The Journal of the Parliamentary and Scientific Committee – All-Party Parliamentary Group

SCIENCE IN PARLIAMENT

sip

WINTER 2023-24

Red Alert:

Developing a human-centred national Heat Resilience Strategy

The Physiological Society

FACULTY OF PUBLIC HEALTH

Parliamentary and Scientific Committee
Bringing Science and Parliament together
Established 1939

Changing How We See Life

Artificial Intelligence (AI) has progressed at an unprecedented pace in recent years. These developments have resulted in exciting opportunities to improve our understanding and treatment of various diseases, and this what our three expert speakers spoke about this evening. Professor James Naismith from The Rosalind Franklin Institute and Professor Sheena Radford from the University of Leeds spoke to us about how AI is helping us understand disease at a molecular level, potentially creating a powerful new way of treating many diseases. Dr Michalis Papadakis, Co-Founder & CEO of Brainomix, spoke to us about his company was using AI to streamline treatment for strokes, improving the outcomes for patients. The Q&A session largely focused on how we can make sure this new technology has the ability to develop safely, and be implemented in the healthcare system in the most efficient way.

Research at the molecular level allows us to understand the fundamentals of our biology, looking at the many mechanism which allow us to live and function. Research into protein structure is a key part of this research, as the function of proteins follows their form. The key to this is figuring out how proteins fold, but this is a tricky task. Prof. Naismith and Prof. Radford explained to us how AlphaFold, an AI powered programme developed by DeepMind, is transforming this field. In its development, the programme was given the many decades of research into protein folding and learnt how to predict this folding, enabling it to understand this process for many more proteins: for some perspective, scientists were able to solve the protein folding problem for 250,000 proteins over 40 years, whereas AlphaFold was able to do this for 200 million protein within a few hours.

Understanding the folding process allows us to understand where and how this process goes wrong, which is the fundemental mechanism to many chronic diseases we can develop as we age. An understanding of this allows for the development of better, more targeted treatments. Furthermore, due to the enhanced puzzle-solving ability thanks to AlphaFold's development, scientists are also able to look at theoretical proteins —structures which aren't found naturally within our bodies. This could help with the development of new drugs to protect us against viruses and other pathogens, further demonstrating the potential of this new technology.

AI is helping with diagnostics as well as treatment development. Timing is key when treating strokes, and Dr Papadakis explained to us how Brainomix is helping to diagnose stroke patients in record time. The programmes reviews the scans of patients brains, and can send the information to physicians within minutes. Given that most stroke patients start on a primary stroke ward and are transferred to a comprehensive stroke ward after a review of their scans. The programme allows for this transfer much faster, resulting in better treatment for individuals. A case study for this success is Reading Hospital, who saw their door-in-door-out time drop from 140 mins to 79 mins, and the proportion of patients achieving independence increase from 16% to 48%. The programme has been used in 37 hospitals and 5 NHS stroke networks, with results from this trial being realised within the next few months.

AI is a powerful technology, and one that has the potential to transform our lives in many ways. This evening was an excellent example of the huge opportunities that comes with this technology, and how it could our health in the years to come.

Alfie Hoar
P&SC Discussion Meeting, 'Changing how we see life'
16th October 2023

Stephen Metcalfe MP
Chairman, Parliamentary & Scientific Committee (All-Party Parliamentary Group)

A warm welcome to our Winter edition and my best wishes for a very Happy New Year.

We have an excellent range of articles for you to read in addition to our usual features. My thanks to our distinguished contributors.

During the Autumn I was pleased to chair three excellent discussion meetings, in cooperation with Northumbria and Newcastle Universities, the Rosalind Franklin Institute, and The Physiological Society, respectively.

My congratulations to Andrew Griffith MP on his appointment as Minister of State for Science, Technology and Innovation and to Saqib Bhatti MP as Parliamentary Under Secretary of State, both of whom took office on the 13th November.

I am delighted that Andrew will be joining us at STEM for BRITAIN on 4th March.

We should also like to record our thanks to George Freeman MP for his work as Minister of State for Science, Technology and Innovation.

Congratulations are also in order for P&SC President, Stephen Benn, who as Viscount Stansgate, has been appointed a Deputy Speaker of the House of Lords.

I was delighted to host the Christmas Parliamentary Science Reception on 16th December. This is the first time that P&SC has organised the event, which would not have been possible without the support of the following member organisations: Royal Society of Chemistry, Royal Society of Biology, Institute of Physics, The Royal Society, Institution of Engineering Technology, Royal Academy of Engineering, the Council for the Mathematical Sciences, The Physiological Society, The Nutrition Society, Biochemical Society and Applied Microbiology International.

My thanks to Leigh Jeffes, Karen Smith and Dr Isabel Spence for their work on this successful and enjoyable event.

We now look forward to our programme of forthcoming discussion meetings and the aforementioned STEM for BRITAIN. I am delighted to report that there has been a significant increase in the number of applications for this year's competition for Early-Career Researchers. My thanks to Dr Isabel Spence for coordinating the application process and to Ben Allen for his work on the event website.

Under the new APPG rules, we are now required to have at least five Parliamentarians present at our discussion events (and a minimum of eight at the Annual General Meeting). I would therefore encourage colleagues from both Houses of Parliament, with a particular interest in science to look in on our meetings. I am also requesting those member Societies who kindly sponsor our discussions to invite MPs and Peers with whom they work to support the event with which they are connected.

I would like to thank David Youdan, our Administration and Programme Manager for all his tremendous work over the past two years. David steps down in the Spring and I wish him well in the future.

And finally a warm welcome to new member, Professor Mini Rai, Global Chair in Robotic Engineering and Head of Space Research at the University of Lincoln.

Stephen Metcalfe MP

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

Science in Parliament has two main objectives:

1. to inform the scientific and industrial communities of activities within Parliament of a scientific nature and of the progress of relevant legislation;
2. to keep Members of Parliament abreast of scientific affairs.

CONTENTS

The Journal of the Parliamentary and Scientific Committee (All-Party Parliamentary Group).

A PUBLIC HEALTH APPROACH TO CLIMATE CHANGE IN THE UK

Ana-Catarina Pinho-Gomes
NIHR Clinical Lecturer, University College London and Public Health Specialty Registrar, London.

THE UK CLIMATE IS CHANGING STRIKINGLY.

The UK climate has been warming for the last decades and extreme heat events are becoming increasingly frequent, long-lasting, and intense.[1] The top 10 warmest years since 1884 have occurred since 2002, whilst the top 10 coldest years happened prior to 1970.[1] In July 2022, the record-breaking temperatures reached above 40°C in the southeast of England. In 2023, we had the hottest June and September on record, with a 7-day heatwave breaking the record for the longest run of days exceeding 30°C in September. If it was not for the jet stream that kept high pressures over Europe, we could have experienced similarly extreme and prolonged heat to central and southern European countries. Besides unprecedented heatwaves, we have seen warm spells more than doubling in length in recent years (from 5.3 days in 1961-90 to over 13 days in 2008-2017), especially in South East England (from 6 days in 1961-90 to over 18 days in 2008-2017). Overall, these stark statistics compellingly demonstrate that our climate is warming at fast pace.

CLIMATE CHANGE IS A KEY CONCERN FOR THE PUBLIC.

It is, thus, unsurprising that climate change is currently the second biggest concern facing adults in Great Britain after the cost-of-living crisis, which is, at least partially, due to climate change.[2] Furthermore, 3 in 4 adults say that rising UK temperatures is the biggest impact of climate change they expect to experience by 2030, with 2 in 3 adults concerned about the impact of heat on themselves.[3] The public acknowledges that many people lack information about their risk and are unprepared to cope with heatwaves, particularly those who are likely to be the most vulnerable.[3]

CLIMATE CHANGE ADAPTATION VERSUS MITIGATION

Climate change mitigation means avoiding and reducing emissions of heat-trapping greenhouse gases into the atmosphere to prevent the planet from warming to more extreme temperatures. Climate change adaptation means altering our behaviour, systems, and – in some cases – ways of life to protect our families, our economies, and the environment in which we live from the impacts of climate change. The more we reduce emissions right now, the easier it will be to adapt to the changes we can no longer avoid. Mitigation will take decades to affect rising temperatures, so we must adapt now to the climate change that is already upon us and will continue to affect us in the foreseeable future.

THE HEALTH CONSEQUENCES OF CLIMATE CHANGE ARE ALREADY EVIDENT.

The increasingly hot summers are already having a negative impact on population health in the UK, particularly in southeast England.[4] The heatwaves in June-August 2022 caused about 3,000 excess deaths, which was the highest number in any given year.[5] Women, adults over 45, young children, and people from a low socioeconomic status and with pre-existing illnesses have an increased risk of death.[6] Heat is also causing non-fatal illness, especially cardiovascular, respiratory and mental diseases.[7,8] Furthermore, heatwaves have been causing significant disruption to NHS services, for instance, by increasing hospital admissions and leading to cancellations in elective care.[4,9] Competing priorities, inappropriate facilities and equipment may all limit the ability of the NHS to cope with heat.[10]

THE NEAR FUTURE WILL CERTAINLY BE HOTTER THAN THE PRESENT.

Even if the most ambitious plans for reducing greenhouse gas emissions are achieved, which is unlikely considering current trends, we are most likely going to breach 1.5°C of global warming within this decade.[11] The Met Office demonstrated that human-caused climate change has set hot-day extremes in the UK on a course towards temperatures that would be too high to be observed in the natural climate and new records are expected in coming years, particularly in the southeast of the UK.[12,13] In all assessments of heat-related impacts using different climate change scenarios, the health consequences of hotter temperatures both in terms of morbidity and mortality are expected to increase. According to the Climate Change Committee, excess deaths due to heat are expected to rise from the current 3,000 per summer to about 7,000 with a 2°C increase in average global temperatures and 13,000 if we

reach a 4°C increase in global temperature.[14]

WE NEED TO ADAPT FAST TO OUR INCREASINGLY HOT CLIMATE.

Our vulnerability as population will depend on our ability to design and implement strategies for effective, sustainable, and equitable adaptation to climate change.[15] Population ageing and the increasing prevalence of long-term conditions will increase our heat vulnerability.[16] Therefore, promoting healthy ageing and addressing risk factors to prevent poor physical and mental health are key public health strategies to reduce heat vulnerability.

In addition, the natural and built environments where we work and live influence the temperature we experience indoors and outdoors. For instance, green spaces, such as parks, have a cooling effect in urban environments and may reduce heat-related deaths.[17] Reflective roofs protect from solar radiation and hence reduce heat exposure in buildings.[18]

Besides increasing our heat resilience at individual and structural level, protective behaviours (e.g., using fans, drinking water, immersing feet and hands in cold water, closing windows and blinds during the day and opening at night) can help us cope with extreme heat events.[19] However, the most heat-vulnerable adults do not consider themselves at increased risk or adopt protective behaviours.[20] Therefore, we need to target communications, interventions, and resources to the most heat-vulnerable groups.

As other public health crises, climate change is exposing and exacerbating existing health inequalities in our society. People experiencing deprivation are not only more likely to have long-term conditions that increase their individual vulnerability but also less likely to have the resources to protect themselves from heat (e.g., lack of access to green spaces). Therefore, we need to apply proportional universalism to our public health response to climate change, and heat in particular. This means that we need to provide support and resources to everyone in proportion to their need, which may depend on different vulnerability factors, such as their health or socioeconomic circumstances.

ADAPTATION ALONE IS NOT ENOUGH – WE CANNOT ENDLESSLY ADAPT TO CLIMATE CHANGE.

Importantly, our ability to adapt to heat and build resilience in our population and environment is not limitless. Limits to adaptation are deeply contextual, i.e., they are shaped by individual vulnerability and context-specific socioecological resilience, both of which are distributed unequally in our population. We are already experiencing extreme heat that is unbearable to the human body and the ecosystems on which our lives depend. As the planet continues to warm, we will be increasingly confronted with intolerable impacts of climate change, especially if we surpass 1.5°C or even 2°C average global warming. Therefore, we need to invest on reducing our greenhouse gas emissions swiftly and effectively across all sectors to avoid the catastrophic consequences of breaching adaptation limits.

CLIMATE CHANGE IS AN UNPRECEDENTED OPPORTUNITY TO BUILD A GREENER, HEALTHIER, AND FAIRER SOCIETY.

Climate mitigation by transitioning to sustainable lifestyles and green energy sources offers numerous co-benefits, such as improvements in population health, economic prosperity, technological development, and energy and food security. For instance,

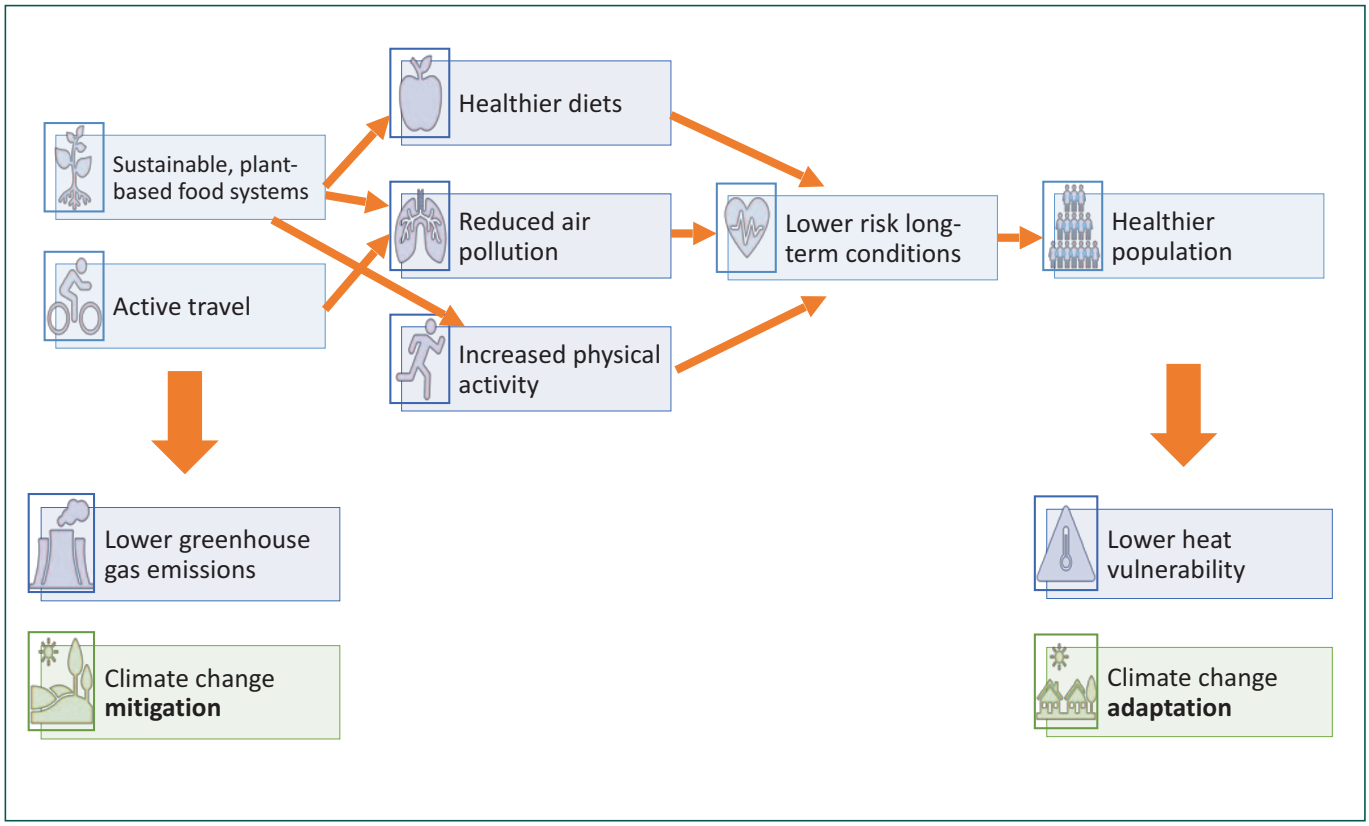


Figure 1: Climate change mitigation contributes to climate change adaptation as the health co-benefits of mitigation improve population health, thus reducing heat vulnerability.

electrification of vehicles and switching from car usage to public and active transport (e.g., walking, cycling) reduce air pollution and increase physical activity, hence improving physical and mental health and reducing the burden on the NHS associated with many long-term conditions.[21] Switching to plant-based diets, with significantly lower intake of meat and dairy, not only reduces greenhouse gas emissions and land use but also improves population health, preserves and protects natural ecosystems, and promotes biodiversity.[21] Besides the health co-benefits, climate mitigation has broader benefits that ultimately improve population health in the UK, thus contributing to our heat resilience (Figure 1). Renewable energy generated in the country reduces our reliance on imported fossil fuels, thus increasing energy security and lowering the cost of energy, which has been a major contributor to the cost-of-living crisis.[22] The future low-carbon economy offers the opportunity for the UK to become a world leader in the development, production, and distribution of sustainable technologies, thus creating new jobs and leading to economic growth.[22] Reducing our greenhouse gas emissions will contribute to lowering the risk of climate-related disasters and conflicts worldwide. Besides fulfilling our global responsibility, this may reduce forced displacement and migration to the UK.[22]

The climate crisis is a public health crisis that requires concerted efforts across all sectors of the UK society and strong cross-party political leadership. Our response to the climate crisis can either promote sustainable development and population health or threaten the lives and livelihoods of current and future generations.

KEY MESSAGES

- The climate crisis is a public health crisis.
- Climate change is already having a serious impact on population health in the UK.
- Some groups in the population may be particularly vulnerable, such as older adults, children, pregnant women, individuals with long-term conditions, who work outdoors or experience homelessness.
- Climate change is exacerbating health inequalities as socioeconomic disadvantaged groups in the population are particularly vulnerable to heat due to their health and working and living conditions.
- Adaptation to increasingly hot temperatures involves both individual (i.e., behaviour change) and structural approaches (e.g., changes to the built environment).
- Adaptation is not endless and needs to be coupled with mitigation.
- Transitioning to sustainable lifestyles and economies has co-benefits across multiple sectors, such as health, economy, or security.
- The health co-benefits of climate change mitigation increase heat resilience in the population.
- Our response to climate change needs to consider inequalities and support the most vulnerable in our society.

