices in each constituency in England, as well as data on the ratio of GPs to patients in each area.

GET REAL-TIME RESEARCH UPDATES FOR PARLIAMENTARY DEBATES

Get impartial, curated research for the day's debates an hour before the Commons Chamber sits from the Commons Library and POST's WhatsApp channel, **Research in Parliament.**

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SCIENCE DIRECTORY

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airto

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AIRTO, the Association of Innovation, Research and Technology Organisations, comprises approximately sixty principal organisations operating in the UK's Innovation, Research and Technology (IRT) sector. The IRT sector has a combined turnover of £6.9bn, employs over 57,000 people and contributes £34bn to UK GVA. AIRTO's members work at the interface between academia and industry, for both private and public sector clients. Members include independent Research and Technology Organisations, Catapult Centres, Public Sector Research Establishments, National Laboratories, some university Technology Transfer Offices and some privately held innovation companies.

Applied Microbiology International

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Applied Microbiology International believes that global challenges need to be solved by global, interdisciplinary experts who apply their diverse experience and unique voices to achieve a common goal. Because of this, we're a truly inclusive, international organisation.

With a strong focus on influencing inte national policy, we are organised around seven goals which align with core UN Sustainable Development Goals and encourage partnership between industry and academia to increase our impact. We publish the leading industry magazine, *The Microbiologist*, and in partnership with Wiley and Oxford University Press, publish six internationally acclaimed journals.

SCIENCE DIRECTORY

AWE NUCLEAR SECURITY TECHNOLOGIES

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For over 70 years, AWE has supported the UK Government's nuclear defence strategy and Continuous At Sea Deterrence.

On behalf of the Ministry of Defence, AWE manufactures, maintains and develops the UK's nuclear warheads, and applies its unique expertise to support nuclear threat reduction and to protect national security.

The company provides guidance to UK military and police counter-terrorism teams, as well as emergency response in the event of nuclear or radiological incidents.

British In Vitro Diagnostics Association

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BIVDA is the UK industry association representing companies who manufacture and/or distribute the diagnostics tests and equipment to diagnose, monitor and manage disease largely through the NHS pathology services.

Increasingly diagnostics are used outside the laboratory in community settings and also to identify those patients who would benefit f om specific drug t eatment particularly for cancer.

BRITISH PHARMACOLOGICAL SOCIETY

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The British Pharmacological Society is a charity with a mission to promote and advance the whole spectrum of pharmacology. It is the primary UK learned society concerned with drugs and the way they work, and leads the way in the research and application of pharmacology around the world. Founded in 1931, the Society champions pharmacology in all its forms, across academia, industry, regulatory agencies and the health service. With over 3,500 members from over 60 countries worldwide, the Society is a friendly and collaborative community. Enquiries about the discovery, development and application of drugs are welcome.

BRITISH SOCIETY FOR ANTIMICROBIAL CHEMOTHERAPY

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BSAC is a learned society whose members are among the world's leading infectious disease physicians, pharmacists, microbiologists, and nurses. With more than 45 years of leadership in antibiotic research and education, BSAC is dedicated to saving lives by fighting infection. It does this by supporting a global network of experts via workshops, conferences, evidence-based guidelines, e-learning courses, and its own high-impact international journal. BSAC also provides national surveillance and susceptibility testing programmes, an outpatient parenteral antimicrobial therapy (OPAT) initiative, research and development grants, and the secretariat for the All-Party Parliamentary Group on Antibiotics. BSAC has members in 40 nations and active learners in more than 135 countries.

British Society for immunology

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The British Society for Immunology is the leading UK charity representing scientists and clinicians who study the immune system in humans and animals.

As a membership organisation, we act as a focal hub for the immunology community, supporting and empowering immunologists working in academic, industry and clinical settings to drive forward scientific discovery and application. e aim to harness the knowledge generated by our membership to ensure society is aware of and can gain from the health benefits that immunology research can deliver.

bsas british society of animal science

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The British Society of Animal Science (BSAS), the principal body for animal science in the UK, was established in 1944.