References

1. Met Office. Effects of climate change. 2022. https://www.metoffice.gov.uk/weather/climate-change/effects-of-climate-change#:~:text=How%20will%20climate%20change%20impact,affected%20by%20climate%20change%2C%20too. (accessed 13 May 2023).
2. Office for National Statistics. Worries about climate change, Great Britain: September to October 2022. 2022. https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/worriesaboutclimatechangegreatbritain/septembertooctober2022 (accessed 14 August 2023).
3. British Red Cross. Policy brief: public perceptions of heatwaves in the UK2023. https://www.redcross.org.uk/-/media/documents/miscellaneous/heatwaves-policy-brief-2023-final.pdf?sc_lang=en&hash=4D0DA180FD8E42FC0B697A46EF357D27 (accessed 18 August 2023).
4. Arbuthnott KG, Hajat S. The health effects of hotter summers and heat waves in the population of the United Kingdom: a review of the evidence. *Environmental Health* 2017; 16(1): 119.
5. UKHSA. Heat mortality monitoring report: 2022. *UK Health Security Agency,* 2023. https://www.gov.uk/government/publications/heat-mortality-monitoring-reports/heat-mortality-monitoring-report-2022 (accessed 18 July 2023).
6. Song X, Wang S, Hu Y, et al. Impact of ambient temperature on morbidity and mortality: An overview of reviews. *Sci Total Environ* 2017; **586**: 241-54.
7. Liu J, Varghese BM, Hansen A, et al. Heat exposure and cardiovascular health outcomes: a systematic review and meta-analysis. *Lancet Planet Health* 2022; **6**(6): e484-e95.
8. Liu J, Varghese BM, Hansen A, et al. Is there an association between hot weather and poor mental health outcomes? A systematic review and meta-analysis. *Environ Int* 2021; **153**: 106533.
9. Hussain Z. UK heatwave piles further pressure on stretched NHS services. BMJ 2022; **378**: o1834.
10. Brooks K, Landeg O, Kovats S, Sewell M, OConnell E. Heatwaves, hospitals and health system resilience in England: a qualitative assessment of frontline perspectives from the hot summer of 2019. BMJ Open 2023; **13**(3): e068298.
11. Hansen JE, Sato M, Simons L, et al. Global warming in the pipeline. *Oxford Open Climate Change* 2023; **3**(1).
12. World Meteorological Organization. Global Annual to Decadal Climate Update Target years: 2022 and 2022-20262022. https://library.wmo.int/index.php?lvl=notice_display&id=22083 (accessed 1 August 2023).
13. Christidis N, McCarthy M, Stott PA. The increasing likelihood of temperatures above 30 to 40°C in the United Kingdom. *Nature Communications* 2020; **11**(1): 3093.
14. Dooks TC. Progress in adapting to climate change 2023 Report to Parliament. 2023.
15. Turek-Hankins LL, Coughlan de Perez E, Scarpa G, et al. Climate change adaptation to extreme heat: a global systematic review of implemented action. *Oxford Open Climate Change* 2021; **1**(1).
16. Chen K, Vicedo-Cabrera AM, Dubrow R. Projections of Ambient Temperature-and Air Pollution-Related Mortality Burden Under Combined Climate Change and Population Aging Scenarios: a Review. *Curr Environ Health Rep* 2020; **7**(3): 243-55.
17. Murage P, Kovats S, Sarran C, Taylor J, McInnes R, Hajat S. What individual and neighbourhood-level factors increase the risk of heat-related mortality? A case-crossover study of over 185,000 deaths in London using high-resolution climate datasets. *Environ Int* 2020; **134**: 105292.
18 Macintyre HL, Heaviside C. Potential benefits of cool roofs in reducing heat-related mortality during heatwaves in a European city. *Environment International* 2019; **127**: 430-41.
19. Hajat S, O'Connor M, Kosatsky T. Health effects of hot weather: from awareness of risk factors to effective health protection. *Lancet* 2010; **375**(9717): 856-63.
20. Erens B, Williams L, Exley J, et al. Public attitudes to, and behaviours taken during, hot weather by vulnerable groups: results from a national survey in England. *BMC Public Health* 2021; **21**(1): 1631.
21. Haines A. Health co-benefits of climate action. *The Lancet Planetary Health* 2017; 1(1): e4-e5.
22. Jennings N, Fecht D, De Matteis S. Co-benefits of climate change mitigation in the UK: What issues are the UK public concerned about and how can action on climate change help to address them. *Imperial College London Grantham Institute Briefing Paper* 2019; **31**: 1-20. ■

HOW AI WILL TRANSFORM THE LANDSCAPE OF TECHNOLOGY SKILLS MARKET

Roger Brown,
CGS Group

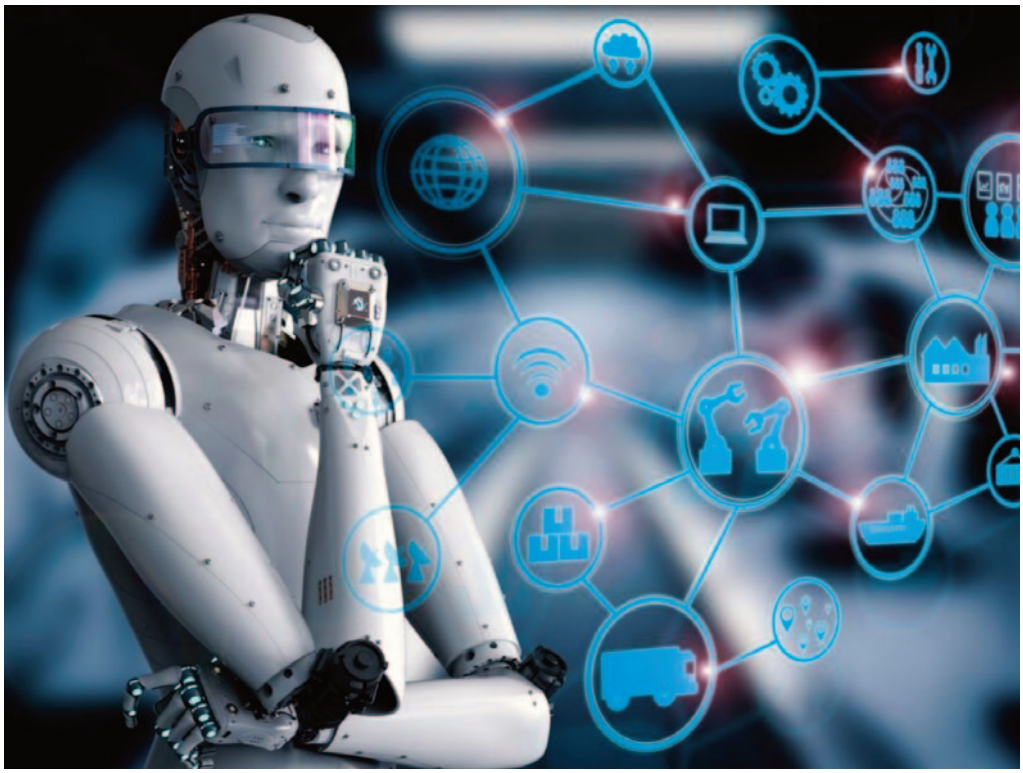
Michael De Kare-Silver, MD,
Digital Prospects

Daniel Carter, Senior Consultant,
Consultancy Group

Peter Tarbitten, Director, CGS Group

Chris Finch, Director, SOM-3

Steve Collier, Director,
Practice CGS Group



"We analyzed the evolving landscape of the IT technology skills market, leveraging AI and other transformative factors. Subsequently, we engage in constructive dialogues concerning these challenges with prominent industry organizations that possess a global footprint and play a pivotal role in driving fundamental shifts within the sector for the different skills needed by organisations."

INTRODUCTION

The Information Technology (IT) skills market has always been responsive to technological advancements and market dynamics, but the confluence of the pandemic, changes in the tax law, advancements in Artificial Intelligence (AI), and evolving consulting regulations has brought about a transformation of unprecedented magnitude. This article delves into the multifaceted impact of these three factors on the IT skills market, analysing the challenges, opportunities, and adaptations that firms within this sector are currently undergoing.

The outbreak of the pandemic

in early 2020 unleashed a wave of disruptions across industries worldwide. Governments imposed lockdowns and social distancing measures, leading to an urgent need for remote work infrastructure and digital solutions. This sudden shift catapulted the demand for IT skills services as organizations raced to ensure business continuity. Consultants played a pivotal role in enabling remote work environments, securing digital communication channels, and facilitating digital transformation strategies. Cloud migration, cybersecurity enhancement, and virtual collaboration tools gained immense prominence as clients sought to navigate the new business landscape.

While the surge in demand for IT skills services presented growth opportunities, it also brought forth challenges. Project delays, budget constraints, and uncertainty about economic prospects impacted the stability of skills firms. The delicate balance between maintaining service quality amidst a remote work setup and meeting clients' evolving needs required rapid adaptation and innovation.

Advancements in AI technologies have been reshaping various industries, and the IT short term skills market is no exception. Machine learning, natural language processing, and automation are becoming integral to service offerings. AI-driven data analytics enable consultants to offer data-driven insights, aiding clients in making informed decisions. AI-powered chatbots are revolutionizing customer support experiences, streamlining interactions and responses. This integration of AI not only enhances efficiency but also augments the value that consultants can provide to clients.

However, the adoption of AI is not without its challenges. The fear of job displacement due to automation looms large, prompting discussions about reskilling and upskilling the workforce to remain relevant in an AI-driven environment. Ethical considerations regarding AI decisions, potential biases in AI algorithms, and concerns about transparency and accountability also add layers of complexity to AI integration.

The alterations in the taxation system for consultants have brought about a significant shift in the landscape, particularly impacting the growth prospects of small consultancies. These changes are primarily driven by the introduction of new tax regulations, specifically related to PAYE (Pay As You Earn) costs, which are now routed through umbrella companies. This shift has led to a rather substantial tax burden on consultants, with taxes being deducted at a rate as high as 45%.

To illustrate this with a practical example, consider a small skill that was operating under the previous tax regime. Under that system, the skills was subject to various taxes, including a 20% Value Added Tax (VAT), a 19% Corporation Tax, and a 32% Dividend Tax. This tax structure, though not insignificant, allowed consultancies to retain a more substantial portion of their revenue.

However, with the new regulations, consultants are now compelled to funnel their income through an umbrella company, which deducts a whopping 45% in taxes. This deduction includes not only the standard income tax but also both the Employee's National Insurance (NI) and Employer's NI contributions. This shift has led to a substantial reduction in the revenue that consultancies can retain for their business growth.

This tax restructuring has effectively favored the umbrella companies, often positioned as intermediary entities in the skills process. These companies now play a pivotal role in managing the tax obligations for consultants. As a result, they have gained a competitive advantage, given the lower tax burden and increased simplicity of the tax process compared to consultancies.

The implications of this taxation shift extend beyond the skills sector and create an uneven playing field for businesses across various industries. It has prompted a reevaluation of the tax landscape, with debates around fairness, the economic impact on smaller enterprises, and the overall competitiveness of the business environment. As the tax landscape evolves, businesses, consultants, and policymakers are grappling with these changes, seeking to strike a balance that ensures both revenue generation for the government and a supportive environment for small businesses to thrive.

The evolving landscape of consulting regulations is another crucial factor influencing the IT skills market. Data protection laws, such as the General Data Protection Regulation (GDPR), have significantly impacted how firms handle client data. With the increasing reliance on digital solutions, the importance of data privacy and cybersecurity has grown manyfold. Moreover, the rise of AI has necessitated the development of regulatory frameworks to ensure responsible AI deployment and prevent discriminatory or unethical practices.

Navigating these regulations requires expertise and adaptability. Skills firms need to ensure their practices align with evolving legal requirements, which can vary across jurisdictions. The ability to understand and implement these regulations effectively has become a competitive advantage, as clients seek out consultants who can provide not only technical expertise but also legal and ethical guidance.

The intersection of COVID-19, AI, and consulting regulations has brought about an array of challenges for IT skills firms. Remote work models, while enabling global collaboration, require effective team management and communication. The integration of AI demands substantial investments in both technology and human capital, with the need for ongoing upskilling and reskilling initiatives. Addressing concerns about job displacement and ensuring a seamless transition to AI-augmented services is critical.

Furthermore, navigating the complex web of consulting regulations poses ongoing challenges. The rapid pace of technological advancement often outstrips the development of regulatory frameworks, leading to uncertainties about compliance. Firms must invest time and resources to stay informed about changing regulations and adapt their practices accordingly.

Amidst these challenges, several opportunities emerge for IT skills firms. The increased demand for digital transformation services, fueled by both the pandemic and the adoption of AI, provides a platform for firms to specialize and offer unique value to clients. Remote work models enable skills firms to tap into a global talent pool, enhancing their ability to find the right expertise for specialized projects. Moreover, as clients grapple with the complexities of regulatory compliance, firms with a deep understanding of relevant

regulations gain a competitive edge.

The integration of AI itself presents opportunities for skills firms to provide specialized AI consulting services, assisting clients in harnessing the potential of AI technologies. Firms that prioritize upskilling and reskilling initiatives position themselves as leaders in navigating the evolving technological landscape.

"INSIGHTS FROM INDUSTRY EXPERTS: AI'S INFLUENCE ON THE IT SKILLS MARKET."

MICHAEL DE KARE-SILVER, THOUGHTS:

IT consulting is about an accumulation of years of experience, of wisdom, developing an intimate understanding of an industry, a market sector, and being able to problem-solve as well as to intuit innovative ideas and opportunities. It's what we humans are good at!

While AI will enable the automation of tasks, the processing of large amounts of data, and provide ways to drive productivity and efficiency, it will always lack human insight, creativity and market savvy. At its best, AI will be an aid to decision-making, a route to get to a solution more quickly, to be able to test out new ideas and compare options. It should be able to make the job of a consultant more fun, easier, and quicker to deliver and with more confidence that the solution path is optimised and deliverable. Some 40% of companies say they are already using AI to some degree today, and most major corporations are appointing Chief AI officers to act as champions and as senior stakeholders who can navigate and develop their organisation's AI adoption and strategy. Best to embrace it than fight it!

CHRIS FINCH THOUGHTS:

The question everyone is asking right now is how AI impacts job opportunities within the IT world. While all jobs and tasks have the potential to be automated, they will also generate new jobs in various sectors.

Our research has shown that more generic jobs such as system maintenance, data entry, and administrative tasks could see a decline in the coming months and years, to be replaced by AI, but it could also result in new skills and jobs within the IT sector. This could be for those who have to control and monitor the AI tools.

Let's not forget the personal touch that AI will never replace. There will always be the need for a human to speak to other humans. Albeit AI can assist in many ways, it will never fully overtake the demand for this as humans.

In Summary, while AI could see the end of certain tasks in the IT world, it could also see the creation of new job opportunities and the demand for upskilling. The constant need for improved performance and the need for people to embrace and welcome AI technologies would see IT professionals thrive in the ever-evolving job world.

DANIEL CARTER, THOUGHTS:

In just a short space of time there has already been explosive growth in the use of generative AI tools within technology consulting, indeed one-third of companies recently surveyed by McKinsey say they're regularly using gen AI in at least one business function.

It's here to stay and will continue aiding consultants to do more with less by providing comprehensive data insights and predictive capabilities, enabling more informed decision-making across more complex projects. Bespoke offerings and personalised client experiences will only improve the consulting proposition in the market and enhance client relationships.

AI's ability to automate processes and collect vast amounts of data quickly allows consultants to move away from time-consuming tasks such as data entry and focus more time on strategic problem-solving. By utilising their intuition and stakeholder management skills, which AI cannot replicate, they can interpret these AI-generated insights and add value to the client at a commercial level.

Is AI coming to take your job as a technology consultant? Probably not. But could someone who knows how to utilise AI better than you take your job? Possibly. Do not fear AI. Embrace it.

FINAL THOUGHTS:

As the effects of COVID-19, AI advancements, and consulting regulations continue to ripple through the IT skills market, firms must adapt to ongoing changes. Integrating AI strategically into service offerings, investing in upskilling initiatives, and embracing a proactive approach to regulatory compliance are essential strategies for future success.

Hybrid service models that balance remote work with in-person interaction may become the norm. This approach could facilitate effective client communication and collaboration while leveraging the benefits of remote work. As AI technologies mature and regulatory frameworks evolve, skills firms must stay agile and responsive, aligning their strategies with emerging trends and requirements.

In conclusion, the IT skills market is undergoing a transformative phase due to the interplay of COVID-19, AI advancements, and consulting regulations. While these factors introduce challenges, they also create unprecedented opportunities for growth, innovation, and specialization. Adapting to this changing landscape requires a holistic approach that encompasses technological expertise, regulatory awareness, and a commitment to continuous learning. By embracing the challenges and opportunities presented by these factors, IT skills firms can position themselves at the forefront of a dynamic and evolving industry. We will revisit this topic in 18 months. ■

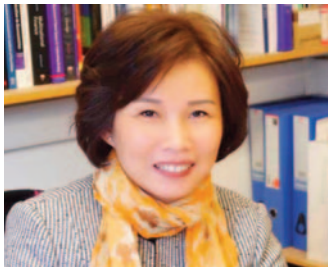
THE UK AI SAFETY SUMMIT: A 'HISTORIC MOMENT' OR LARGELY SYMBOLIC?


John Tasioulas


Professor Carissa Véliz


Felipe Thomaz


Alex Connock


Xiaolan-Fu


Robert Trager


Lulu Shi


Brent Mittelstadt


Ciaran Martin


Helen Margetts

On 1 and 2 November 2023, the UK Government hosted the first global AI Safety Summit, bringing together leading nations, technology companies, AI researchers, and multilateral organisations. The aim was to consider the risks of AI, especially at the frontier of development, and to discuss how these could be mitigated through international collaboration. But did it succeed? Leading AI researchers at Oxford University give their views.

EVERYONE AROUND THE TABLE

Some would argue that regardless of what was decided at the summit, simply convening such a broad range of stakeholders could be regarded as a success. "Perhaps the biggest achievement of the summit was that China was brought into this discussion" says **Professor John Tasioulas, Director of the Institute for Ethics in AI, Oxford University**. "This is absolutely vital, since there cannot be the meaningful global regulation of AI that is needed without China's participation."

This broad international representation led to all 28 attending countries and the European Union signing 'The Bletchley Declaration': a joint agreement on the need for international collaboration to ensure advanced AI technologies are developed safely. Whilst Prime Minister Rishi Sunak described this as "a landmark achievement" that would help "ensure the long-term future of our children and grandchildren", Professor Tasioulas believes that the Declaration will have little real impact unless it is translated into meaningful actions. "The concept of 'safety' is stretched in the Declaration to include not only avoiding catastrophe, but also securing human rights and the UN Sustainable Development Goals etc. This is a highly unstructured list of concerns. As such, the value of the Declaration may be largely symbolic. The heavy lifting still needs to be done to translate the Declaration's values into effective regulation."

COOPERATIVE REGULATION?

Nevertheless, some progress may have been made towards a framework for regulation. At the summit, a group of 11 Government signatories and eight leading AI companies - including Meta, Google DeepMind, and OpenAI – agreed to collaborate on testing

the latest AI products before their public release. As a voluntary initiative, however, this may ultimately lack any real teeth to hold big tech companies to account.

According to **Associate Professor Carissa Véliz, from Oxford's Institute for Ethics in AI**, if the UK wants to be taken seriously as a leader in AI regulation, "it would do well to properly regulate AI within its own borders. It should also give less prominence to tech executives who, by definition, cannot regulate themselves—their financial conflict of interest disqualifies them."

In this respect, many felt that the Prime Minister's decision to host Elon Musk for a near hour-long interview only highlighted the technology sector's excessive influence. "As a political scientist, I was uncomfortable that a head of state should be asking questions of a tech mogul and not the other way around" says **Helen Margetts, Professor of Society and the Internet at Oxford University**. "Brilliant though he may be at technological development, Musk has shown himself to lack skills in understanding the social world – ill befitting him to tackle the central question of the summit: how will frontier AI affect all of us?"

Felipe Thomaz, Associate Professor of Marketing at Oxford University, adds that the new agreement may even play directly into the hands of the largest tech companies. "This announcement represents an incredibly successful year-long lobbying effort by the largest AI players and providers globally, who were deeply concerned about the ease of entry by homebrewed competitors into their arena" he says. "By requiring government approval prior to public testing and product releases, these governments have raised very tall barriers to enter the AI economy. This will favour the largest companies who already have inroads into government and who already spent the previous year accelerating their own R&D with the knowledge of this development."

A NEW UK AI SAFETY INSTITUTE

During the summit, the UK Government announced the creation of a new UK AI Safety Institute, with the mission "to minimise surprise to the UK and humanity from rapid and unexpected advances in AI." Although a welcome development, there are concerns that this will have too limited a scope to address AI threats on a global scale. "The use of AI by bad actors is one risk that can indeed be partially mitigated by AI safety institutes of this kind, by spy agencies checking new models and so forth" says **Dr Alex Connock from Oxford's Saïd Business School** and author of 'The Media Business and Artificial Intelligence.' "Although even that will be hard as Large Language Models increasingly become something you can tune and run on a laptop, and there are actually countries out there who didn't make the summit that nonetheless might want to use unregulated models of their own."

Xiaolan Fu, Professor of Technology and International Development at Oxford University, adds: "I hope that the Institute also considers AI safety in different contexts, taking into consideration low-income countries to make sure AI is safe and working for good in all countries at different levels of development."

One of the Institute's first activities will be to host an expert writing group chaired by Yoshua Bengio (one of three so-called 'godfathers of AI') to produce a 'State of the Science' Report on the capabilities and risks of advanced AI. According to **Professor Robert Trager, Director of the Oxford Martin AI Governance Initiative**, both the new Institute and the commissioning of the report demonstrate a "real show of leadership" by the UK Government. "A state of the science consensus report could potentially play a role similar to the IPCC in the climate area. A key to success there will be producing findings more quickly than the IPCC does, and happily Bengio appreciates this urgency" he says.

TOO MUCH FOCUS ON FRONTIER TECHNOLOGIES?

Despite the extreme risks posed by highly advanced AI, the summit has been criticised for focusing too much on frontier AI rather than the ways AI is already disrupting society. **Dr Lulu Shi, from Oxford's Department of Education**, says: "Concentrating on the long-term risks, such as risks of human extinctions, is dangerous as it leads the debate away from the very real and already existing risks that AI is causing, such as those caused by surveillance technologies which have been punishing people from already marginalised groups. At no point was social justice put at the center of the discussion during the summit."

According to **Professor Brent Mittelstadt from the Oxford Internet Institute**, frontier AI should not be used as an excuse to avoid regulating the well-established harms of today's AI systems. "The decision to focus the Safety Summit on frontier AI and long-term existential risks, cybersecurity, and terrorism, meant that an exceptional portfolio of research on AI ethics, regulation, and safety, was effectively being ignored. We know the risks that AI poses now, and we've developed ways to address them, so why is there such a reluctance to take any steps towards hard regulation?"

NOT PERFECT – BUT A START

Even with these criticisms, the Bletchley Summit was an important start in an ongoing process, argues **Ciaran Martin, Professor of Practice in the Management of Public Organisations, Oxford University**. "It is easy to criticise, but don't let the perfect be the enemy of the good. This was an important initiative and the British Government deserves credit for its global leadership" he says. "The alternative was not a better event – the alternative was nothing at all. Going forward, we will need to broaden the conversation and make sure it's not captured by the existing tech giants. But Bletchley was a good start."

As Professor Véliz observes, ultimately time will decide whether the first Safety Summit will be judged a success or a failure. "Thus far, the event has had a symbolic function. However, sometimes symbolism weighs enough to make a difference. If the summit eventually leads to an adequate and binding international agreement on AI ethics, then it will have been a success. But if all we are left with are a few nice photos, a toothless and vague declaration, and well wishes, then it will have been a failure indeed." ■

Author Dr Caroline Wood is a Communications Manager for Research and Innovation at Oxford University.

TRANSFORMING STROKE CARE WITH AI

Jeff Wyrtzen, Chief Marketing Officer, Brainomix

An Oxford-based company has developed cutting-edge, AI-enabled software solutions that are helping hospitals and networks improve access to life-changing stroke treatments

Brainomix, an Oxford-based company, are helping to transform the way that stroke care is managed in the UK and beyond. The company, which began as a spin-out from the University of Oxford, specialises in the creation of artificial intelligence (AI)-powered software solutions to unlock the potential of life-saving treatments. Its flagship product, the Brainomix 360 Stroke platform, helps doctors interpret brain scans, and facilitates faster, more confident treatment decisions for patients with suspected stroke.

Stroke is a devastating disease affecting more than 100,000 people each year in the UK, and is a leading cause of death and disability. Most strokes are ischaemic, which means they are caused by a blood clot blocking a vessel in the brain. About one in five people who have an ischaemic stroke can be helped by either a clot-busting drug delivered intravenously (called thrombolysis) or by having the clot mechanically removed using a special device (called mechanical thrombectomy). Thrombectomy is a life-changing treatment which can reduce disability and prevent or limit long-term care needs in patients with the most severe strokes due to blockage of a large blood vessel supplying the brain, and was specifically called out in the NHS Long Term Plan as a key focus area.

A brain scan of the patient can help diagnose the type of stroke and determine the best treatment to be given to each patient, but interpreting the brain scans is a complex challenge often requiring specialist expertise. Most patients will be assessed by less specialist doctors when they arrive at a hospital – meaning that not all patients get the right treatment when they need it. The Brainomix 360 Stroke platform addresses this challenge by supporting both non-specialist and specialist doctors in the diagnosis and decision-making for doctors seeing a stroke patient, with an aim towards enabling more patients to receive the right treatment, in the right, at the right time.

Brainomix was awarded an NHS AI in Health and Care Award in September 2020, which enabled the company to deploy its stroke AI software across five stroke networks in the NHS. Health Innovation Oxford & Thames Valley (formerly the Oxford Academic Health Science Network) were appointed by the Accelerated Access Collaborative to independently evaluate the impact of Brainomix 360 Stroke on stroke patient care in 24 hospitals.

The three-year assessment included individual patient data from nearly 70,000 stroke patients, and an interim report published in July 2023 showed that the average mechanical thrombectomy rate in hospitals utilizing Brainomix 360 Stroke was 55% higher than the national average (5.7% vs 3.6%). This uplift in thrombectomy reflects hundreds more patients receiving life-changing treatment that likely

helped minimize or even avoid long-term disability.

Professor Gary Ford CBE, FMedSci, Chief Executive of the Health Innovation Oxford & Thames Valley and a Consultant Stroke Physician at Oxford University Hospitals, said: "Harnessing AI imaging technology within stroke networks has the potential to transform outcomes for many more stroke patients. We have worked with Brainomix and our NHS partners to ensure widespread adoption of e-Stroke and the evaluation is providing more evidence to support further spread."

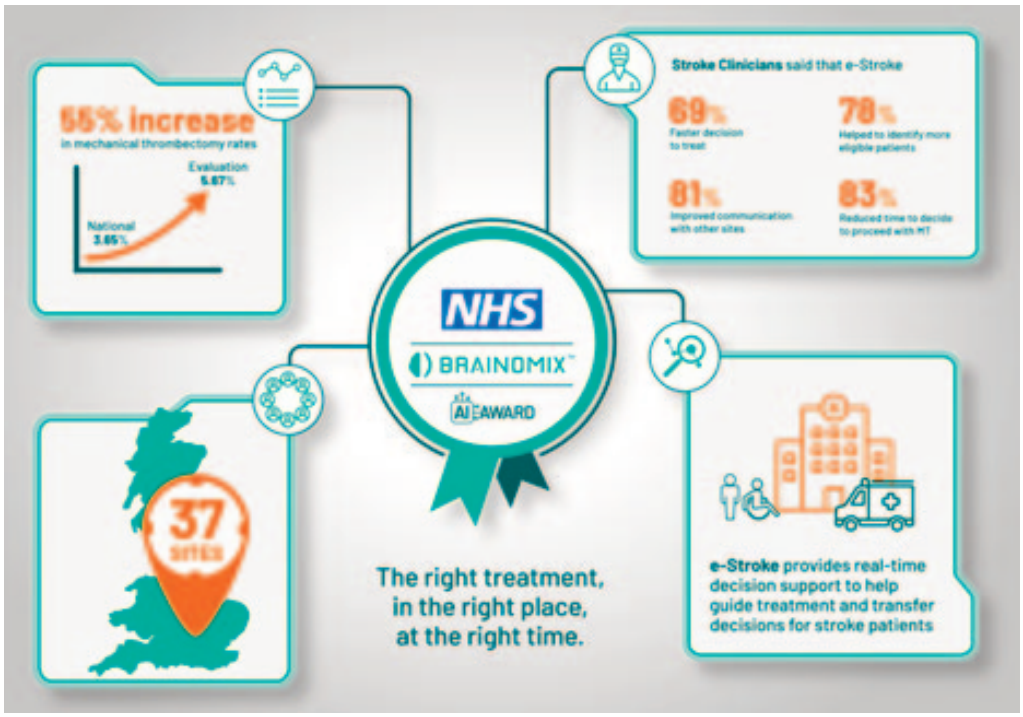
Dr George Harston, Chief Medical & Innovation Officer at Brainomix and Consultant Stroke Physician at Oxford University Hospitals, commented: "The NHS AI Award enabled us to deploy Brainomix 360 Stroke across a range of urban and rural NHS hospital networks, and to have the impact of the AI technology on stroke patient care independently evaluated. The results are very impressive, with Brainomix 360 Stroke sites achieving much higher rates of thrombectomy, ensuring access to life-changing treatment for more patients across the country. Feedback from NHS colleagues reported that the software is helping them to deliver a more efficient and effective stroke service for their patients. We look forward to seeing more results as they come out, building on the largest real-world and independent evaluation of a stroke AI imaging platform."

This latest data builds on a growing body of evidence showing the impact of Brainomix 360 Stroke, including a study from the Royal Berkshire Hospital which showed that the implementation of Brainomix 360 Stroke reduced the door-in-door-out (DIDO) time – a key metric in stroke care – from 140 minutes down to 79 minutes, an improvement of over 1 hour. More significantly, the study also found that more patients achieved functional independence (defined as mRS 0-2) following the adoption of Brainomix 360 Stroke, trebling from 16% to 48% of patients – a result which even caught the attention of *The Times* when they showcased the impact of Brainomix technology on stroke care in the UK in a December 2022 article.

Stroke AI imaging tools are now becoming a standard of care across the UK, including the East of England Integrated Stroke Delivery Networks (ISDNs) North and South, who announced that the Brainomix 360 Stroke platform had been rolled out across all 16 of the regional stroke centres as part of the ISDN's mission of bringing together specialists from all part of the stroke pathway to ensure that more people who experience a stroke receive high-quality specialist care, from pre-hospital, though to early supported discharge, community specialist stroke-skilled rehabilitation and life after stroke.

Dr Paul Guyler, Clinical Director for the East of England ISDNs, and Consultant in Stroke Medicine at Southend University Hospital, commented: "The procurement and deployment of Brainomix and networked AI across the East of England allows our consultants to access scans and images remotely and securely, meaning that stroke centres can immediately discuss stroke patients together, delivering more consistent treatment decisions and faster patient transfers – particularly to Cambridge University Hospitals NHS Foundation Trust as the main comprehensive stroke centre and hub for the region. This will enable more patients to get the right treatment, in the right place, at the right time, to help save lives and prevent people from severe disability."

Brainomix have firmly established themselves as market leaders in the UK and rest of Europe, with more than 350 sites across 30 countries, and more than 1.5M scans processed since introducing its technology to the market in 2016. At the Society of Vascular and Interventional Neurology (SVIN) Conference in Miami in November 2023, the company launched its Brainomix 360 platform in the US following a series of FDA clearances.



Dr Waleed Brinjikji, Professor of Radiology and Neurosurgery at the Mayo Clinic in Rochester, Minnesota, delivered a keynote presentation at SVIN, highlighting his experience with the Brainomix: "We have been collaborating with the Brainomix team around numerous research projects over the past couple of years, including a recent study that validated the performance of their e-ASPECTS module. The results showed that the accuracy of ASPECTS scoring by physicians improved across disciplines and levels of experience, which makes the e-ASPECTS module a powerful tool for clinicians across the US who are managing stroke patients."

Dr Michalis Papadakis, co-founder and CEO of Brainomix, also spoke about the importance of the US launch: "We are delighted to have the opportunity to introduce our Brainomix 360 platform to more and more US stroke networks, and to showcase the extensive validation of our technology, a good portion of which was conducted in the US at such institutions as the Mayo Clinic, Emory University, Mount Sinai in New York, and UCLA. As a spin-out from the University of Oxford, we have a longstanding heritage of scientific and academic excellence, which has allowed us to achieve broad success in the UK and across Europe, including national-level deployments of Brainomix 360 across Hungary and Wales, as well as wide-ranging roll-outs in England, Poland, Sweden, Italy and Spain." ■

THE DEEP TECH SME ECOSYSTEM SUPPORTING RESEARCH-INTENSIVE CHEMISTRY SMES FOR GROWTH

Henry Lovett, Policy Advisor, Royal Society of Chemistry

Innovation is a vital driver of growth and the answer to global challenges, such as improving health and tackling climate change. To unleash this potential, the innovation ecosystem of research-driven businesses needs support from a range of stakeholders, in addition to Westminster. The Royal Society of Chemistry (RSC) is working to shine a light on the social, environmental and economic value of deep tech chemistry and bring it into focus for policy and investment.

In the Autumn Statement 2023, Chancellor Jeremy Hunt said that "the best universities, the cleverest scientists and the smartest entrepreneurs have given us Europe's most innovative economy". It is fantastic that these are the strengths he chose to highlight, and a testament to the cutting-edge research done in academia and SMEs around the country.

The chemical sciences underpin much of this research work, and will provide the answers to global challenges we face in fields as diverse as energy and net zero, secure food and water supplies, and population health. Many of the companies developing these technologies and taking them to market fit the definition of a Deep Tech SME – a small or medium-sized company developing new and potentially disruptive chemical technologies with long and uncertain R&D timelines and high capital requirements. The RSC has worked to understand the situation, strengths and challenges of these companies so we can take action to support them in their mission to make the world a better place, using our research with the Enterprise Research Centre set out in our 2022 report *Igniting Innovation* [1].

CHEMISTRY DRIVING INNOVATION

Figures from the 2019 UK Innovation Survey [2] show that chemistry SMEs are twice as likely as the average SME population to invest in R&D (39% vs 20%), more likely to bring new-to-market innovation (16% vs 9%), and more likely to train staff for innovative activities (21% vs 13%). They are also more likely to collaborate with partner organisations, particularly

universities, showing they are active in the translation of publicly funded research into beneficial products. However, the nature of chemical research means these companies also face unique challenges on their journey to commercialisation. The RSC is working to address these challenges, as detailed here.

Laboratory research, extensive testing, and scale-up of production capacity are all expensive. However, for a deep tech chemistry SME they are all necessary before a minimum viable product can be reached and the company can become revenue-generating. This leads to challenges in seeking investment as these up-front costs must be paid before any chance of generating a return. The RSC encourages government to increase the early-stage grant support available for deep tech innovation as well as other methods such as co-investment to de-risk these companies in the eyes of private capital.

Scientific expertise in the financial sector is limited, meaning analysts advising on investment decisions are not always best-placed to understand the detail and the potential of the technology they are presented with; a further barrier to successfully attracting funding. The RSC brings high-potential emerging companies to the attention of investors through our Investment Catalyst events, and uses our scientific understanding to act as a kitemark recognising the most promising innovation.

As well as the cost of chemical research, it also requires bespoke equipment and facilities. Finding these available for commercial use at an affordable rate can be very hard, particularly in areas without an established research SME sector. Smaller companies and early-stage university spin-outs can sometimes access university equipment, but as the need to grow increases finding facilities can be harder. The needs of each company can be very specific so there is little incentive for landlords to pre-fit premises at great expense, but existing lab space is oversubscribed even in places with well-established innovation clusters like Cambridge. We are working to audit and map available facilities as well as promoting the building of more lab space suitable for deep tech SMEs to grow and thrive in.

Chemistry SMEs are often founded by scientists with the intent of commercialising their research. However, the skills needed to create a successful business are different to those needed to be an effective researcher. In many cases, SMEs struggle to develop strong leadership, management and business skills. Training and partnership opportunities are available in some cases, but this takes time and money away from the research that is the core of the business. The RSC acts as a hub for peer to peer networking, sharing these necessary skills and learning from seasoned entrepreneurs. We are also active in the conversation with government and arms-length bodies on the skills needed for the future UK workforce and how scientists can be trained to add them to their technical knowledge.

Innovation flourishes in clusters, where many companies at different stages of the innovation journey can share knowledge and best practice, find economies of scale and, if companies do fail, scientists and entrepreneurs working in that ecosystem know they can find new jobs. For chemistry, there are not enough mature networks to make these advantages widely available, particularly away from the "golden triangle" of R&D activity in London, Oxford and Cambridge. The RSC works with scientists, universities and companies around the UK and globally, and advocates to decision-makers for policy decisions beneficial to local R&D business growth across local communities.

Alex Groombridge, Chief Technology Officer and a founder at Echion Technologies holding their fast-charging battery prototype.

THE RSC WORKING FOR CHEMISTRY START-UPS

The home of this activity within the RSC is Change Makers, our entrepreneurial ecosystem for deep tech chemistry SMEs[3]. This is a home for any SME working on chemical technologies that aid the UN Sustainable Development Goals (SDGs)[4], as well as investors specialising in deep tech companies and selected mentors who can pass their skills and knowledge on to those at an earlier stage of the deep tech commercialisation journey.

This initiative has grown from a history of support for chemistry SMEs by the RSC. We have, over the past decade, worked with more than 600 companies who have collectively raised more than £3.5bn in funding through grants and investment. Some SMEs identified by the RSC as "ones to watch" have gone on to achieve exits in the range of hundreds of millions to billions[5], while others have achieved notable successes such as Notpla winning the 2022 Earthshot prize.[6]

POLICY ACTIVITY TO SUPPORT INNOVATION

The RSC is not, of course, working on this topic in a vacuum. The Government has over the last few years made policy changes and investments aimed at boosting innovative UK companies through several different vehicles and initiatives. We have seen the welcome announcement of new funding streams for investment in science and technology companies, particularly where it can crowd-in investment from private partners. This is aimed at companies with more mature technologies that have demonstrated their potential. Innovate UK funding helps more nascent companies with grants for proof-of-concept work and early development. Support for levelling up through innovation clusters and regional support for R&D businesses centred around universities are positive steps for building networks of innovative SMEs. Other financial tools relevant to innovative SMEs include R&D tax credits, particularly where companies are pre-revenue, and financial help from Tech Transfer Offices if companies are being spun out from university research.

Other, non-financial, policy areas affect SMEs. Companies need the talent to conduct their research and turn a product into a business. This can involve hiring specialist scientists from global talent pools, so immigration policies and a climate which attract a range of scientific talent are of great importance. Skills and education decisions also affect the domestic supply of graduates and workers. Government weight behind particular

technologies and areas of research strength can boost interest in companies working in these areas, driving investment chances. Locally devolved policy such as business rates, planning decisions and local infrastructure are also critical to providing an environment for innovative SMEs to flourish.

In conclusion, we encourage those in the political sphere to celebrate the contribution that deep tech chemistry and other R&D-driven SMEs make locally and nationally, and to recognise the capability of innovation and deep tech chemistry to bring economic and societal improvements. Innovation policy requires joined-up thinking and inclusion of the sector's voice from the earliest stages of development. We, and the entrepreneurs at the heart of deep tech chemistry, stand ready to drive UK growth through the strength of our innovation.

References

1 *Igniting Innovation*, RSC, 2022, https://www.rsc.org/policy-evidence-campaigns/discovery-research-and-innovation/discovery-research-innovation-reports-surveys-campaigns/the-case-for-supporting-uk-deep-tech-chemistry/

2 *The UK Innovation Survey* 2019, BEIS, https://www.gov.uk/government/statistics/uk-innovation-survey-2019-main-report

3 https://changemakers.rsc.org/

4 https://sdgs.un.org/goals

5 Ziylo (bought by Novo Nordisk), Exscientia (floated on Nasdaq)

6 https://earthshotprize.org/winners-finalists/notpla/

A BOLD PLAN FOR THE BIOMEDICAL SCIENTIST WORKFORCE

David Wells, Chief Executive, Institute of Biomedical Science

As the leading professional body for biomedical scientists and laboratory staff in the NHS, the Institute of Biomedical Science (IBMS) welcomed the NHS England Long Term Workforce Plan and committed to ensuring that the biomedical scientist workforce will be a key part in its successful delivery.

Our response, the IBMS Long Term Biomedical Scientist Workforce Plan, presents a bold strategy for the UK to develop the biomedical scientist workforce so that it can operate at the highest levels of practice through training, experience, and professional qualifications. It outlines how to support and upskill biomedical scientists in a manner that is safe, efficient, and meets nationally recognised standards for the whole of the UK.

BIOMEDICAL SCIENTISTS – A WORKFORCE OF ALL THE TALENTS

Biomedical scientists, regulated since 1960, make up the largest segment (40%) of healthcare science professionals, totalling over 27,000 Health and Care Professions Council (HCPC) registrants. They are the largest staff group in UK pathology laboratories at approximately 14,000, with the remainder in management roles, NHS Blood and Transplant, public health services, private laboratories, research, armed forces, the diagnostics industry, and academia.

The biomedical scientist workforce has extensive experience of both NHS laboratory management and advanced clinical practice and has vast knowledge and experience of haematology, transfusion science, clinical chemistry, microbiology, cellular pathology, immunology, molecular pathology, and

genomics – the widest knowledge base of all healthcare professionals covering from before conception to after death.

Their high-level clinical and scientific knowledge has supported the expansion of the pathology test repertoire. There are now hundreds of diagnostic tests, many of which can be performed within hours (sometimes minutes) of receiving the patient's sample. This is critical to enable timely clinical interventions, reduce waiting times, and to prevent further disease.

This is the workforce with the capacity and capability to respond to large and rapid increases in demand for laboratory testing services generated by a pandemic. This is also the workforce with the capacity and capability to undertake advanced clinical roles to report histopathology samples alongside medically qualified pathologists – helping to support the UK cancer screening programmes and meet the challenge of early diagnosis and treatment of cancers as per the UK Major Conditions Strategy.