We work globally with members and partners to shape the future of animal science, supporting the advancement of responsible, environmentally and economically sustainable animal production, addressing issues such as the role of animal science in resolving the world's food crisis.

BSAS disseminates research findings to ensu e practical and beneficial application of positive outcomes to include livestock, animal health and welfare, the care of equine, companion, and zoo animals.

75 BRITISH SOCIETY OF SOIL SCIENCE

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The British Society of Soil Science (BSSS) was founded in 1947 and is an established international membership organisation and charity committed to the study of soil in its widest aspects.

The society brings together those working within academia, practitioners implementing soil science in industry and all those working with, or with an interest in soils. We promote research and education, both academically and in practice, and build collaborative partnerships to help safeguard our soil for the future. This includes hosting the World Congress of Soil Science 2022 in Glasgow, where those with an interest in soil science met to discuss the critical global issues relating to soil.

Brunel University London

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Brunel University London is an international research active university with 3 leading research institutes: Institute of Energy Futures: Led by Professor Savvas Tassou, the main themes of the Institute are Advanced Engines and Biofuels, Energy Efficient and Sustainable Technologies, Smart Power Networks, and Resource Efficient Futu e Cities. Institute of Materials and Manufacturing: The main themes of research are Design for Sustainable Manufacturing, Liquid Metal Engineering, Materials Characterisation and Processing, Micro-Nano Manufacturing, and Structural Integrity. The Institute is led by Professor Luiz Wrobel. Institute of Environment, Health and Societies: Professor Susan Jobling leads this pioneering research institute whose themes are Health and Environment, Healthy Ageing, Health Economics Synthetic Biology, Biomedical Engineering and Healthcare Technologies, and Social Sciences and Health. Brunel University London offers a wide range of expertise and knowledge, and prides itself on having academic excellence at the core of its offer, and was ranked in the recent REF as 33rd in the UK for Research Power (average quality rating by number of submissions) and described by The Times Higher Education as one of the real winners of the REF 2014.

Cavendish Laboratory — UNIVERSITY OF CAMBRIDGE

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The Cavendish Laboratory houses the Department of Physics of the University of Cambridge. The research programme covers the breadth of contemporary physics.

Extreme Universe: astrophysics, cosmology and high energy physics

Quantum Universe: cold atoms, condensed matter theory, scientific computing, quantum matter and semiconductor physics

Materials Universe: optoelectronics, nanophotonics, detector physics, thin film magnetism, surface physics and the Winton programme for the physics of sustainability

Biological Universe: physics of medicine, biological systems and soft matter. The Laboratory has world-wide collaborations with other universities and industry

SCIENCE DIRECTORY

CIPA THE CHARTERED INSTITUTE OF PATENT ATTORNEYS

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CIPA represents virtually all of the UK's 2,600 registered patent attorneys in industry and private practice. We are the UK's largest intellectual property organisation with over 4,700 members, including 1,100 trainee patent attorneys.

It is our members that support British SMEs, universities and large companies in protecting their innovative technology worldwide. The reputation of the UK for IP advice draws work from around the world; only 11% of European patent applications by British representatives are for UK applicants. Consequently, the profession generates around £1 billion for the economy in gross value added and approaching £750 million in exports.

The Cosmetic Toiletry & Perfumery Association | ctpa

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W: www.thefactsabout.co.uk

CTPA is the UK trade association representing manufacturers of cosmetic products and suppliers to the cosmetic products industry. 'Cosmetic products' are legally defined and subject to stringent EU safety laws.

CTPA is the authoritative public voice of a vibrant and responsible UK industry trusted to act for the consumer; ensuring the science behind cosmetics is fully understood.