GROWING AND TRAINING A SUSTAINABLE WORKFORCE

HCPC registration for biomedical scientists requires an IBMS Accredited degree and completion of an IBMS Registration Training Portfolio in an approved laboratory during or post-graduation. Around 60 UK universities offer IBMS Accredited biomedical science degrees. Graduates from these accredited degrees can finish pre-registration training within 12 months, whereas those with non-accredited degrees may have to add an extra year for additional study.

The IBMS recognises the risk of a potential skills gap due to an ageing workforce approaching retirement and we are putting in place measures to support the supply stream of biomedical science graduates entering the profession and seeking HCPC registration. However, in order to grow and train a sustainable workforce, we must introduce a registration training grant for departments to train individuals completing their IBMS Registration Training Portfolio, expand the number of training positions, enable more biomedical science graduates to get registered, and thereby prevent an interruption in the pipeline of talent.

The current absence of central funding hinders this and recent graduates often struggle to secure training positions, leading to valuable talent seeking alternative careers due to training shortages. Implementing a registration training grant for departments could alleviate this bottleneck, ensuring a continuous flow of qualified professionals to enhance pathology services amid increasing demands.

SPECIALIST KNOWLEDGE AND SKILLS

IBMS qualifications extend beyond HCPC registration - with a suite of professional qualifications that provide a structured career-long training framework. The Specialist Diploma, available in each laboratory specialism, is a prerequisite for NHS Band 6 roles in most laboratories and will soon adopt a modular format to tailor training to specific service needs.

This aim of the Specialist Diplomas is to ensure alignment with current practice and supporting new registrants in their early career stages. New Specialist Portfolios in Molecular Pathology and Genomics are in development to train biomedical scientists for roles in genomic hubs, meeting escalating workload demands. Beginning in 2024, a Specialist Portfolio in Andrology will be developed to standardise post-registration training for biomedical scientists in fertility services laboratories.

LEADING AND MANAGING OUR LABORATORY SERVICES

Modern NHS laboratories drive research and innovation, enhancing diagnostic services for acute, chronic, and emergency conditions, refining patient care. Pathology investigations now play a crucial role in over 80% of patient care pathways, a trend likely to grow with genomic testing and personalised medicine.

Biomedical scientists, beyond their scientific expertise, oversee quality, safety, equipment, budgets, and staff in these complex environments. This responsibility demands individuals deeply attuned to their service and its role in patient care.

Learning to manage a laboratory isn't solely attainable through on-the-job experience, and standard management courses fall short for this workforce. Responding to this gap, the IBMS designed Certificate of Expert Practice (CEP) courses - short-duration distance learning programmes, to introduce new managers to specific aspects of laboratory management.

In 2023, a new CEP in Laboratory Information

Technology and Clinical Informatics was introduced. This course aids individuals taking on expanding roles in laboratory IT projects and supports non-biomedical scientist IT managers in grasping the intricacies of the service they support.

WORKING AND TRAINING DIFFERENTLY

The biomedical scientist workforce stands out in healthcare due to its unique suite of affordable, service-specific professional qualifications spanning an entire career - precisely mirroring professional practice.

Recognising the need for affordable and accessible level 7-equivalent qualifications, the IBMS offers the Higher Specialist Diploma (HSD). This level 7-equivalent professional qualification, available in all major laboratory specialisms, equips candidates not just in science but also in leadership and laboratory management.

UPSKILLING THE WORKFORCE

The advancement of consultant-level practice for scientists in UK health services is gaining momentum. However, while this forward-thinking approach is standard in nursing and allied health professions, it has progressed at a slower rate in biomedical science.

NHSE is driving the adoption of advanced and consultant roles for biomedical scientists across pathology disciplines. These roles expand diagnostic and treatment capacity, overseeing patient care in primary, secondary, and community diagnostic hubs.

Increasing numbers of biomedical scientists are now undertaking IBMS professional qualifications that enable them to work alongside medical pathologists as part of the pathology dissection and reporting team, freeing up many hours of consultant pathologist time each week to focus on reporting.

Recognising pressures in haematology, IBMS is developing specialist programmes in haemostasis, thrombosis, and red cell disorders. The aim is to enhance the skills of scientists, supporting medical colleagues effectively and safely.

INDUSTRY AND INNOVATION

The field of biomedical and life science in healthcare is agile, evolving rapidly to meet shifting patient and societal needs. Early-stage life science research and the integration of life science R&D into the NHS offers the promise of pioneering treatments, improved patient outcomes, and the potential to revolutionise healthcare practices. Innovative diagnostics enable quicker, more accurate services closer to patients, improving outcomes, reducing healthcare costs, and shortening hospital stays.

Cancer care paths, among healthcare's costliest and lengthiest, now benefit from genomic testing, tailoring treatments to individuals. The IBMS advocates rapid genomic/proteomic testing for cancer patients, aiming to expedite targeted treatments. With biomedical scientists in every laboratory supporting cancer centres, and advanced technology in the diagnostics industry, greater diagnostic options are feasible at reduced costs, ensuring optimal patient outcomes.

The IBMS offers NHSE and the NHS in the devolved nations its diagnostics experience, and its links to industry and innovation. Working together will drive improvement and the adoption of new diagnostic strategies to deliver the most rapid, effective, and efficient treatments for patients that utilise the biomedical science workforce to speed up adoption of proven, effective technologies and diagnostic tests.

THE ROUTE FORWARD

The IBMS wants biomedical scientists to be recognised as the key health service workforce in pathology and diagnostics, with IBMS qualifications the primary route to its further development.

The biomedical scientist profession should be supported in a manner that allows the full scale of its skills and expertise to be galvanised to contribute to the delivery of the Government's new Major Conditions Strategy, with its focus on primary and secondary prevention, early diagnosis, managing multiple conditions effectively, and helping people live well after they have been diagnosed.

The IBMS can help the UK Governments make this happen faster and on a greater scale through the application of our Long Term Biomedical Scientist Workforce Plan, benefiting the healthcare system and patients.

Contact us:
communications@ibms.org ■

KNOCKING OUT ANTIMICROBIAL RESISTANCE

The Microbiology Society is a membership charity for scientists interested in microbes. With over 7,000 expert members across the globe, we have access to a wide range of expertise and are well placed to provide support, evidence and advice to policymakers working to tackle the grand challenges. Perhaps one of the most pressing challenges we face is that of Antimicrobial Resistance (AMR). The Microbiology Society's new project, 'Knocking Out AMR', seeks to bring together experts working internationally on AMR across academia, industry, healthcare, and policy to support the development of solutions to this global health threat.

Antimicrobial Resistance (AMR) is one of the most urgent and devastating global health threats. AMR refers to disease-causing microbes evolving and gaining resistance to drugs and substances that were once effective treatments (antimicrobials). When microbes are exposed to antimicrobials they are put under a selective pressure that forces them to develop mechanisms to resist the antimicrobials to survive. Resistant microbes can then multiply and share their defence mechanisms with other microbes. Therefore, overuse and inappropriate use of antimicrobials increases the prevalence of AMR as the greater the use of antimicrobials, the greater the chance of resistance developing.[1]

While often referred to as the silent pandemic, recent estimates from the Global Research on Antimicrobial resistance (GRAM) study outline between 1.27 million deaths were attributable to, and 4.95 million deaths were associated with, AMR globally in 2019[2], making it one of the most urgent threats to public health today.

We are already witnessing the devastating consequences of AMR to healthcare systems, economies, the environment, and animal health. The World Bank estimates the global costs associated with AMR might exceed $1 trillion USD annually by 2030[3], and AMR will kill 10 million people per year by 2050[4]; more than cancer and diabetes combined.

We need to develop innovative solutions to minimise the growing global existential threat of AMR and we need to act now. Microbiologists in academia, industry and clinical settings are at the forefront of the fight against this threat both in the UK and internationally. However, to harness the power of these possible solutions, it's essential that the microbiology global community work collaboratively with decision-makers to raise the profile of AMR and to step-up a mandate for policy action to reduce and control its spread.

AMR is a truly cross-sectoral issue – it can spread between humans, between animals, and through the environment – so it is crucial that we focus on an interdisciplinary, solutions-driven approach within a 'One Health' context. To this end, the Microbiology Society has launched the 'Knocking Out AMR' project – an ambitious, bold and extensive scheme of work aiming to promote feasible and effective solutions to AMR through cross-disciplinary and multi-sector collaboration worldwide. This project will be spearheaded by Dr Tina Joshi (University of Plymouth) and Dr Catrin Moore (St Georges, University of London).

The 'Knocking Out AMR' project will focus on:

1: Therapeutics and Vaccines

Using the Society's cross disciplinary expertise, the 'Knocking Out AMR' project will support activities in key areas such as research and development of preventative measures and alternative therapeutics; interdisciplinary co-working in the antimicrobial pipeline; and the reduction of inappropriate antimicrobial exposure.

2: Diagnostics and Surveillance

Through effective knowledge sharing in the UK and internationally, the 'Knocking Out AMR' project will act as a conduit between the Society's expert membership and external stakeholders in order to integrate efforts of those across different sectors working on diagnostics and surveillance.

3: Policy engagement

The 'Knocking Out AMR' project aims to drive knowledge exchange between AMR experts and policymakers in order to increase our collective voices and drive policy discourse around AMR in the UK and worldwide. We aim to ensure the full diversity of voices of microbiologists working on AMR are heard.

The 'Knocking Out AMR' project represents a unique opportunity to capitalise on our members' expertise and influence to shape the response to AMR. While addressing AMR is a monumental challenge, we believe that by working together we can bridge the gap between research and policy to develop and implement bold, innovative solutions to this pressing global health crisis.

We are keen to collaborate with those working across academia, industry, clinics and policy. To find out more about opportunities to get involved in 'Knocking Out AMR', please email knockingoutamr@microbiologysociety.org

References

1 **Microbiology Society**. Antimicrobial Resistance in the UK: Diagnostics and Surveillance. Available at: https://microbiologysociety.org/publication/ policy-briefings/antimicrobial-resistance-in-the-uk-diagnostics-and-surveillance.html

2 **Antimicrobial Resistance Collaborators**. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. Lancet 2022; 399:629.

3 **World Bank Group**. Drug-resistant infections: a threat to our economic future; 2017. https://documents.worldbank.org/en/publication/ documentsreports/documentdetail/323311493396993758/final-report (accessed 15 December 2023).

4 **Review on Antimicrobial Resistance**. Tracking drug resistant infections globally: final report and recommendations; 2016. https://amr-review.org/sites/default/files/160525_Final%20paper_with%20cover.pdf (accessed 15 December 2023).

NAVIGATING THE POST-PANDEMIC LANDSCAPE: NML'S USE OF METROLOGY

Dr Denise O'Sullivan
Principal Scientist, Molecular & Cell Biology
NML at LGC, Teddington
denise.osullivan@lgcgroup.com

Dr Jim Huggett
Science Fellow, Molecular & Cell Biology
NML at LGC, Teddington
jim.huggett@lgcgroup.com

The National Measurement Laboratory (NML) at LGC is a strategic national asset that provides a unique national capability for the UK, providing further confidence in the UK's science and technology capabilities, and is essential for advancing measurement science, ensuring precision and accuracy in bioanalytical testing in the UK and worldwide. During the COVID-19 pandemic, NML's expertise was pivotal in enhancing diagnostic test accuracy and laying the foundation for a sustainable UK framework for future pandemic preparedness. This framework guarantees the reliability of diagnostic tests, enabling informed public health decisions.

THE CRUCIAL ROLE OF BIOANALYTICAL BREAKTHROUGHS IN HEALTHCARE ADVANCEMENTS

The advances in healthcare over the last half century have been unparalleled, with major improvements in mortality and morbidity associated with conditions ranging from cancer and cardiovascular diseases to infectious diseases. Many of these breakthroughs have needed cutting-edge advances in bioanalytical tests to provide accurate information on the physiology, immunity, or genetics to aid in diagnosis, prognosis and longitudinal monitoring of disease progression and treatment response.

The need for bioanalytical technologies was highlighted during COVID-19. How could governments have responded to COVID-19 without genetic sequencing, PCR, and later, lateral flow tests? Yet this episode also highlighted the critical need for precision and accuracy in healthcare testing. As bioanalytical technologies provide previously unknown clinical and epidemiological information across various diagnostic challenges, the community becomes more dependent on the outcomes of the tests in decision-making. Consequently, it is paramount that the methods are known, and can be demonstrated, to be working within specified parameters to address challenges from antimicrobial resistance to precision medicine for patient benefit.

NML'S METROLOGY ROLE:

The NML is the UK's designated institute for chemical and bio-measurement and, as a national laboratory and PSRE (based in a private limited company), is a crucial part of the UK National Measurement System. We provide high-quality world-leading science, to solve measurement problems and provide the resilient measurement infrastructure

needed to support government, healthcare, industry and protect consumers within the UK, as well as representing the UK's measurement interests internationally. We address emerging challenges in measurement science, supporting businesses to innovate more effectively and with less risk – through the application and translation of fit-for-purpose measurement solutions and the provision of standards that underpin complex measurements – and so fostering economic growth.

OUR PANDEMIC RESPONSE

Over the last fifteen years, we have led the development of a global framework for biological measurement quantification. Through UK government funding in our national role, combined with additional leveraged income through European projects (Horizon 2020), we have developed advanced nucleic acid measurement capabilities and expertise within the UK, establishing it as a leading measurement institute in supporting pathogen analysis. Our strategic role has been pivotal in improving the comparability and traceability of infectious disease diagnostics, informing clinical best practice, supporting molecular diagnostic accreditation, and contributing to international standards.

As a result, we were well-positioned to respond to the COVID-19 pandemic, quickly developing reference methods required to support accurate molecular detection and providing independent advice.[1] We collaborated with government, industry, and academia to establish a national testing programme, founded on reliable chemical and biological measurement science.

During the pandemic, the need for clear technical guidance in developing in vitro diagnostic tests for SARS-CoV-2 detection became paramount. Representing BSI on the International Organization for Standardization (ISO) diagnostic committee in January 2021 highlighted the potential threat variants of concern (VoC) could have on diagnostic testing. We played a central role in drafting requirements to screen for VoC in collaboration with the Medicines and Healthcare products Regulatory Agency's (MHRA)[2].

Through collaboration with MHRA we developed Target Product Profiles (TPPs) for diagnostic tests. These profiles guide manufacturers in test development, considering factors like usage, location, and result application (e.g., contact tracing or isolation decisions). We ensured TPPs had accurate terminology and clear technical directions, ensuring effective and scientifically rigorous SARS-CoV-2 diagnostic tests. This emphasized the importance of precise early diagnostics in pandemic management and provided guidance for COVID-19 in vitro diagnostic manufacturers[3].

In April 2020, over 480 laboratories joined one of the first external quality assessment schemes (EQAs), a vital milestone. For the first time, laboratories could validate the fast-developed independent methods. Leveraging our expertise based on our experience, we characterised materials with high accuracy. A follow-up study assigned virus numbers to these materials, establishing benchmarks for laboratory competency and test reproducibility[4].

NML, in collaboration with MHRA and NIM China, led global comparison studies, including a rapid reference measurement pilot for COVID-19 (CCQM NAWG P199b) to standardise molecular diagnostics. This study demonstrated method comparability for end-user testing at an unprecedented pace in the measurement community.

Despite these achievements, it's essential to stress the ongoing need for improving testing efficiency and accuracy. Our extensive work during the COVID-19 pandemic underscores the importance of integrating national and international measurement expertise into pandemic preparedness. A comprehensive reference system, encompassing both quality control materials and reference methods, should be a vital part of rapidly deploying diagnostic tests in response to new outbreaks. Enabling comparisons across various approaches through a centralized, accessible process will benefit end-users, highlighting the importance of a cohesive and standardized response in future health emergencies.

LEARNING FROM THE PANDEMIC: THE 100-DAY MISSION, CCQM ROADMAP AND GLOBAL HEALTH STRATEGY:

The pandemic highlighted the crucial role of diagnostics in identifying and managing health crises. It became clear that early and robust diagnostic capability was key to managing the disease.

In response to the Covid-19 pandemic, the 100 Days Mission[5] was published, an ambitious initiative produced through collaboration between global experts. Its main objective was to develop safe, effective, and affordable rapid diagnostics, therapeutics, and vaccines within 100 days of a major outbreak. Building robust, sustainable resources for rapid activation and implementation of diagnostic measures in response to emerging health threats is essential to achieving this target.

Working closely with the measurement community, and national and global policy and healthcare officials who were on the front line of managing national responses to COVID-19, we led the development of the CCQM Pandemic Roadmap[5]. This roadmap sets out recommendations for specific measurement interventions to enable a rapid response and enhance clinical outcomes, providing globally accepted baseline measurements for policy decisions in future infectious disease outbreaks.

It focuses on a deep understanding of pathogens, the standardization of test requirements for in vitro diagnostic devices, and the proactive development of diagnostics, therapeutics and vaccines (DTVs). These measures are critical for effective pandemic management, highlighting the roadmap's comprehensive approach to public health crises.

EMBRACING COLLABORATION:

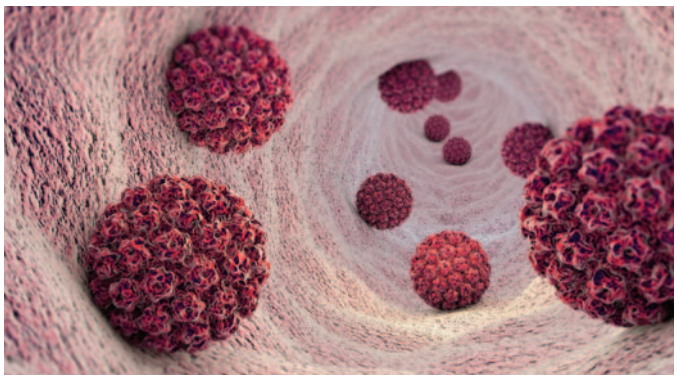
Central to our work is the establishment of a multidisciplinary expert community in the diagnostic space in the UK. An interconnected measurement system is vital for advancing global health responses, ensuring diagnostic accuracy, supporting regulatory compliance, and enhancing public health management. Collaboration in measurement science is instrumental in achieving the objectives of the CCQM Roadmap and the 100 Days Mission, ultimately improving pandemic response strategies.

THE PANDEMIC PARLIAMENTARY EVENT:

As part of our collaboration initiative, we hosted a Pandemic Preparedness Event at

Parliament in October 2023. The event emphasized our dedication to the 100 Days Mission and its role in implementing post pandemic responses. Hosted in the House of Commons and chaired by Stephen Metcalfe MP, it featured advancements in diagnostic testing from ourselves, MHRA, UKHSA, NHS laboratories and others, and reinforced the UK's leadership in this field.

The discussion stressed diagnostics' pivotal role in addressing various health challenges, especially in pandemic preparedness based on COVID-19 lessons. It emphasized their importance in dealing with infectious diseases, antimicrobial resistance, precision medicine, and cancer



detection. However, diagnostics, despite their cost-effectiveness and early detection benefits, often receive less funding and policy attention than therapeutics and vaccines. Clear, consistent, ambitious government policies are crucial to boost confidence in the UK diagnostics industry, promote investments, ensure sector stability, and maximize its impact.

The discussion concluded with a forward-looking perspective on how the framework, spearheaded by the UK, is being implemented to ensure timely access to quality-assured diagnostic tests for future infectious diseases.

Following on from this event, the NML is continuing to work across the diagnostics, regulatory and policy communities to raise the profile and importance of diagnostics further.

References

1 https://www.lgcgroup.com/pandemic-preparedness/

2 ISO/TS 5798:2022 - In vitro diagnostic test systems — Requirements and recommendations for detection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by nucleic acid amplification methods

3 Guidance for manufacturers: diagnostic assurance with SARS-CoV-2 variants in circulation - GOV.UK (www.gov.uk)

4 DOI: 10.1371/journal.pone.0262656

5 https://www.bipm.org/en/-/2022-06-16-ccqm-pandemic-roadmap ■

LONG COVID – THE GIFT THAT KEEPS GIVING

Michael Graz, Biophys Ltd, UK

Heather Graz, Biophys Ltd, UK

Bryan Hanley
ACTA (ACTA is the joint Dental Faculty of the University of Amsterdam and the VU Amsterdam). A.B.Hanley@acta.nl

Following on from Professor Charles Bangham's treatise on long COVID in this Science in Parliament in Summer 2021 (77(2), 16-18, 2021), a review of what is now known about long COVID, 2 years later was warranted.

WHAT IS LONG COVID?

Long COVID (also known as post-COVID syndrome and post-acute sequelae of SARS CoV-2 infection (PASC)) manifests as a set of clinical symptoms that are reported by people who have had COVID and are still reporting effects some months after the initial infection. A range of symptoms have been reported and the effects vary between individuals both in severity and in the length of time that they persist. It is estimated that between 10% and 30% of people who are infected with COVID develop long COVID [1] and that, while some symptoms appear more often than others including tiredness or fatigue that interferes with daily life symptoms that get worse after physical or mental effort and fever [2]. Other symptoms seem to target specific parts of the body and cause heart palpitations, shortness of breath, exercise intolerance, difficulty in thinking or concentrating (brain fog), headaches, fatigue, muscle weakness, sleep disturbances, diarrhoea and stomach pain and (chronic) joint or muscle pain [1]. The symptoms are similar to those reported by people with myalgic encephalomyelitis/ chronic fatigue syndrome

(ME/CFS) and other poorly understood chronic illnesses that may occur after other infections.

WHAT CAUSES LONG COVID?

One of the problems with long COVID is that there is no single test available that can confirm a diagnosis. Even a history of having had (or not had) COVID is not definitive since some people who develop the symptoms associated with long COVID can have had asymptomatic COVID (around 20% of people who have COVID are largely or completely asymptomatic perhaps due to pre-existing T cell immunity) and were not aware of having the infection in the first place. In addition, there is no mechanistic basis for diagnosis of long COVID [2]. The incidence of long COVID is estimated at 10–30% of non-hospitalized cases, 50–70% of hospitalized cases and 10–12% of vaccinated cases [3]. It is, therefore, inaccurate to suppose that vaccination can completely eliminate long COVID. Symptoms of long COVID can persist for years [4] and, in some cases it is estimated that these may last a whole lifetime [5]. For affected individuals, the consequences of long COVID are significant and a return to normality (e.g. working and leisure pursuits) may be impaired for a considerable time [6].

A number of possible mechanisms for long COVID have been suggested, based in part on other viral diseases, the characteristics of the disease and those of ME/CFS and the organs affected. These include the accumulation of the virus in tissues and a failure to eliminate it from the body, reactivation or increased susceptibility to other viral infections, immune dysregulation, effects on the microbiome and, somewhat intriguingly, priming of the immune system by molecular mimicry [7]. Some recent work has linked long COVID to disruption in serotonin signalling driven by Type I interferons [8]. Immune dysregulation has been observed in those with severe and persisting COVID and it was speculated that this was due to gut fungal pathobionts (opportunistic microbes that emerge as a result of perturbations in the healthy microbiome) [9]. A key aspect in the development of long COVID appears to be the need to take time to rest and recover from the initial infection and this in turn means that those who are more economically vulnerable might suffer more longer-term effects [10].

RESEARCH INTO LONG COVID

While COVID is, for many, a problem for which we have found a solution (vaccination), it remains a significant health issue for many – particularly those with pre-existing conditions. Health authorities would like COVID to be considered as small a risk (in the perception of the general population, at least) as seasonal flu. It should be noted, however, that seasonal flu still kills about 15,000 people a year in the UK [11]. In the UK the National Institute for Health Care Research (NIHCR) have a programme of work on long COVID and have recently implicated the migration of a certain type of immune cells in the development of long COVID respiratory symptoms [12] and other work is funded in the UK [13] to develop new treatments. While much of this work is designed to assess the prevalence of long COVID, an understanding of the causes will be essential if effective treatments are to be developed.

In the US, the National Institutes of Health (NIH) are funding a number of studies including the RECOVER initiative ($1.15Bn) [14]. The aim of RECOVER is to "rapidly improve our understanding of and ability to predict, treat, and prevent PASC (post-acute sequelae of SARS-CoV-2), including Long COVID." Such work is still at an early stage and recent investigations are still at the stage of attempting to develop a framework for identifying long COVID based on symptoms and to thereby define long COVID as a new condition [15]. Although the NIH is in the assessment phase of studies into long COVID, they are also funding clinical studies under the RECOVER program to try to discover treatments that may be effective based upon what we already know about the virus [16].

SOCIETAL IMPACTS OF LONG COVID

The societal impacts of long COVID are still difficult to quantify. It is likely that progression to the development of long COVID will remain at between 5 and 10% of those infected with the virus. Since it has been estimated that 10% of people who develop long COVID are affected to the extent that they stop working while others are off sick for extended periods and, once they return to work, their effectiveness will be reduced due to fatigue, the potential societal and economic impact is severe [17].

Finally, all of the above makes two key assumptions:

1 That new variants of COVID or other viral respiratory diseases (which will almost certainly arise) do not lead to a greater incidence of long COVID than the 10% figure quoted above.

2. That long COVID does not increase the prevalence, susceptibility to or severity of other conditions such as other viral infections or other organ-related diseases such as respiratory disease, immune function disruption or cardiovascular disease.

Based upon what we know and have learned over the past 3-4 years, we cannot have complete confidence about either of these assumptions. There are already some indications that a proportion of individuals who suffered from severe COVID are suffering from multi-organ damage [18] and, while this may not be due to persistence of the virus it is, nonetheless, a long term consequence of infection and is, therefore a type of 'long COVID'.

References

1. Sutherland, S, The Brain and Long Covid. Scientific American 328, 3, 26-33 (March 2023) doi:10.1038/scientificamerican0323-26
2. https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/index.html#:~:text=Long%20COVID%20is%20broadly%20defined,after%20initial%20COVID%2D19%20infection.
3. Davis, H.E., McCorkell, L., Vogel, J.M. et al. Long COVID: major findings, mechanisms and recommendations. Nat Rev Microbiol 21, 133–146 (2023). https://doi.org/10.1038/s41579-022-00846-2
4. Demko, Z. O. et al. Post-acute sequelae of SARS-CoV-2 (PASC) impact quality of life at 6, 12 and 18 months post-infection. Preprint at medRxiv https://doi.org/10.1101/2022.08.08.22278543 (2022).
5. Cairns, R. & Hotopf, M. A systematic review describing the prognosis of chronic fatigue syndrome. Occup. Med. Oxf. Engl. 55, 20–31 (2005).
6. Davis, H. E. et al. Characterizing long COVID in an international cohort: 7 months of symptoms and their impact. eClinicalMedicine 38, 101019 (2021).
7. Proal, A. D. & VanElzakker, M. B. Long COVID or post-acute sequelae of COVID-19 (PASC): an overview of biological factors that may contribute to persistent symptoms. Front. Microbiol. 12, 698169 (2021).
8. Wong, A C et al Cell 2023 https://www.cell.com/cell/fulltext/S0092-8674(23)01034-6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0092867423010346%3Fshowall%3Dtrue

9. Kusakabi, T. et al. Fungal microbiota sustains lasting immune activation of neutrophils and their progenitors in severe COVID-19. Nature Immunology, 24, 1879–1889, 2023.

10. Williamson, A. E., Tydeman, F., Miners, A., Pyper, K. & Martineau, A. R. Short-term and long-term impacts of COVID-19 on economic vulnerability: a population-based longitudinal study (COVIDENCE UK). BMJ Open 12, e065083 (2022)

11. https://www.gov.uk/government/statistics/annual-flu-reports/surveillance-of-influenza-and-other-seasonal-respiratory-viruses-in-the-uk-winter-2022-to-2023

12. https://www.nihr.ac.uk/news/long-COVID-research-reveals-new-targets-for-potential-treatment/32970

13. https://evidence.nihr.ac.uk/themedreview/researching-long-COVID-addressing-a-new-global-health-challenge/

14. https://recoverCOVID.org/

15. Thaweethai T, Jolley SE, Karlson EW, et al. Development of a Definition of Postacute Sequelae of SARS-CoV-2 Infection. JAMA. 2023;329(22):1934–1946. doi:10.1001/jama.2023.8823

16. https://COVID19.nih.gov/news-and-stories/nih-launches-clinical-trials-long-COVID-treatments

17. Waters T and Wernham T. Long Covid and the Labour Market. IFS, 2022

18. Long COVID research: an update from the PHOSP-COVID Scientific Summit, Christopher E Brightling, Rachael A Evans, Amisha Singapuri, Nikki Smith, Louise V Wain, on behalf of the PHOSP-COVID Collaborative Group, The Lancet Respiratory Medicine, Oct. 16, 2023 10.1016/S2213-2600(23)00341-7.

FOSTERING INCLUSIVITY WITHIN DIGITAL INNOVATION: WHY SHOULD DIGITAL EXCLUSION BE A PRIORITY?

Dr Gemma Wilson-Menzfeld, CPsychol, PhD, MSc, BSc (Hons), FHEA
Associate Professor in Digital Health; Health Psychologist
Faculty of Health and Life Sciences, Northumbria University

Dr Goran Erfani, PhD, MSc, BSc, FHEA
Research Fellow
Faculty of Health and Life Sciences, Northumbria University

DIGITAL INNOVATION IN THE HEALTH SECTOR

Digital connectivity continues to be critical for employment, education, finance, and both civic and social citizenship. In the health sector, digital transformation was a key part of the NHS long-term plan, published in 2019, particularly focusing on prevention, care, and treatment [1]. Patients across the UK have already witnessed these changes, from digital triage and consultation within primary care to monitoring daily health and well-being. Whilst evidence indicates the benefits of using digital methods throughout the healthcare system [2,3] only those who are 'digitally included' have access to / can benefit from these digital solutions. For example, services across many sectors are now online only or 'digital by default' [4-6] removing an individual's choice, and in many cases ability, to access this information or these services offline. Digital exclusion is complex and comprises digital access, skills, confidence, and the value people assign to digital technology in their daily lives [7].

Understanding digitally excluded groups locally, regionally, and nationally is critical when developing digital policy initiatives in healthcare, and beyond. However, a recent House of Lords report identified that the UK government does not currently have an adequate strategy to tackle digital exclusion [8]. While digital policies exist across the health and social care sector, much of this is not evidence-based. It is, therefore, critical to build evidence to guide the development of social policy which aims to tackle digital exclusion for those most at risk. Furthermore, this evidence base must include the most digitally excluded communities, so that real, lived experience is at the forefront of this evidence base. This is often overlooked in current research studies through inappropriate (and often online) methods.

WHAT EVIDENCE DO WE HAVE?

We know that those most at risk of digital exclusion are those who already experience other inequalities [6, 9-11]. Therefore, those who are in most need of health and social care information and support are being further digitally excluded through fast-paced digital transformation [6]. We also know that this digital inequity is highest in the North-East of England through challenges with affordability, lack of digital access, and lack of digital skills [12]. The North East of England currently has the largest internet usage gap across the UK [13].

A recent research project, funded by the former North Tyneside Clinical Commissioning Group (now NHS North East North Cumbria ICB), and led by Dr Gemma Wilson-Menzfeld, achieved the largest study focussed on digital exclusion at a borough level across the globe [6]. Aiming to explore and gain a more in-depth understanding of

digital poverty across North Tyneside, this project used an innovative research methodology, recruiting participants using a household survey distributed across the borough, to capture data from 9,181 participants. Of these, 1,130 individuals (12.31%) were classified as being most digitally excluded. The research corroborated international evidence by highlighting the following predictors of digital exclusion: Increased age; Lower income; Lower (or no) education levels; Living with a disability, or living in a household with someone else living with a disability; and/or living in a smaller household[6].

Within current evidence, geographical differences are typically considered as urban vs. rural, or North vs. South, however a pioneering finding of this study in North Tyneside was based on micro-geographical factors of digital exclusion[6]. Despite the demographic predictors of digital exclusion presented above, residing in higher socio-economic geographical areas did not necessarily equate to being more digitally included. For example, residents of one locality within the most affluent area of North Tyneside self-reported the least digital access, least use of technology, least digital confidence, and least digital skills across the borough. This has a major impact on local, regional, and national decision-making. Further research is needed across wider populations to recognise additional micro-geographical differences in digital exclusion. Without this evidence, government funding is being spent on incorrect solutions in the wrong communities and those at most risk of digital exclusion may be missed at a local, regional, and national level.

BUT WON'T THIS PROBLEM BECOME A THING OF THE PAST?

Digital exclusion is a dynamic phenomenon that varies in time and space. Our research carried out in North Tyneside showed that certain social groups may experience digital exclusion at different stages of their life and/or places[6]. For example, statistical evidence in this study shows that older retired adults with disability, no or low-level education, residing in some specific (micro) geographical areas, are more likely to drift into digital exclusion[6]. School children from lower socio-economic families often reported digital exclusion at home during the protracted period of remote learning during the COVID-19 pandemic due to a lack of access to the internet or sharing the limited number of digital devices with multiple family members in their household[14]. Whilst generations will increasingly become more familiar with technology, as they have been perhaps introduced to this at an earlier age, the problem will not go away entirely. It may shift from generational exclusion to exclusion based on other factors, such as existing health and geographical inequalities.

There is also the ever-shifting nature of digital exclusion and fear prevented many individuals in our study from using digital tools, particularly the internet[6]. As technology rapidly develops, it has the potential to exclude existing digital users more, through technophobia e.g., fear around Artificial Intelligence (AI) or increasing cost of digital services/products. This will mean that digital exclusion is likely to be problematic for a long time. Therefore, long-term policies are needed to ensure the availability and accessibility of affordable digital resources within the home and community. This indicates the need for increased investment in facilitating access to digital resources for all, supporting the choice of working and learning from home during future lockdowns and restrictions.

Regional and national policy initiatives should reduce these inequalities and increase individuals' skills, use, and access to digital resources to bridge the existing digital divide across the country. Active engagement and involvement of the digitally excluded and marginalised groups in local collaborative planning processes provide an opportunity to reduce the digital gap. We must also keep digital exclusion in mind whilst developing digital solutions, as opposed to designing digital-only or digital-by-default offers. The training programmes and advice services should adequately and constantly meet the rapidly changing needs of new digital services introduced by healthcare facilities and other services. In addition, investment in equitable and inclusive access to digital resources is crucial for the success of any digital transformations and infrastructure developments.

Evidence suggests that older retired adults with disabilities residing in specific geographical areas are at higher risk of digital exclusion *(photo from the image published library via The Centre for Ageing Better)*.

CONCLUSION

Digital innovation benefits patient and public health outcomes. However, digital transformation across health and social care sectors can lead to further exclusion for those who are already digitally excluded, and issues of digital exclusion should be considered throughout all digital transformation decisions. We will not be successful in digital health/healthcare transformation unless we reduce the scale and extent of digital exclusion.

Including digitally excluded individuals within research is critical in understanding the complexity of digital exclusion. We need to continue building the evidence base to support social policy and practice implementation throughout the UK. This empirical data can subsequently serve as a basis for the judicious deployment of appropriate interventions in suitable geographical and demographic contexts, thereby mitigating the allocation of financial resources towards expensive and ineffectual remedies targeting inappropriate target groups.

This article is written on behalf of a larger research team: Dr Gemma Wilson-Menzfeld (project lead), Dr Goran Erfani, Wally Charlton, Dr Lesley-Young

Murphy, Professor Alison Steven, Dr Holly De Luca, and Professor Katie Brittain.

References

1. NHS. The NHS long term plan 2019 [Available from: https://www.longtermplan.nhs.uk/.
2. Imison C, Castle-Clarke S, Watson R, Edwards N. Delivering the benefits of digital health care: Nuffield Trust London; 2016.
3. Sheikh A, Anderson M, Albala S, Casadei B, Franklin BD, Richards M, et al. Health information technology and digital innovation for national learning health and care systems. The Lancet Digital Health. 2021;3(6):e383-e96.
4. Age UK. Later life in a digital world. London: Age UK; 2018.
5. Munford L, et al. Overcoming health inequalities in 'left behind' neighbourhoods. London: Northern Health Science Alliance and the APPG for 'left behind' neighbourhoods; 2022.
6. Wilson-Menzfeld G, Erfani G, Charlton W, De Luca H, Brittain K, Steven A, et al. Understanding Digital Exclusion across North Tyneside. Newcastle, UK: Northumbria University; 2023.
7. van Deursen AJAM, Helsper EJ. The Third-Level Digital Divide: Who Benefits Most from Being Online? Communication and Information Technologies Annual. Studies in Media and Communications. 10: Emerald Group Publishing Limited; 2015. p. 29-52.
8. House of Lords. Digital exclusion. In: Communications and Digital Committee, editor. London: Authority of the House of Lords; 2023.
9. Hargittai E. Second-level digital divide: Mapping differences in people's online skills. arXiv preprint cs/0109068. 2001.
10. Matthews K, Nazroo J, Marshall A. Digital inclusion in later life: cohort changes in internet use over a ten-year period in England. Ageing & Society. 2019;39(9):1914-32.
11. Yu RP, Ellison NB, McCammon RJ, Langa KM. Mapping the two levels of digital divide: Internet access and social network site adoption among older adults in the USA. Information, Communication & Society. 2016;19(10):1445-64.
12. Office for National Statistics. Exploring the UK's Digital Divide London: Office for National Statistics; 2019 [Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04.
13. Yates SJ, Carmi E, Lockley E, Pawluczuk A, French T, Vincent S. Who are the limited users of digital systems and media? An examination of UK evidence. First Monday. 2020;25(7).
14. Ofcom. Children and parents: media use and attitudes report. London: Ofcom; 2021. ■

SPACE DEBRIS: HOW THE UK IS TACKLING SUSTAINABILITY BEYOND THE EARTH

Professor Dr. Mini Chakravarthini Rai
Global Chair in Robotic Engineering,
Head of Space Research,
University of Lincoln, UK.

Max Alexander
Visual Storyteller, Photographer and Creative Strategist
Max Alexander Photography, UK.

As evidenced by COP28, major undertakings are in progress to mitigate climate change and achieve a net-zero future on Earth. Sustainability beyond Earth is equally critical for protecting the space ecosystem and continuing to benefit from space-enabled economic growth and prosperity. This article directs readers to the growing space debris problems, their serious threat, and how the UK addresses this global challenge.

INTRODUCTION

The first documented case of an accidental collision between two artificial objects in low Earth orbit (LEO) occurred in 1996. The incident happened on 24 July when debris from an Ariane launcher hit the French military reconnaissance satellite CERISE. It is a sadly repeating story. In February 2009, the collision between the US satellite, Iridium 33, and the derelict Russian Cosmos 2251 resulted in more than two thousand pieces of debris.

In October 2016, a retired satellite from the US Air Force, the Defense Meteorological Satellite Program Flight 12, broke up in orbit. More recently, in March 2021, the breakup of Chinese satellite Yunhai-1 was linked to an accidental collision with a small piece of debris just 10-50 centimetres in length associated with a Russian Zenit-2 launcher sent into orbit in 1996.

These events and many others have created more than 27,000 tracked pieces of debris orbiting the Earth and an estimated tens of thousands of pieces of smaller debris that remain unchartered. The sizes of space junk vary from a few millimetres, such as glass fragments, to several meters, such as the large non-operational Environment Satellite (ENVISAT) by ESA.

Natural meteoroids are also space debris. Yet, regardless of whether debris is natural or artificial, it poses a significant threat to our current and future space assets.

LITTERED ORBITS

In Earth's orbit, most debris results from orbital collisions and breakups from space missions. The more waste there is in space, the greater the risk to operational satellites and crewed

vehicles, such as the International Space Station (ISS) and SpaceX's Crew Dragon capsule, or directly to astronauts undertaking extra-vehicular activities.

Now, after 66 years of uncontrolled debris proliferation and intensive space use, Earth orbits have reached a tipping point, known as the "Kessler syndrome", where human intervention is needed. The Kessler Syndrome is a runaway chain reaction of collisions in orbit that exponentially increases the number of debris in orbit (See essay: 'Recognising the Threat of Space Debris' by Donald J. Kessler.) It is a grim prospect.

LOSING ACCESS TO SPACE

A forecast for the next 200 years states that access to space will become impossible if measures to mitigate debris proliferation are not in place. Many space agencies are working on solutions to combat the threat of space junk, especially in developing different methods for removing the trash in Earth's orbit.