CLIFTON SCIENTIFIC Trust

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We bring school students and their teachers to:
- work closely with scientists and engineers
- experience science as a creative, questioning, team exploration
- add real-life meaning and motivation, from primary to post-16
- internationally build global awareness and experience science as a cultural bridge
- build transferable skills for employability and citizenship

Two powerful exemplars:
- Post-16; our unique UK-Japan Young Scientist Workshop Programme hosted in universities in England and Japan since 2001
- Primary; our local Meet-a-Medic Programme since 2005

Clifton Scientific rust Ltd is registered charity in England and Wales 1086933

THE FRANCIS CRICK INSTITUTE

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The Francis Crick Institute is an independent charity, established to be a UK flagship for discovery research in biomedicine. The Crick's mission is discovery without boundaries. We don't limit the direction our research takes. We want to understand more about how living things work to help improve treatment, diagnosis and prevention of human disease, and generate economic opportunities for the UK. In our institute more than 2,000 staff and students use their wide-ranging knowledge and expertise to work across disciplines and explore biology at all levels, from molecules through cells to entire organisms.

Daphne Jackson TRUST

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Founded in 1992 in memory of the UK's first female Professor of Physics, the Trust is the UK's leading charity dedicated to realising the potential of scientists and engineers returning to research after career breaks for family, caring and health reasons. Recently, we have expanded our remit to incorporate the social sciences and arts & humanities. Our Fellowship programme, working in partnership with universities, UKRI, charities, learned societies and industry, enables individuals to undertake part- time research in universities and research institutes. Fellowships comprise a research project alongside an individually tailored retraining programme, with additional mentoring and support, enabling recipients to re-establish their research credentials, update skills and redevelop confidence, in a suitably supportive environment.

EngineeringUK

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EngineeringUK is an independent organisation that promotes the vital role of engineers, engineering and technology in our society.

EngineeringUK partners business and industry, Government and the wider science and technology community: producing evidence on the state of engineering; sharing knowledge within engineering, and inspiring young people to choose a career in engineering, matching employers' demand for skills.

The Geological Society

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The Geological Society of London is the UK's national society for geoscience, providing support to 12,000 Fellows (members) worldwide.

The Fellowship encompasses those working in industry, academia and government, with a wide range of expertise on policy-relevant science, and the Society is a leading communicator of this science to government bodies and other non-technical audiences.

The Society aims to be an inclusive and thriving Earth science community advancing knowledge, addressing global challenges, and inspiring future generations.

IBMS Institute of Biomedical Science

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Advancing knowledge and setting standards in biomedical science
With over 20,000 members in 61 countries, IBMS is the leading professional body for scientists, support staff and students in the field of biomedical science. Since 1912 we have been dedicated to the promotion, development and delivery of excellence in biomedical science within all aspects of healthcare, and to providing the highest standards of service to patients and the public. By supporting our members in their practice, we set quality standards for the profession through training, education, assessments, examinations and continuous professional development.

IKE

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IKE is the UK's professional body for innovators. It accredits and certificates innovation practices. We influence the inte -relationship between education, business, and government through research and collaborative networks.

Our Innovation Manifesto highlights our commitment to support the development of innovative people and organisations. IKE runs think-tanks, conducts research, develops new business models and tools and supports organisations to benchmark their innovation capabilities.

SCIENCE DIRECTORY

Institute of Measurement and Control

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Registration Charity number: 269815

The InstMC is a professional engineering institution and learned society dedicated to the science and application of measurement and control technology for the public benefit. The Institute has a comprehensive range of membership grades for individuals engaged in both technical and non-technical occupations. Also, it is licensed by the Engineering Council to assess and register individuals as Chartered Engineers (CEng), Incorporated Engineers (IEng) and Engineering Technicians (EngTech). The InstMC works to develop the knowledge and skills of individual engineers, fostering communication and advancing the science and practices within the industry.

IOP Institute of Physics

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The Institute of Physics (IOP) is the professional body and learned society for physics in the UK and Ireland.

The IOP's mission is to raise public awareness and understanding of physics, inspire people to develop their knowledge, understanding and enjoyment of physics and support the development of a diverse and inclusive physics community.

As a charity, the IOP seeks to ensure that physics delivers on its exceptional potential to benefit society.

IPEM Institute of Physics and Engineering in Medicine

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The Institute of Physics and Engineering in Medicine (IPEM) is the professional body for Medical Physicists, Clinical Engineers and Clinical Technologists working across healthcare, academia and industry.