However, Active Debris Removal (ADR) missions are complex, expensive, and high risk due to the extreme space conditions and the limited technology readiness levels. As a result, there are no viable and cost-effective 'one-size-fits-all' solutions for ADR, as the strategy depends mainly on the debris object's size, shape, and operational state.

Nevertheless, capturing and deorbiting large derelict objects in widely used orbits, such as LEO, remains a priority because larger objects are larger targets, so the risk of colliding with other orbit objects is higher. Beyond LEO, high-value satellites occupy valuable orbital slots in medium Earth orbit or geostationary orbit. These, too, must be protected by removing the faulty ones that represent a threat.

Handling cooperative and uncooperative targets in orbit poses different types of challenges. The detailed strategy for capturing space debris depends on several factors. If the target is spinning or tumbling, the chaser spacecraft must match this movement, making the approach and capture difficult. It increases the risk of the grappling manoeuvre going wrong.

DEBRIS CAPTURE TECHNIQUES

Despite the many difficulties in removing debris from orbit, progress is being made. The Surrey Space Centre led the RemoveDebris study funded by the European Commission. As part of the technology demonstration mission, the spacecraft was taken to ISS and deployed into orbit in 2018. This mission successfully validated the space net and harpoon technologies developed by industrial partners.

More recently, in March 2021, Astroscale launched its ELSA-d spacecraft to demonstrate capturing cooperative orbital debris using a magnetic capture mechanism to retrieve and deorbit a target spacecraft designed by Surrey Satellite Technology Ltd. While a success, this technique is not suitable for capturing satellites that do not have the pre-designed counterpart of its magnetic docking mechanism.

ROBOTS TO THE RESCUE

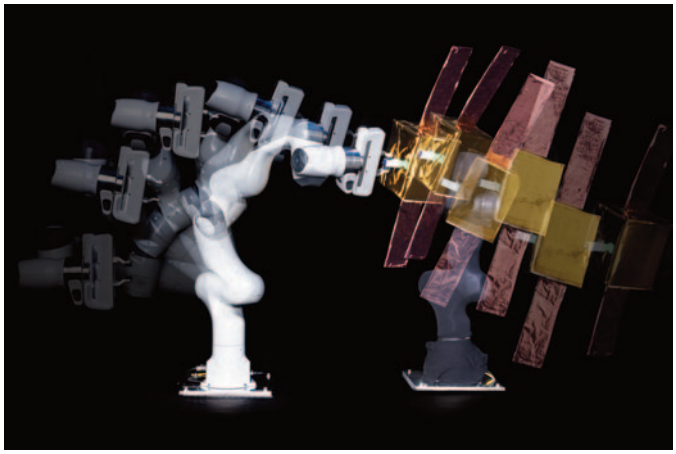
Businesses are turning to space robots to offer the kind of versatility needed for general-purpose ADR missions; space robots are satellites with robotic arms and hands to manipulate debris. Semi-autonomous and autonomous space robots are preferred to overcome the time delays encountered in Earth-based teleoperation. ADR missions are fertile testing grounds for artificial intelligence and machine learning algorithms in space.

Over the years, various space agencies, industries, and academic research groups have studied mission concepts to validate the use of a space robot for ADR missions. However, for various reasons, none made it into orbit.

ESA's e-Deorbit study aimed to capture the largest piece of space debris in orbit – ENVISAT. Ultimately, the scale of the mission worked against the demonstration as deorbiting ENVISAT was seen as rather ambitious with 2018 levels of technology. The knowledge acquired feeds into ESA's current efforts to remove space debris.

In 2019, ESA signed an €86 million contract with a European industrial consortium led by Swiss start-up ClearSpace SA to develop a unique debris removal service to remove the VEGA Secondary Payload Adapter

a



b

These photographs by Max Alexander demonstrate active debris removal from space: (a) Portrait of Professor Dr. Rai inspired by Michelangelo's 'Creation of Adam' (b) Robotic ADR - it shows the sequences involved in capturing uncooperative space debris (target on the right) using a spacecraft with a robotic manipulator (chaser on the left). This Earth analogue experimental testbed at the University of Lincoln is used for validating the close-proximity approach, safe capture and controlling the worst-case tumbling behaviours of the debris for post-capture stabilisation and subsequent deorbiting. Thank you to Dr. Mithun Poozhiyil and Dr. Manu Nair for building the robotic ADR testbed.

launched in 2013. The ClearSpace-1 capture system under development consists of four articulated robotic arms large enough to embrace the target.

Astroscale's Cleaning Outer Space Mission through Innovative Capture (COSMIC) mission, due for launch by 2026, aims to dovetail their rendezvous and proximity operation and robotic debris capture capabilities to remove two defunct British satellites currently orbiting Earth.

UK LEADERSHIP IN SPACE SUSTAINABILITY

The UK space industry is actively engaging with stakeholders and policymakers to assess plans and ambitions outlined in the National Space Strategy published by the government in September 2021.

The UK government and the UK Space Agency are facilitating the co-creation of new finance and insurance products with international space agencies, industries, investment bankers, insurers, underwriters, regulators, legal advisors, and other stakeholders. The collective effort will help establish a global framework for the commercial space sector to mitigate the creation of new debris, clean up legacy space junk, and invest in in-orbit services.

A major step to realising sustainability beyond Earth is prioritising large-scale cleaning up of space junk from LEO as a service. To position the UK at the forefront of space sustainability, UK-based satellite manufacturers and operators must adhere to evolving space regulations and adopt modular architecture for newer satellites to facilitate in-orbit servicing, life-extension, and subsequent removal, upcycling, or recycling. The best practices in the UK space sector are being shared with other like-minded countries, encouraging businesses to follow safety standards.

The unveiling of the Astra Carta by HM The King in June 2023 and signing up to the Memorandum of Principles by over 120 companies is strong evidence of the UK's commitment to space sustainability. The Earth and Space Sustainability Initiative funded by UKSA further reinforces the importance of a robust regulatory framework and standards for sustainability in space.

OUTREACH AND BUILDING PUBLIC AWARENESS

An important component for the continued success of the UK's space sustainability effort is public awareness. The photography series, *Our Fragile Space*, by Max Alexander highlights the urgent need to become good stewards of the near-space environment as the number of satellites grows exponentially. This limited and fragile environment is becoming congested with megaconstellation satellites, rocket bodies and space debris.

The photographs capture the importance of space in our daily lives, showing the socio-economic and scientific benefits and anthropogenic change of how humans are polluting the land, oceans, atmosphere, and now, this fourth domain of space.

The project involved engaging with the space sector, agencies, military, financial and insurance markets, academia, government and regulators. The series also explores the global efforts to address this challenge, including the UK's leading role in active debris removal and the emerging field of space sustainability.

The exhibition has helped 'galvanise space policy for the UK government' and has been shown at prestigious venues such as Lloyd's of London, the United Nations, the European Parliament, and the New York Stock Exchange.

CONCLUSION

In summary, building debris removal and satellite servicing capabilities will open bigger and longer-term markets linked to the assembly of high-value infrastructures, upcycling and recycling of space debris, and manufacturing in space. The UK is well positioned to steer this new 'in-orbit economy'. As it evolves, robotics and autonomous systems will be pivotal in many future ADR and on-orbit serving, assembly and manufacturing missions. In turn, safer and sustainable use of space will boost economic prosperity and improve lives on Earth. ■

WHY THE UK IS LOSING THE RACE TO BECOME A SCIENCE SUPERPOWER

Sharon Todd, CEO of global hub for industrial innovation, SCI

Science and innovation are the bedrock of British industry. That excellence has been witnessed throughout the centuries – be it the first reflecting telescope or creation of the world wide web; the discovery of penicillin or rolling out the world's first Covid vaccine.

The UK retains its reputation as a global leader of science-based industry, particularly regarding the quality and quantity of our researchers and innovators.

We are not, however, meeting our vast economic potential. Too often we see our start-ups move abroad, where access to capital is more freely available. Innovative business is departing our shores at an alarming scale. AstraZeneca's decision in 2023 to locate in Ireland rather than its UK base marks just the start of the departure, as large-scale firms commercialise their research in more attractive tax systems overseas.

Lacking the commercial resources to grow our early-stage companies and attract multinationals that can help us deliver growth at scale means revenue and skilled jobs are leaking out of the UK.

There is no escaping it – the UK is losing the race to becoming a science superpower.

Before the Autumn Statement, the Chancellor vowed to respond to business leaders who have been deeply concerned by the abandonment of any form of industrial strategy. The policy was officially dropped in 2021, though the strategy had already drifted for several years.

There have been some promising signs that the government has started to see the need to boost UK competitiveness. The Autumn Statement targeted high-value technology sectors and certain local areas. However, the policy needs joining up to deliver our high-value manufacturing, research, life sciences and green technology sectors into economic engines.

The gap between the UK and other growing economies has been widening for some time. Over the last 20 years, UK growth averaged 1.5%, compared with a global level of 3.6%. High-growth nations such as Ireland and Singapore averaged growth rates of 5.5% and 5%, respectively.

IMF forecasts predict the UK will have the lowest level of growth within Europe, as well as amongst G7 countries in 2024 – where all nations except for the UK have a clear and comprehensive industrial strategy.

Despite being the world's sixth largest economy, the UK is currently staring down the barrel of a global growth gap.

These countries have well-defined industrial strategies, driven by government. This translates into considerable investment in high-growth manufacturing sectors including life sciences and, more recently, renewable energy.

Take manufacturing, where economic value is generated through jobs, indirect investment in the local economy and taxes. The UK's share of manufacturing as a percentage of the economy

SCI ***Where Science Meets Business*** is a global industrial innovation hub for the benefit of society. It is based in London and has members in over 70 countries. It is a charity, formed in 1881 as the Society of Chemical Industry.

has been in steady decline for decades. It has fallen from over 30% of GDP in the 1970s to less than 10% – the lowest of the major economies.

Not one top ten FTSE100 company has built or developed new manufacturing plant in the UK in the last 20 years. The last two decades have been a lost opportunity. Put in simple terms, if the economy had grown at an extra percentage point every year during the last 20-year period, this would have contributed an astonishing extra £484bn into the economy.

Globally, other sectors demonstrate the opportunities available. The global pharmaceutical market is valued at £2 trillion, and clean tech at £1.2 trillion. Both are showing strong growth rates of 6% and 12% per annum, respectively.

The UK's performance in the pharmaceutical sector has been at best lacklustre. In contrast to major pharmaceutical manufacturing countries – which have all grown exports – the UK's pharmaceutical exports have been in decline for a decade. Germany has consistently been a leader in pharmaceutical exports and has maintained that position during the same period.

A recent report by LEK Consulting, commissioned by SCI, estimated the value opportunity in life sciences and clean tech alone in the UK to be worth £230bn in GVA, with an additional 240,000 of new jobs by 2030. It is an opportunity we cannot afford to pass up.

CREATING THE ENVIRONMENT FOR SCIENCE-BUSINESS

To unlock this potential, however, will require the creation of a conducive business environment, set at the very top. An effective industrial strategy for science will include simplifying R&D tax incentive schemes. It will ensure scale-up capital is available, and make the UK globally competitive to attract investment for large scale projects.

The government needs the advice of a single body of science-based business leaders that can join the dots on creating the new infrastructure required to sustain 21st century innovation - a single voice that can help direct public investment to where it is needed.

The UK cannot afford to stand still while other advanced economies are implementing huge industrial strategies to propel their economies, creating jobs while becoming world leaders in the green tech revolution.

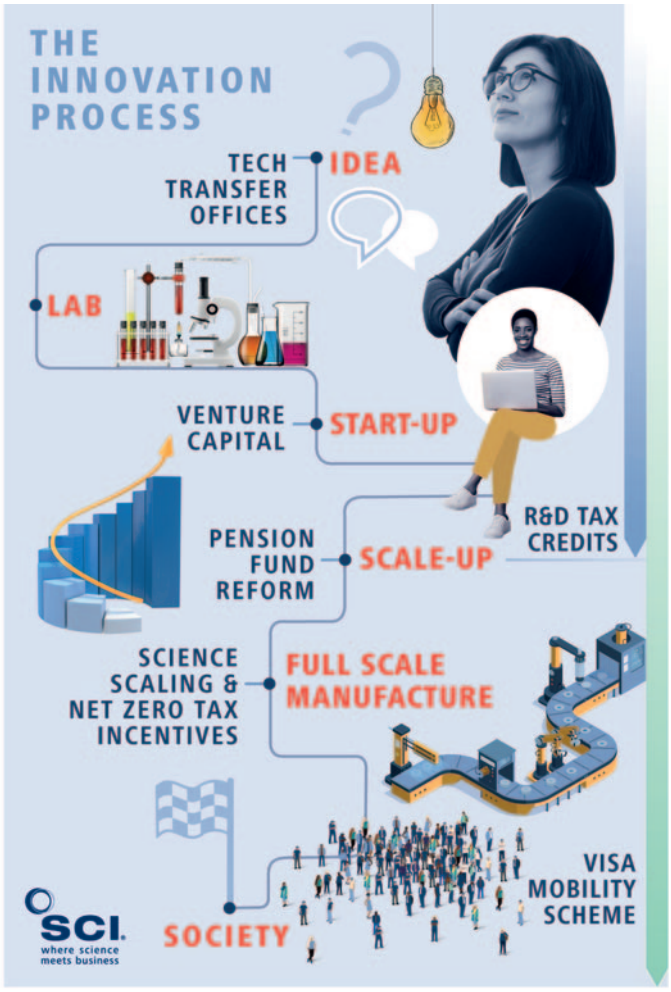
There is no better example than the US's Inflation Reduction Act, which contains $500b in tax breaks and spending for clean energy and to reduce healthcare costs. R&D will be boosted beyond measure, as will commercialisation of state-of-the-art technologies such as carbon capture and storage and clean hydrogen.

In the UK, the words "industrial strategy" are mentioned often by commentators, expert organisations and politicians. What should be in such a strategy is rarely articulated.

That's why we have developed SCI's Industrial Science & Innovation Manifesto – it is science-based business' articulation of what an industrial strategy should look like.

This document is not a menu of options, but a whole life-cycle strategy. Industry needs every element of this manifesto to be implemented to grow the most dynamic start-ups and make sure revenues stay in the UK once these long-term investments can produce at scale.

We believe that this could not only be encapsulated in an Innovation Implementation Act, but must also form part of an overall Industrial Strategy, with science and innovation recognised as a vital component for its success.



TURBOCHARGING UK BUSINESS

By taking commercial advantage of our expertise, the UK's economy would be turbocharged.

The resulting investment and job creation would take place in diverse areas of the UK, supporting political ambitions to rebalance the economy from its dependence on London and the south-east of England and into some of the most economically deprived areas of the country.

The UK must take its place in the green tech revolution, as it must protect those industries it founded and fostered in previous industrial revolutions.

To achieve these incontrovertible wins for the UK, political parties must first agree to an Industrial Science and Innovation Manifesto.

To read SCI's Manifesto for an Industrial Science and Innovation Strategy, scan the QR code below or visit bit.ly/SCIManifestoPdf ■

CHRISTMAS PARLIAMENTARY SCIENCE RECEPTION

The 2023 Christmas Parliamentary Science Reception, organised by the Parliamentary & Scientific Committee, on behalf of, and in cooperation with, the STEM community was held at the Attlee Suite, Portcullis House, House of Commons on Wednesday 13th December.

Speaking at the event were co-sponsoring Parliamentarians, Stephen Metcalfe MP (Chair, P&SC), Stephen Benn, Viscount Stansgate, (President) and Chi Onwurah MP (Vice-Chair).

The Reception - the first to be held since the pandemic was supported by 11 Learned Societies and attended by 120 leading representatives of the UK scientific community, as well as a number of Parliamentarians, including Greg Clark MP, Lord Taylor of Holbeach CBE, Lord Robert Mair CBE, Lord Tim Clement-Jones, Sir Peter Bottomley MP and Lord Trees.

Viscount Stansgate

Tim Allison, Matthew Burnett, Tom Addison, George Sadler and Daniel Callaghan

Emily Wood

Stephen Turner and Professor Sa'ad Sam Medhat

Stephen Metcalfe MP and Professor Sarah Main

Viscount Stansgate, Dr Dick Sibley, Professor Lord Trees and Professor Helen Fielding

Professor Martin Bridson, Leigh Jeffes, Lord Taylor of Holbeach CBE, and Professor Alison Etheridge

All photographs – John Deehan Photography

Professor Alan Malcom and Professor Ian Haines

Harriet Gould and Professor Constantinos Soutis

Professor Cath Rees and Professor Diane Purchase

Dr Mark Downs and Dr Kate Baillie

Tracy Bogan, Mark Hollingsworth and Emma Ashby

Karen Smith, Sue Wharton, Chi Onwurah MP and Leigh Jeffes

Tori Blakeman and Jonathan Shapiro

Christopher Knibb

Lord Robert Mair, Matt Grogan and Tim Allison

All photographs – John Deehan Photography

Simon Andrews and Colin Danson

Tom Grinyer and Dr Mark Downs

Dr Richard Siow and Dr Guy Hembury

Professor Michael Elves and Professor Narender Ramnani

Professor Andrea Townsend-Nicolson and Professor Ulrike Tillmann

Dr Graham Herries and Professor Peter Bannister

Gavin Costigan and Dr William Duncan

Stephen Metcalfe MP and Viscount Stansgate

All photographs – John Deehan Photography

HOUSE OF COMMONS SELECT COMMITTEES

BUSINESS AND TRADE COMMITTEE

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

Membership:

Rt Hon Liam Byrne MP, Labour (Chair)
Douglas Chapman MP, Scottish National Party
Jonathan Gullis MP, Conservative
Antony Higginbottom MP, Conservative
Jane Hunt MP, Conservative
Ian Lavery MP, Labour
Anthony Mangnall MP, Conservative
Andy McDonald MP, Labour
Charlotte Nichols MP, Labour
Mark Pawsey MP, Conservative

Current Inquiries:

- Batteries for electric vehicle manufacturing. Opened 17th January 2023.
  Report published 21st November 2023.
- Export-led growth. Opened 26th May 2023.
- The performance of investment zones and freeports in England. Opened 9th June 2023.
- Industrial Policy. Opened 9th December 2023. Deadline 29th January 2024;

For further details: Tel: 020 7219 5777
Email: commonsbtc@parliament.uk

ENVIRONMENTAL AUDIT COMMITTEE

The remit of the Environmental Audit Committee 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.

Unlike most select committees, the Committee's remit cuts across government rather than focuses on the work of a particular department.

From its beginning in 1997, in carrying out its environmental 'audit' role the Committee has had extensive support from the National Audit Office, providing seconded staff and research and briefing papers.

Membership:

Rt Hon Philip Dunne MP, Conservative, Chair
Duncan Baker MP, Conservative
Sir Christopher Chope MP, Conservative
Barry Gardiner MP, Labour
James Gray MP, Conservative
Ian Levy MP, Conservative
Clive Lewis MP, Labour
Caroline Lucas MP, Green Party
Cherilyn Mackrory, Conservative
Jerome Mayhew MP, Conservative
Anna McMorrin MP, Labour
John McNally MP, Scottish National Party
Dr Matthew Offord MP, Conservative
Rt Hon Chris Skidmore MP, Conservative
Cat Smith MP, Labour
Claudia Webbe MP, Independent

Current Inquiries

- Mapping the path to net zero: Opened 25th June 2021.
- Net zero aviation and shipping: Opened 20th July 2021. Report published 21st December 2023.
- Accelerating the transition from fossil fuels and securing energy supplies. Opened 31st March 2022. Report published 5th January 2023. Government response published 23rd March 2023.
- The financial sector and the UK's net zero transition. Opened 30th May 2022.
  Report published 29th November 2023.
- Sustainable timber and deforestation. Opened 25th July 2022. Closed 8th September 2022. Report published 19th July 2023. Government response published 15th December 2023.
- Environmental Change and Food Security
  Opened 10th November 2022. Report published 8th December 2023.
- Enabling sustainable electrification of the UK economy. Opened 4th May 2023.
- Outdoor and indoor air quality targets. Opened 10th May 2023.
- Hear resilience and sustainable cooling. Opened 3rd July 2023.
- The role of natural capital in the green economy. Opened 31st July 2023.
- Small modular reactors in the transition from fossil fuels. Opened 19th October 2023.