We are a charity with a mission of Improving Health through Physics and Engineering in Medicine. Our vision is one in which professionalism drives improvements in diagnosis, treatment and care, transforming the lives of patients.

IPEM is licensed by the Science Council to award CSci, RSci and RSciTech, and by the Engineering Council to award CEng, IEng and EngTech.

IChemE

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The Institution of Chemical Engineers (IChemE) is the UK based and internationally recognised qualifying body and learned society for chemical, biochemical and process engineers.

We advance chemical engineering's contribution for the benefit of societ , facilitate the development of chemical engineering professionals across a wide range of sectors including energy, water, food and health, and provide connections to a powerful network of over 30,000 members in more than 100 countries.

IET The Institution of Engineering and Technology

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The IET is a world leading professional organisation, sharing and advancing knowledge to promote science, engineering and technology across the world.

Dating back to 1871, the IET has over 163,000 members in 127 countries with offices in Eu ope, North America, and Asia-Pacific.

LGC

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LGC is a leading global life science tools company, providing genomics and quality assurance solutions into high growth application areas within human healthcare and applied market segments. Our core purpose is Science for a Safer World.

Our 180 years of scientific heritage, combined with a focus on innovation and value-enhancing acquisitions, has enabled us to build a highly valued product portfolio, and to closely collaborate with our customers, partners and the global scientific communit .

As the UK Government Chemist www.gov.uk/government/ organisations/government-chemist, LGC acts as the referee analyst and advises Government and the wider analytical community on analytical measurement matters for policy, standards and regulation.

LGC is also the UK's National Measurement Laboratory for chemical and bio-measurement, finding solutions to fundamental and emerging measurement challenges, driving innovation, productivity and economic growth.

The Linnean Society of London

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As the world's oldest active biological society, the Linnean Society is an essential forum and meeting point for those interested in the natural world. The Society holds regular public lectures and events, publishes three peer-reviewed journals, and promotes the study of the natural world with several educational initiatives. The Society is home to a world famous library and collection of natural history specimens. The Society's Fellows have a considerable range of biological expertise that can be harnessed to inform and advise on scientific and public policy issues.

A Forum for Natural History

Institution of Mechanical Engineers

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The Institution provides politicians and civil servants with information, expertise and advice on a diverse range of subjects, focusing on manufacturing, energy, environment, transport and education policy.

We regularly publish policy statements and host political briefings and policy events to establish a working relationship between the engineering profession and parliament.

Met Office

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The Met Office doesn t just forecast the weather on television.

Our forecasts and warnings protect UK communities and infrastructure from severe weather and environmental hazards every day – they save lives and money.

Our Climate Programme delivers evidence to underpin Government policy through the Met Office Hadley Cent e.

Our Mobile Meteorological Unit supports the Armed Forces around the world.

We build capacity overseas in support of international development. All of this built on world-class environmental science.

SCIENCE DIRECTORY

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The Microbiology Society is a membership charity for scientists interested in microbes, their effects and their practical uses. It has a worldwide membership based in universities, industry, hospitals, research institutes, schools, and other organisations. Our members have a unique depth and breadth of knowledge about the discipline.

The Society's role is to help unlock and harness the potential of that knowledge. Our principal goal is to strengthen our culture of being a community-driven Society by amplifying our members' voices, wherever they are in the world, and empowering them to embed the benefits of microbiology within wider society.

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The National Physical Laboratory (NPL) is the United Kingdom's national measurement institute, an internationally respected and independent centre of excellence in research, development and knowledge transfer in measurement and materials science.

For more than a century, NPL has developed and maintained the nation's primary measurement standards - the heart of an infrastructure designed to ensure accuracy, consistency and innovation in physical measurement.

Advancing the science of nature

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We challenge the way people think about the natural world – its past, present and future We use our unique collection and unrivalled expertise to tackle the biggest challenges facing the world today. We are leaders in the scientific understanding of the origin of our planet, life on it and can predict the impact of future change. We study the diversity of life and the delicate balance of ecosystems to ensure the survival of our planet. We help enable food security, eradicate disease and manage resource scarcity. We inspire people to engage with science to solve major societal challenges.