For further details: Tel: 020 7219 5776 Email: eacom@parliament.uk

SCIENCE, INNOVATION AND TECHNOLOGY COMMITTEE

For further details: Tel: 020 7219 2793

Email: commonssitc@parliament.uk

The Science, Technology and Innovation Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Department of Science, Innovation and Technology, and associated public bodies.

It also exists to ensure that Government policies and decision-making are based on solid scientific evidence and advice.

Membership:

Rt. Hon Greg Clark MP, Conservative, Chair

Dawn Butler MP, Labour

Chris Clarkson MP, Conservative

Tracey Crouch MP, Conservative

Dr James Davies MP, Conservative

Katherine Fletcher MP, Conservative

Rebecca Long-Bailey MP, Labour

Stephen Metcalfe MP, Conservative

Carol Monaghan MP, Scottish National Party

Graham Stringer MP, Labour

Christian Wakeford MP, Labour

Current Inquiries

- The role of technology, research and innovation in the COVID-19 recovery – Opened 24th July 2020.
- UK space strategy and UK satellite infrastructure – Opened 23rd April 2021. Report published 4th November 2022. Government response published 27th October 2023.
- Reproducibility and research integrity. Opened 22nd July 2021. Closed 30th September 2021. Report published 10th May 2023.Government response published 21st July 2023.
- Diversity and inclusion in STEM – Opened 22nd November 2021. Report published 24th March 2023. Government response published 16th June 2023.
- The right to privacy: digital data – Opened 16th December 2021.
- My science inquiry. Opened 12th July 2022. Report published 8th November 2022.
- Delivering Nuclear Power. Opened 19th July 2022. Published 31st July 2023.
  Government response published 25th October 2023.
- Governance of artificial intelligence (AI). Opened 20th October 2022. Report published 31st August 2023. Government response publishes 16th November 2023.
- The antimicrobial potential of bacteriophages. Opened 9th November. Report published 3rd January 2024.
- Emerging diseases and learnings from covid-19. Opened 15th December 2022.
- Commercialising quantum technologies. Opened 16th March 2023.
- Insect decline and UK food security. Opened 20th March 2023.
- UK Astronomy. Opened 10th September 2023. Deadline: 27th October 2023.
- Cyber resilience of the UK's critical national infrastructure. Opened 15th September 2023. Deadline: 10th November 2023.

HEALTH AND SOCIAL CARE COMMITTEE

The Committee scrutinises government and in particular the work of the Department of Health and Social Care.

The Committee also scrutinises the work of public bodies in the health system in England, such as NHS England and Improvement, Public Health England and the Care Quality Commission, and professional regulators such as the General Medical Council and the Nursing and Midwifery Council. They do so by holding inquiries on specific topics and accountability hearings with the Secretary of State, and Chief Executives of relevant public bodies.

Membership:

Steve Brine MP, Conservative, Chair

Lucy Allan MP, Conservative

Paul Blomfield MP, Labour

Paul Bristow MP, Conservative

Amy Callaghan MP, Scottish National Party

Chris Green MP, Conservative

Paulette Hamilton MP, Labour

Dr Caroline Johnson MP, Conservative

Rachael Maskell MP, Labour

James Morris MP, Conservative

Taiwo Owatemi MP, Labour

Current Inquiries

- Integrated Care Systems: autonomy and accountability. Opened 6th July 2022. Report published 30th March 2023. Government Response published 14th June 2023.
- Assisted dying/assisted suicide. Opened 5th December 2022.
- NHS Dentistry. Opened 7th December 2022. Report published 14th July 2023.
- Government response published 13th December 2023.
- Prevention in health and social care. Opened 18th January 2023. Report published 27th July 2023. Government response published 20th October 2023.
- Future cancer. Opened 21st March 2023.
- Pharmacy. Opened 8th June 2023.
- Men's health. Opened 20th July 2023.

For further details: Tel: 020 7219 6182
Email: hsccom@parliament.uk

ENERGY SECURITY AND NET ZERO COMMITTEE

The Energy Security and Net Zero Committee scrutinizes 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.

Membership:

Angus Brendan McNeil, Scottish National Party, Chair

Rt Hon Vicky Ford MP, Conservative

Barry Gardiner MP, Labour

Mark Garnier MP, Conservative

Sir Mark Hendrick MP, Labour

Mark Jenkinson MP, Conservative

Mark Pawsey MP, Conservative

Dr Dan Poulter MP, Conservative

Lloyd Russell-Moyle MP, Conservative

Alexander Stafford MP, Conservative

Derek Thomas MP, Conservative

Mick Whitley MP, Labour

Current Inquiries:

- The work of the Department for Energy Security and Net Zero. Opened 14th June 2023.
- Preparing for the winter. Opened 7th July 2023. Report published on 23rd September. Government response published 15th December 2023.
- Keeping the power on: our future energy technology mix. Opened 7th July 2023.
- Heating our homes. Opened 7th July 2023.
- A flexible Grid for the future. Opened 7th July 2023.
- Securing the domestic supply chain. Opened 17th November 2023.
- Energy bills for domestic consumers. Opened 24th November 2023. Accepting evidence until 2nd February 2024.

For further details: Media 07720 202 985
Email: commonsesnz@parliament.uk ■

HOUSE OF LORDS SELECT COMMITTEES

SCIENCE AND TECHNOLOGY COMMITTEE

The Science and Technology Committee has a broad remit "to consider science and technology".

The Committee scrutinises Government policy by undertaking cross-departmental inquiries into a range of different activities. These include:

- public policy areas which ought to be informed by scientific research (for example, health effects of air travel),
- technological challenges and opportunities (for example, genomic medicine) and
- public policy towards science itself (for example, setting priorities for publicly funded research).

In addition, the Committee undertakes from time to time shorter inquiries, either taking evidence from Ministers and officials on topical issues, or following up previous work.

Members:

The Baroness Brown of Cambridge DBE FREng FRS, Crossbench, Chair

The Lord Borwick, Conservative

The Viscount Hanworth, Labour

The Lord Holmes of Richmond MBE

The Lord Krebs, Crossbench

The Baroness Neuberger DBE, Crossbench

The Rt Hon. the Baroness Neville-Jones DCMG, Conservative

The Rt Hon. the Baroness Northover, Liberal Democrat

The Lord Rees of Ludlow OM

The Lord Sharkey, Liberal Democrat

The Viscount Stansgate, Labour

The Lord Wei, Conservative

The Lord Winston, Labour

CURRENT INQUIRIES

- The effects of artificial light and noise on human health. Opened 30th January 2023. Report published 19th July 2023. Government response published 1st December 2023.
- Long-duration energy storage. Opened 26th July 2023.

For further details: Tel: 020 7219 5750

Email: hlscience@parliament.uk ■

PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY (POST)

WINTER 2023

The Parliamentary Office of Science and Technology (POST) works to bring the best available research evidence to bear on the legislative process and scrutiny of Government.

NEW PARLIAMENTARY RESEARCH ROLES ANNOUNCED

Over 2023, Parliament and the ESRC piloted a new role in Parliament: the Thematic Research Lead. Evidence suggests that these prestigious and influential roles are making a positive impact. As a result, in 2024, Parliament will partner with UKRI to expand Parliament's network of Thematic Research Leads across a wider range of academic disciplines and policy areas.

We are recruiting to eight positions from a broad range of scientific and research disciplines:

- Thematic Research Lead on AI and Digital
- Thematic Research Lead on Arts and Humanities
- Thematic Research Lead on Business, Economics and Trade
- Thematic Research Lead on Climate and Environment
- Thematic Research Lead on Crime and Justice
- Thematic Research Lead on Health
- Thematic Research Lead on International Affairs and National Security
- Thematic Research Lead on Transport

These part-time roles, funded by UKRI and supported by all UKRI's research councils, will be appointed to work with UK Parliament from September 2024 to summer 2026.

Further information about this project and details about how to apply can be found on the POST website.

RECENTLY PUBLISHED WORK

POST research is published on our website. POST research produced since September 2023 includes:

- Future of Horticulture
- What is a just transition for environmental targets?
- Online Advertising Technology and Competition
- Artificial Intelligence: An explainer
- Men's health
- Hormone Treatments for Children and Young People with Gender Dysphoria
- Indoor air quality

Ongoing and future projects approved by the POST Board

Over coming months, POST will work on a range of projects, including:

- Demand side response
- Consumer debt and mental health
- Biodiversity net gain
- Freshwater, floodplain and wetland restoration
- Carbon offsetting
- The future of fertiliser use
- Reform of the Mental Health Act – impacts on people with learning difficulties and on people with autism
- Psychedelic drugs to treat mental health conditions
- Human embryo models
- Policy implications of artificial intelligence
- Social and psychological implications of fraud
- Green choices for net zero
- Use of artificial intelligence in education delivery and assessment
- Green skills in employment and education

POST will announce a new round of research projects in January 2024. Stakeholders are encouraged to contact POST if they would like to engage with this research.

Please subscribe on our website to receive alerts about these projects and our other work.

THE POST BOARD

The POST Board oversees POST's objectives, outputs and future work programme. It meets quarterly.

Officers

- Chair: Adam Afriyie MP
- Vice-Chair: Professor the Lord Winston, FMedSci, FRSA, FRCP, FRCOG, FREng

House of Commons

- Rt Hon Greg Clark MP
- Katherine Fletcher MP
- Stephen Metcalfe MP
- Maria Miller MP
- Carol Monaghan MP
- Dr Ben Spencer MP
- Alan Whitehead MP

House of Lords

- Baroness Brown of Cambridge
- Lord Haskel
- Lord Ravensdale

Non-parliamentary

- Professor Elizabeth Fisher, FMedSci
- Paul Martynenko, FBCS
- Professor Sir Bernard Silverman, FRS, FAcSS
- Professor Susan Owens

Ex-officio

- Oliver Bennett MBE, Head of the Parliamentary Office of Science and Technology
- Grant Hill-Cawthorne, House of Commons Librarian and Managing Director of Research & Information
- Ariella Huff, Select Committee Team, House of Commons
- Xameerah Malik, Head of Science and Environment Section, House of Commons Library
- Amy Creese, Clerk of Select Committees, House of Lords

Oliver Bennett MBE **Head of POST**

PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY

Houses of Parliament, Westminster , London SW1A 0AA

Email: post@parliament.uk
Website: post.parliament.uk
X: https://twitter.com/POST_UK
LinkedIn: https://www.linkedin.com/company/post-uk/

HOUSE OF COMMONS LIBRARY

The House of Commons Library is an impartial research and information service for Members of Parliament of all parties and their staff. The Science and Environment Section (SES) is one of eight teams in the Research Service in the House of Commons Library.

The Library provides confidential, impartial and bespoke briefing to Members of the House of Commons and their offices supporting the full range of parliamentary work, from policy development to constituency issues. Members and their staff can request briefing by visiting the Member's Library in the Palace or by emailing HCLibrary@parliament.uk. SES has recently provided confidential briefings to MPs on a wide range of issues including energy, planning law, health, environment, water quality, telecommunications and animal welfare.

The Library also publishes a range of products including topical research briefings, shorter insight articles and briefings for non-legislative debates, all of which are available online for MPs and the public. These briefings include analysis of all major pieces of legislation. You can find publications on the Commons Library website (https://commonslibrary.parliament.uk) where you can also sign up for alerts.

In recent months, SES has published and updated briefings on issues including:

Debate on public sector food procurement and healthy eating
Published Tuesday, 05 December 2023, CDP 2023/0210

A landing page with background information published ahead of a Westminster Hall debate on 12 December 2023.

This page includes background on food procurement, government buying standards for food, nutrition standards, buying food locally, the voluntary industry programme for sugar, salt and calorie reduction and procurement reform.

The ban on XL Bully dogs
Published Thursday, 23 November 2023, CBP 9897

The government has announced a ban on American XL Bully dogs in England and Wales that will come into force on 31 December 2023, in response to increased reports of injuries and deaths caused by dogs, which have been linked in some cases to XL Bully dogs. This paper gives background on XL Bully dogs, data on dog attacks and injuries, details of the ban and stakeholder views.

UK-EU Relations: Fisheries
Published Monday, 27 November 2023, CBP 9902

This briefing provides background on fisheries provisions in the UK-EU Trade and Cooperation Agreement (TCA) and how these have been implemented since the UK left the EU.

The briefing was prepared for a breakout session at the fourth meeting of the UK-EU Parliamentary Partnership Assembly (PPA) (and second UK-hosted meeting) in the UK Parliament on 4 to 5 December 2023. The PPA was established under the UK-EU Trade and Cooperation Agreement and includes members of the UK Parliament (MPs and Peers) and Members of the European Parliament. The PPA is a forum for the UK Parliament and the European Parliament to exchange views on their partnership.

Animal Welfare (Livestock Exports) Bill 2023-24
Published Monday, 11 December 2023, CBP 9912

The Animal Welfare (Livestock Exports) Bill 2023-24 will make it an offence to export from or through Great Britain live livestock for slaughter outside the British Islands. It was introduced to the House of Commons on 4 December and second reading is scheduled for 18 December 2023.

Nutrient neutrality and housing development
Published Friday, 13 October 2023, CBP 9850

In August 2023, the government announced that it would amend the Habitats Regulations which underpin 'nutrient neutrality' through the Levelling Up and Regeneration Bill 2022–23. The proposed amendments were rejected by the House of Lords in September 2023.

Nutrient neutrality requires that new housing developments in certain areas should not add more 'nutrient pollution' to the water catchment. It applies only to new housing developments in areas with protected habitats sites that are already in 'unfavourable condition' (due to nutrient pollution).

This paper gives background on nutrient neutrality, the Habitats Regulations, proposals to 'scrap' nutrient neutrality and responses to this, and tackling nutrient pollution in wastewater and farming.

Nitrous oxide becomes a Class C drug
Insight article, published Tuesday, 28 November 2023

Nitrous oxide used to be controlled under the Psychoactive

Substances Act 2016 but it was reclassified as a Class C drug in 2023, making possession illegal. This article gives brief background to nitrous oxide, its use as a recreational drug, its legitimate uses, why and how the law has changed and statistics on the prevalence of its use.

Support for cancer in England
Published Wednesday, 29 November 2023, CBP 9766

A briefing on Government and NHS policy on cancer in England and cancer research.

Infant mortality and health inequalities
Published Wednesday, 29 November 2023, CBP 9904

In 2015, the Government announced the National Maternity Safety Ambition to reduce the rate of stillbirths, neonatal deaths and maternal deaths in England by 50% by 2030. The ambition was subsequently revised in 2017 and the deadline for meeting the target was brought forward to 2025.

This short research briefing examines the progress to date in reducing deaths during both the neonatal (first 28 days) and post-neonatal (28 days to 1 year) periods, collectively referred to as 'infant mortality'. It particularly focuses on persistent inequalities in infant mortality rates by geographical area, ethnicity and socio-economic group. While some UK-wide data is presented, the briefing primarily focuses on England.

Help with energy bills
Published Tuesday, 12 December 2023, CBP 9919

This Library briefing sets out sources of financial and practical help for constituents with domestic energy bills. This briefing focuses on schemes that individuals can access, rather than those aimed at local authorities or housing associations. It covers universal government support schemes, targeted schemes, and provides information on practical steps such as supplier switching, joining priority services registers, collective purchasing, and making complaints. It also provides links to useful resources.

The smokefree 2030 ambition for England
Published Monday, 16 October 2023, CBP 9655

In 2019, the government published its green paper on preventative health; Advancing our health: prevention in the 2020s. Here, it announced an ambition for England to become 'smokefree' by 2030 – achieved when adult smoking prevalence falls to 5% or less. The government has proposed further tobacco and vaping regulation in support of the smokefree 2030 ambition for England. Our briefing gives further information.

In October 2023, the Department of Health and Social Care (DHSC) published its policy paper, Stopping the start: our new plan to create a smokefree generation, where the government set out an intention to create the first 'smokefree generation'. The Department of Health and Social Care launched a consultation on the proposals set out in the policy paper on 12 October 2023, inviting responses until 6 December 2023.

Adjournment debate: Licensing for tattoo artists, body piercers and cosmetic clinics
Published Monday, 27 November 2023, CDP 2023/0211

A debate pack published ahead of a debate on 28 November 2023 on licensing for tattoo artists, body piercers and cosmetic clinics.

Section 180 of the Health and Care Act 2022 enables the UK Government to establish a licensing scheme for non-surgical cosmetic procedures for England and Wales.

The government is yet to introduce a national licensing scheme, but it has consulted on its future design. Local authorities in England already have some powers to license cosmetic procedures under existing legislation. Practitioners are also subject to general requirements set out by health and safety legislation intended to ensure that members of the public are not harmed by the practitioner's work activity. Between September and October 2023, the Department of Health and Social Care held a public consultation seeking views on the remit of a future licensing scheme.

Quality and safety of maternity care (England)
Published Friday, 08 December 2023, CBP 9815

This research briefing sets out the current policies addressing the quality and safety of health services in England and discusses recent concerns regarding disparities in maternal health between ethnic groups.

Health services are a devolved policy responsibility. This briefing refers to the position in England.

What is the proposed WHO Pandemic Preparedness Treaty?
Published Thursday, 14 December 2023, CBP 9550

The WHO is negotiating a treaty on pandemic preparedness. The briefing outlines what has been proposed, how it relates to the International Health Regulations, where negotiations are up to, and what comes next.

Debate on Water, Sanitation and Hygiene and sustainable development
Published Tuesday, 10 October 2023, CDP 2023/0193

A debate pack prepared ahead of a Backbench Business Committee debate on 17 October.

Water, sanitation and hygiene (WASH) is about access to water and is commonly used by non-governmental organisations and aid agencies. It covers accessibility, water quality and water safety, and encompasses drinking water, sanitation (for example, access to toilets) and hygiene practices (for example, handwashing). In 2010, the United Nations General Assembly recognised the human right to water and sanitation. In 2015, the Sustainable Development Goals (SDGs) were adopted by UN Member States, including SDG6 for clean water and sanitation.

SDG6 aims to "ensure availability and sustainable management of water and sanitation for all", prompting nations to act to deliver targets relating to WASH. It calls for universal access to safe and affordable drinking water, sanitation and hygiene. It also aims to end defecation in the open, improve water quality and water use efficiency, and encourage sustainable abstractions (removal of water from the environment) and supply of freshwater.

COP28: The 2023 United Nations Climate Change Conference
Published Friday, 10 November 2023, CBP 9884

The 2023 United Nations Climate Change Conference (COP28) was held from 30 November to 1 December 2023 in Dubai, the United Arab Emirates. Egypt will hand over presidency to the UAE, having hosted COP27 in Sharm-el-Sheikh in November 2022.

The UAE outlined four themes for COP28: technology and innovation, inclusion, frontline communities, and finance.

The UK's plans and progress to reach net zero by 2050
Published Tuesday, 14 November 2023, CBP 9888

The UK is committed to reaching net zero by 2050. This means that the total greenhouse gas emissions would be equal to the emissions removed from the atmosphere, with the aim of limiting global warming and resultant climate change.

The UK Government has adopted a suite of policies in order to reach net zero, set out in two strategy publications, the Net Zero Strategy (2021) and Powering Up Britain: The Net Zero Growth Plan (2023).

This briefing provides an overview of the background context for net zero, the plans in place to reach this goal, and current progress.

Opposition Day Debate: Bonuses for water company executives
Published Tuesday, 05 December 2023, CDP 2023/0222

A debate pack prepared ahead of a debate on 5 December.

On 20 March 2023, the economic regulator for the water industry, Ofwat announced new powers to enable it to stop a water company paying dividends to its shareholders if it would risk a water company's financial resilience. These powers would also enable it to take enforcement actions against water companies that do not link dividend payments to the company's overall performance.

On 29 June 2023, Ofwat confirmed new plans to "ensure customers no longer fund executive bonus payments where they have not been sufficiently justified" through increasing its guidance relating to pay and dividends.

Debate on coastal erosion in Suffolk and Norfolk
Published Friday, 15 December 2023, CDP 2023/0230

A debate pack prepared ahead of a Westminster Hall debate on 19 December.

Coastal erosion is the loss or displacement of land along the coast. There are a number of processes that cause and exacerbate coastal erosion, including erosion from waves and storms, rising sea levels and human factors.

Suffolk and Norfolk are counties on the eastern coast of England experiencing high rates of coastal erosion. The Environment Agency state:

"Norfolk and Suffolk have some of the fastest eroding coasts in Europe, with over 2.500 homes at direct coastal risk and thousands more properties and businesses directly and indirectly affected by loss of property, infrastructure and utilities."