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The University of Northampton is an institution committed to science education through initial teacher training, a STEM Ambassador network which works within the community and teaching and research to doctoral level.

We are an Ashoka U 'Changemaker Campus' status university recognising our commitment to social innovation and entrepreneurship.

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With 43,000 students and campuses in Nottingham, China and Malaysia, The University of Nottingham is 'the nearest Britain has to a truly global university'.

With more than 97 per cent of research at the University recognised internationally according to the Research Excellence Framework 2014, the University is ranked in the top 1% of the world's universities by the QS World University Rankings.

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The Nutrition Society, formed in 1941, is a diverse community with the independence and courage to challenge, question and progress the field of nutrition.

Through a progressive approach that champions collaboration and breaking down research silos, we welcome members from around the world, regardless of their level of expertise. They must however have a genuine interest in pushing forward the field of nutrition for the benefit o people, animals while balancing the health of our planet too.

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As the largest network of physiologists in Europe, with academic journals of global reach, we continue our 140-year tradition of being at the forefront of the life sciences.

We bring together scientists from over 60 countries, and our Members have included numerous Nobel Prize winners from Ivan Pavlov to John O'Keefe.

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The £75m Quadram Institute opened in 2019 and is focused on fundamental and translational research into the interfaces between the gut microbiome, food, and human health.

The Quadram Institute combines leading-edge bioscience capabilities with NHS endoscopy, clinical trials and biobank facilities.

The Quadram Institute is a partnership between the Norfolk and Norwich University Hospital, University of East Anglia, Quadram Institute Bioscience and BBSRC.

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As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.

We have four strategic challenges:

- Drive faster and more balanced economic growth
- Foster better education and skills
- Lead the profession
- Promote engineering at the heart of society.

SCIENCE DIRECTORY

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RBG Kew is a centre of global scientific expertise in plant and fungal diversity, conservation, and sustainable use, housed in two world-class gardens. Our scientific vision is to document and understand global plant and fungal diversity and its uses, bringing authoritative expertise to bear on the critical challenges facing humanity today. Kew's strategic priorities for science are: (1) To document and conduct research into global plant and fungal diversity and its uses for humanity. (2) To curate and provide data-rich evidence from Kew's unrivalled collections as a global asset for scientific esearch. (3) To disseminate our scientific knowledge of plants and fungi, maximising its impact in science, education, conservation policy and management. These priorities enable us to curate, use, enhance, explore and share Kew's global resource, providing robust data and a strong evidence base for our UK and global stakeholders. Kew is a non-departmental government body with exempt charitable status, partially funded by Defra.

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The Royal Society is the academy of science in the UK and the Commonwealth comprising 1400 outstanding individuals representing the sciences, engineering and medicine. The Society has played a part in some of the most fundamental, significant and life-changing discoveries in scientific history and Royal Society scientists continue to make outstanding contributions to science across the wide breadth of research areas. Through its Fellowship and permanent staff, it seeks to ensure that its contribution to shaping the future of science in the UK and beyond has a deep and enduring impact, supporting excellence in science and encouraging the development and use of science for the benefit of humanit .

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The Royal Society of Biology is a single unified voice, representing a diverse membership of individuals, learned societies and other organisations.

The RSB has a central role in facilitating scientific knowledge exchange and in harnessing the expertise of our community to advise policy-makers on key bioscience issues of national and global significance.

Our vision is a world that values biology's contribution to understanding and improving life for all.

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The Royal Society of Chemistry is the world's leading chemistry community, advancing excellence in the chemical sciences.

With over 50,000 members and a knowledge business that spans the globe, we are the UK's professional body for chemical scientists; a not-for-profit organisation with 170 years of history and an international vision of the future.

We promote, support and celebrate chemistry. We work to shape the future of the chemical sciences – for the benefit of science and humanity.

Society for Underwater Technology

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The SUT is a multidisciplinary learned society that brings together individuals and organisations with a common interest in underwater technology, ocean science, and offshore/subsea engineering.

The society was founded in 1966 and has members from over 40 countries, including engineers, scientists, other professionals and students working in these areas.

Society of Chemical Industry

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Established by Royal Charter in 1881, SCI is a unique multi-disciplinary community. Set up by a prominent group of forward thinking scientists, inventors and entrepreneurs, SCI continues to be a multi-science and industry network based around chemistry and related sciences. Our charitable objective is to promote links between science and industry for the benefit of societ . Our passion is invention and creation. We deliver our charitable objective by:
• Supporting the commercial application of science into industry
• Tackling global challenges across Agrifood, Energy, Environment, Health and Materials.

Society of Cosmetic Scientists

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Advancing the science of cosmetics is the primary objective of the SCS. Cosmetic science covers a wide range of disciplines from organic and physical chemistry to biology and photo-biology, dermatology, microbiology, physical sciences and psychology.

Members are scientists and the SCS helps them progress their careers and the science of cosmetics ethically and responsibly. Services include publications, educational courses and scientific meetings

The Society for Radiological Protection

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The Society for Radiological Protection is the principal independent professional body for radiation protection in the UK.

Its members operate in the fields of medicine, the nuclear power cycle and other industries, research, and teaching.

We offer a profession-wide view to regulators and are involved in training and educational outreach. We ensure that professional standards are maintained at the highest levels.

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The UK Innovation & Science Seed Fund is a leading patient capital investor with more than £330 million private investment leveraged to date.

The Fund works to build technology companies from the earliest stage by working closely with its partners led by STFC, BBSRC, NERC and Dstl, with the National Research and Innovation Campuses they support, and with entrepreneurial science-led teams.

The Fund is also closely aligned with the Catapults and InnovateUK, helping to commercialise key technological advances in industrial biotech, agricultural technology, healthcare, medicine, clean energy, materials, artificial intelligence, software and space.

SCIENCE DIRECTORY

ANNUAL LUNCHEON 2025

The P&SC Annual Luncheon was held in the Cholmondeley Room, House of Lords on Tuesday 1st July, and hosted by the President, Viscount Stansgate. The Guest Speaker was Professor Virginia Murray, Head of Global Disaster Risk Reduction, UK Health Security Agency. A Vote of Thanks was proposed by the Chair, George Freeman FRSA MP.

Viscount Stansgate

Professor Virginia Murray

George Freeman MP

Stephen Metcalfe, Viscount Stansgate and Dame Chi Onwurah MP

Photo credit: Kinga Panczak

The Parliamentary & Scientific Committee's STEM for BRITAIN 2026 competition

Tuesday 17 March 2026, the Attlee Suite, Portcullis House, House of Commons

APPLICATIONS are are now open from early-career research scientists, engineers, technologists and mathematicians who wish to exhibit posters in one of the following areas:

- Biological and Biomedical Sciences
- Chemistry
- Engineering
- Mathematics
- Physics

The closing date for applications is Monday 24 November 2025

PRIZES will be awarded for the posters presented in each discipline which best communicates high level science, engineering or mathematics to a lay audience.

The Westminster Medal, in memory of the late Dr Eric Wharton, who did so much to establish SET for Britain as a regular event in the Parliamentary calendar, will be awarded at a P&SC event in Parliament in April 2026, following online judging.

Full details of the competition and exhibition including the application form are on the STEM for Britain website: **www.stemforbritain.org.uk**

Members of Parliament whose constituents are exhibiting on 17 March will be notified in January. We look forward to welcoming them, together with other Parliamentarians.

A wide range of important scientific, engineering and mathematics institutions and organisations are lending their support to this event, including the Royal Society of Chemistry, the Institute of Physics, the Royal Academy of Engineering, the Academy for the Mathematical Sciences, The Physiological Society, The Nutrition Society, the Royal Society of Biology, the Clay Mathematics Institute, Warwick Manufacturing Group, AWE, the Institute of Biomedical Science, the Heilbronn Institute for Mathematical Research, the Isaac Newton Institute for Mathematical Sciences, United Kingdom Research and Innovation, the Biochemical Society, and the Society of Chemical Industry.

This reflects the importance we all attach to the encouragement of researchers at this stage in their careers.