Air quality: policies, proposals and concerns
Published Tuesday, 10 October 2023, CBP 9600

Poor air quality is considered by the government to be "the largest environmental risk to public health in the UK". As well as human health, air pollution also has implications for the natural environment and for the economy. Due to the transboundary nature of air pollution, action to manage and improve air quality in the UK has

been driven by both international agreements and EU legislation, as well as national and devolved legislation.

This briefing gives an overview of the current outdoor air quality legal framework, the changing governance and enforcement mechanisms following the UK's EU exit, forthcoming legislative changes and ongoing issues and concerns.

Household waste collection in England and Wales: FAQs
Published Monday, 27 November 2023

This constituency casework article provides an overview of the main legal provisions on household waste collection, but it does not cover all exceptions to the law.

Will glass shatter plans for UK deposit return schemes?
Published Tuesday, 28 November 2023

Different parts of the UK have different views on including glass in planned deposit return schemes, which could complicate the UK's internal market.

Deposit return schemes charge customers a small extra fee for single-use containers, which they can get back by returning the container to the seller or a collection point so it can be recycled.

While the administrations in all four parts of the UK are developing deposit return schemes, there is disagreement about whether they should include glass containers.

This Insight looks at the legal framework for return schemes, why there is disagreement over glass, and role of the UK Internal Market Act.

Debate on provision of broadband for rural communities
Published Friday, 08 December 2023, CDP 2023/0225

Information prepared ahead of a Westminster Hall debate on 13 December. More detail on the issues discussed in this debate pack can be found the Library briefings, Gigabit broadband in the UK: Government targets, policy, and funding (July 2023) and Building broadband and mobile infrastructure (December 2022).

General debate on the potential merger of Three UK and Vodafone
Published Wednesday, 13 December, 2023, CDP 2023/0227

The debate was called in particular to consider new evidence from Australia about competitive dynamics, national security concerns, and hearings from parties at the Business and Trade Committee, which are addressed in the debate pack.

The merger is being investigated by the CMA to assess whether competition is likely to be affected.

The withdrawal of landlines and switch to digital calls
Published Thursday, 14 December 2023, CBP 9471

Over the next few years, landline telephone services will switch to a fully digital network. This means phone calls will be carried over the internet. This briefing addresses frequently asked questions about the switch of traditional landline phones to digital, Voice over Internet Protocol (VOIP) services.

Debate on the contribution of ports to green energy
Published Tuesday, 17 October 2023, CDP 2023/0198

Information prepared ahead of a Westminster Hall debate on 18 October.

Ports have an important role to play in delivering offshore renewable technologies, such as offshore and floating offshore wind (FLOW), as well as wave and tidal power. Industry groups, such as Associated British Ports, have also expressed interest in developing seaports as hubs for 'green' hydrogen.

Contracts for Difference Scheme
Published Tuesday, 17 October 2023, CBP 9871

The Contracts for Difference (CfD) scheme supports new low carbon infrastructure. This briefing provides an overview of the CfD scheme and statistics on the projects it has delivered. It also covers stakeholder commentary on the most recent CfD auction and changes to the scheme under consideration.

Debate on energy social tariffs
Published Thursday, 16 November 2023

A debate pack prepared ahead of a Backbench Business Committee debate on 23 November.

Wholesale energy prices increased rapidly from the second half of 2021 and much of 2022, both globally and in the UK. This debate pack sets out different types of proposed social tariffs. It also provides stakeholder commentary on the benefits and challenges of a social tariff, along with relevant Parliamentary Questions and news items.

Floating offshore wind
Published Wednesday, 15 November 2023, CDP 2023/0208

Information published ahead of a Westminster Hall debate on 16 November.

A floating wind turbine is an offshore wind turbine built on a floating platform, rather than on the seabed. Floating wind turbines are able to be installed in deeper sea waters, overcoming some of the technological and economic challenges of building conventional fixed foundations offshore wind turbines on deep sea beds.

Debate on planning considerations for renewable energy providers
Published Tuesday, 24 October 2023, CDP 2023/0201

A debate pack published ahead of a Westminster Hall debate on 25 October.

Renewable energy developments usually require planning consent. Exceptions apply to small-scale developments, such as solar panels on domestic roofs with a capacity up to 50 kilowatt, which are covered by 'permitted development rights'.

Some renewable energy developments, such as solar farms, biomass and waste combustion plants or hydropower, require consent either from the local planning authority (LPA) or from the Secretary of State for Energy Security and Net Zero depending on their size.

Debate on heritage pubs

Published Wednesday, 15 November 2023, CDP 2023/0207

A debate pack prepared ahead of a Westminster Hall debate on 16 November.

There is no statutory definition of heritage pubs. Heritage pubs may be designated or non-designated heritage assets:

Designated heritage assets, such as listed buildings, are subject to statutory protections.

Non-designated assets have "a degree of heritage significance meriting consideration in planning decisions" but do not meet listing criteria.

The main test for whether a building should be listed is its special historic or architectural interest. An application needs to be made to Historic England, and the final decision rests with the Secretary of State for Culture, Media and Sports.

This pack also looks at requirements to change the use of, or demolish, a pub and concerns about unauthorised demolitions and the falling number of pubs.

Planning for onshore wind

Published Thursday, 05 October 2023, SN 04370

The government updated planning rules for onshore wind in England in September 2023. These rules differ from those for other energy projects.

All onshore wind turbines, except for small-scale domestic turbines, require planning permission from the local planning authority (LPA) in England. In September 2023, the government updated national planning policy to provide that LPAs should approve planning applications for an onshore wind farm if:

It is an area identified as suitable in the local development plan (local plan or a neighbourhood plan) or a supplementary planning document.

The planning impacts identified by the affected local community have been appropriately addressed and the proposal has community support.

Should my landlord install a fire alarm? (England)

Published Tuesday, 10 October 2023

A constituency casework article to help find out when fire and smoke alarms are mandatory in flats in England, who is responsible and how to report concerns.

Fire safety in houses and flats

Published Monday, 23 October 2023, CBP 9770

In October 2023, new fire safety requirements for blocks of flats took effect in England. They are part of the government response to the Grenfell Tower fire.

Planning for solar farms

Published Wednesday, 08 November, 2023, CBP 7434

This briefing covers planning policy for solar farms in England and the devolved administrations and commentary on the use of agricultural land for solar farms.

Can access to housing be restricted to local people?

Published Tuesday, 14 November 2023

A constituency casework article explaining how planning and housing policies might be used to ensure local people benefit from housing provision.

Planning reforms in England: Levelling Up and Regeneration Act 2023 and further changes

Published Tuesday, 05 December 2023, CBP 9911

The government is changing planning law with the Levelling Up and Regeneration Act 2023. Alongside the Act, it has proposed changes to planning regulations.

Green Belt

Published Friday, 15 December 2023, SN00934

This briefing discusses green belt planning policy and some of the recent discussions around the green belt. It applies only to England.

The government states that the "fundamental aim" of the green belt "is to prevent urban sprawl by keeping land permanently open" around urban areas. It is for local planning authorities (LPAs) to define and maintain green belt land in their local areas. Government policy on the green belt is set out in chapter 13 of the National Planning Policy Framework (NPPF).

The government has proposed updating its guidance to make clear that LPAs are not required to review and alter green belt boundaries if building on green belt land would be the only way of meeting housing need. It consulted on the proposed changes between December 2022 and March 2023. At the time of writing, it has not yet responded to the consultation.

SCIENCE DIRECTORY

UK Research and Innovation

Samiha Chowdhury
UKRI, 7th floor, Caxton House
Tothill Street, London
SW1H 9NA

Tel: 02073952280 | 07706000363
Email: externalaffairs@ukri.org

Website: www.ukri.org

Big challenges demand big thinkers - those who can unlock the answers and further our understanding of the important issues of our time. Our work encompasses everything from the physical, biological and social sciences, to innovation, engineering, medicine, the environment and the cultural impact of the arts and humanities. In all of these areas, our role is to bring together the people who can innovate and change the world for the better. We work with the government to invest over £7 billion a year in research and innovation by partnering with academia and industry to make the impossible, possible. Through the UK's nine leading academic and industrial funding councils, we create knowledge with impact.

Arts and Humanities Research Council

Website: www.ahrc.ukri.org

AHRC funds outstanding original research across the whole range of the arts and humanities. This research provides economic, social and cultural benefits to the UK, and contributes to the culture and welfare of societies around the globe.

Biotechnology and Biological Sciences Research Council

Website: www.bbsrc.ukri.org

BBSRC invests in world-class bioscience research and training. This research is helping society to meet major challenges, including food security, green energy and healthier, longer lives and underpinning important UK economic sectors, such as farming, food, industrial biotechnology and pharmaceuticals.

Economic and Social Research Council

Website: www.esrc.ukri.org

ESRC is the UK's largest funder of research on the social and economic questions facing us today. This research shapes public policy and contributes to making the economy more competitive, as well as giving people a better understanding of 21st century society.

Engineering and Physical Sciences Research Council

Website: www.epsrc.ukri.org

EPSRC invests in world-leading research and postgraduate training across the engineering and physical sciences. This research builds the knowledge and skills base needed to address scientific and technological challenges and provides a platform for future UK prosperity by contributing to a healthy, connected, resilient, productive nation.

Innovate UK

Website: www.ukri.org/councils/innovate-uk/

Innovate UK drives productivity and economic growth by supporting businesses to develop and realise the potential of new ideas, including those from the UK's world-class research base. They connect businesses to the partners, customers and investors that can help them turn these ideas into commercially successful products and services, and business growth.

Medical Research Council

Website: www.mrc.ukri.org

MRC is at the forefront of scientific discovery to improve human health. Its scientists tackle some of the greatest health problems facing humanity in the 21st century, from the rising tide of chronic diseases associated with ageing to the threats posed by rapidly mutating micro-organisms.

Natural Environment Research Council

Website: www.nerc.ukri.org

NERC is the driving force of investment in environmental science. Its leading research, skills and infrastructure help solve major issues and bring benefits to the UK, such as affordable clean energy, air pollution, and resilience of our infrastructure.

Research England

Website: www.re.ukri.org

Research England creates and sustains the conditions for a healthy and dynamic research and knowledge exchange system in English universities. Working to understand their strategies, capabilities and capacity; supporting and challenging universities to create new knowledge, strengthen the economy, and enrich society.

Science and Technology Facilities Council

Website: www.stfc.ukri.org

STFC is a world-leading multi-disciplinary science organisation. Its research seeks to understand the Universe from the largest astronomical scales to the tiniest constituents of matter, and creates impact on a very tangible, human scale.

SCIENCE DIRECTORY

Contact: Dr Jane Gate, Executive Director
AIRTO Ltd: Association of Innovation Research & Technology Organisations Ltd
c/o Net Zero Tech Centre,
20 Queens Road, Aberdeen AB15 4ZT
E-mail: enquiries@airto.co.uk
Twitter: @airtoinnovation
Website: www.airto.co.uk

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.

Contact: Lucky Cullen
Policy, Public Affairs and Diversity Manager
Salisbury House, Station Road, Cambridge
CB1 2LA
lucky@appliedmicrobiology.org
+44 (0)20 3880 2881

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 international 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. At Applied Microbiology International we publish the leading industry magazine, *The Microbiologist*, and in partnership with Wiley and Oxford University Press, we publish six internationally acclaimed journals.

Contact:
Colin Danson
Distinguished Scientist & Head of Profession for Physics and Mathematics
AWE
Aldermaston, Reading RG7 4PR
Email: Colin.Danson@awe.co.uk
www.awe.co.uk
Tel: 0118 98 56901

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.

Policy Team
Biochemical Society
1 Naoroji Street
London
WC1X 0GB

Tel: +44 (0)20 3880 2793
Email: policy@biochemistry.org
Website: www.biochemistry.org

The Biochemical Society works to promote the molecular biosciences; facilitating the sharing of expertise, supporting the advancement of biochemistry and molecular biology and raising awareness of their importance in addressing societal grand challenges. We achieve our mission by :

- bringing together molecular bioscientists;
- supporting the next generation of biochemists;
- promoting and sharing knowledge and
- promoting the importance of our discipline.

Contact:
Dr Daniela Russi
Senior Policy Manager
42 Wharf Rd, Hoxton,
London N1 7GS
Email: daniela@britishecologicalsociety.org
Tel: +44 20 3994 8252
Website: www.BritishEcologicalSociety.org
Twitter: @BESPolicy

The British Ecological Society is an independent, authoritative learned society, and the voice of the UK's ecological community. Working with our members, we gather and communicate the best available ecological evidence to inform decision making. We offer a source of unbiased, objective ecological knowledge, and promote an evidence-informed approach to finding the right solutions to environmental questions.

British In Vitro Diagnostics Association (BIVDA)

Contact: Doris-Ann Williams MBE
Chief Executive
British In Vitro Diagnostics Association
299 Oxford Street, London W1C 2DZ

Tel: 0845 6188224
Email: doris-ann@bivda.co.uk
www.bivda.org.uk

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 from specific drug treatment particularly for cancer.

Contact: Policy Officer
British Pharmacological Society
The Schild Plot, 16 Angel Gate,
City Road, London EC1V 2PT
Tel: 020 7239 0171
Email: policy@bps.ac.uk
Website: www.bps.ac.uk

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.

Tracey Guise, Chief Executive Officer
British Society for Antimicrobial Chemotherapy (BSAC)
53 Regent Place, Birmingham B1 3NJ
+44 (0)121 236 1988
tguise@bsac.org.uk
www.bsac.org.uk

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.

Contact Dr Doug Brown, CEO
British Society for Immunology
Devonshire House,
60 Goswell Road,
London EC1M 7AD.
Tel: 020 3019 5901
E-mail: bsi@immunology.org
Website: www.immunology.org

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

SCIENCE DIRECTORY

Contact: Maggie Mitchell
Chief Executive
18 North Street, Glenrothes, KY7 5NA
Email: maggie.mitchell@bsas.org.uk
Mobile: 07952 970325
Website: www.bsas.org.uk

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 ensure practical and beneficial application of positive outcomes to include livestock, animal health and welfare, the care of equine, companion, and zoo animals.

Contact: Sarah Garry
Building 42a Cranfield University
Cranfield, MK43 0AL
Email: exec@soils.org.uk
Website: www.soils.org.uk

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 can meet to discuss the critical global issues relating to soil.

Contact: Geoff Rodgers
Brunel University London
Kingston Lane
Uxbridge UB8 3PH
Tel: 01895 265609
Fax: 01895 269740
E-mail: g.j.rodgers@brunel.ac.uk
Website: www.brunel.ac.uk

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 Future 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

Contact: Communications Team
The Cavendish Laboratory
J J Thomson Avenue, Cambridge CB3 0HE, UK
Email: communications@phy.cam.ac.uk
http://www.phy.cam.ac.uk

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

Contact: Ben Peachey
Chief Executive
b.peachey@ergonomics.org.uk
+44 7354 477433
www.ergonomics.org.uk

Our vision is integrated design to improve life, wellbeing and performance through science, engineering, technology and psychology. The Institute is one of the largest in the world representing the discipline and profession of Human Factors and Ergonomics. We have sector groups in most industries from defence to aviation and pharmaceuticals that provide expert advice to industry and government. We accredit university courses and consultancy practices and work closely with allied learned societies.

Contact: Dr Emma Meredith
Sackville House
40 Piccadilly
London W1J 0DR
Tel: 020 7491 8891
E-mail: info@ctpa.org.uk
Website: www.ctpa.org.uk &
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.

Contact: Dr Eric Albone MBE, Director,
Clifton Scientific Trust
49 Northumberland Road, Bristol BS6 7BA
Tel: 0117 924 7664 Mob:07721 683528
E-mail: eric@clifton-scientific.org
Website: www.clifton-scientific.org

We bring school students and their teachers

- to work closely with scientists and engineers
- to experience science as a creative, questioning, team exploration
- to add real-life meaning and motivation, from primary to post-16
- internationally to build global awareness and experience science as a cultural bridge
- to 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 Trust Ltd is registered charity in England and Wales 1086933

Contact: Jennifer Gunn
De Morgan House
57-58 Russell Square
London WC1B 4HS
Tel: 020 7637 3686
Fax: 020 7323 3655
Email: cms@lms.ac.uk
Website: www.cms.ac.uk

The Council for the Mathematical Sciences is an authoritative and objective body that works to develop, influence and respond to UK policy issues affecting mathematical sciences in higher education and research, and therefore the UK economy and society by:

- providing expert advice;
- engaging with government, funding agencies and other decision makers;
- raising public awareness; and
- facilitating communication between the mathematical sciences community and other stakeholders

Louise Wren
Head of External Affairs
The Francis Crick Institute
Midland Road, London NW1 1AT
Press office: 020 3796 5252
E: louise.wren@crick.ac.uk
W: www.crick.ac.uk

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.

SCIENCE DIRECTORY

Daphne Jackson Trust

Contact: Dr Katie Perry
Chief Executive
The Daphne Jackson Trust
Department of Physics
University of Surrey, Guildford GU2 7XH
Tel: 01483 689166
Email: Katie.perry@surrey.ac.uk
Website: www.daphnejackson.org

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

Suzanne King
Policy and Voice Manager
EngineeringUK
Northern & Shell Building, 5th floor
10 Lower Thames Street
London, EC3 6EN
Email: sking@engineeringuk.com

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.

fera

Contact: Director of Science
Fera Science Ltd. (Fera)
Sand Hutton, York, YO41 1LZ
Tel: 01904 462000
E-mail: chiefscientistoffice@fera.co.uk
Website: www.fera.co.uk

Fera provides expert analytical and professional services to governments, agrichemical companies, food retailers, manufacturers and farmers to facilitate safety, productivity and quality across the agrifood supply chain in a sustainable and environmentally compatible way.

Fera uses its world leading scientific expertise to provide robust evidence, rigorous analysis and professional advice to governments, international bodies and companies worldwide. Our food integrity, plant health, agri-tech and agri-informatics services ensure that our customers have access to leading edge science, technology and expertise.

GAMBICA

Contact: Steven Brambley
Rotherwick House
3 Thomas More Street
London, E1W 1YZ
Tel: 020 7642 8080
E-mail: info@gambica.org.uk
Website : www.gambica.org.uk

GAMBICA is the voice of the laboratory technology, instrumentation, control and automation industries, providing influence, knowledge and community. We offer members a common platform for voicing their opinions and representing their common interests to a range of stakeholders. GAMBICA seeks to spread best-practice and be thought leaders in our sectors.

The Geological Society

Contact: Dr Megan O'Donnell FGS
Head of Policy and Communications
The Geological Society
Burlington House
Piccadilly
London W1J 0BG
E-mail: megan.odonnell@geolsoc.org.uk
Website: www.geolsoc.org.uk

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

Contact: Lynda Rigby, Executive Head of Marketing and Membership
Institute of Biomedical Science,
12 Coldbath Square, London, EC1R 5HL
Tel: 020 7713 0214
Email: mc@ibms.org
Twitter: @IBMScience
Website: www.ibms.org

Advancing knowledge and setting standards in biomedical science

With over 20,000 members in 61 countries, the Institute of Biomedical Science (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.

Institute of Food Science + Technology ifst

Contact: Delia Mertoiu
5 Cambridge Court
210 Shepherds Bush Road
London W6 7NJ
Tel: 020 7603 6316
E-mail: info@ifst.org
Website: www.ifst.org

We are the UK's leading professional body for those involved in all aspects of food science and technology. We are an internationally respected independent membership body, supporting food professionals through knowledge sharing and professional recognition.

Our core aim is the advancement of food science and technology based on impartial science and knowledge sharing.

Our membership comprises individuals from a wide range of backgrounds, from students to experts, working across a wide range of disciplines within the sector.

IKE Institute of Innovation & Knowledge Exchange

Contact: Michelle Medhat
Institute of Innovation & Knowledge Exchange
Rex House
4 – 12 Regent Street
London SW1Y 4PE
www. InnovationInstitute.org.uk

IKE is the UK's professional body for innovators. It accredits and certificates innovation practices. We influence the inter-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.

Institute of Marine Engineering, Science and Technology (IMarEST)

Contact: Bev Mackenzie
Institute of Marine Engineering, Science and Technology (IMarEST), Aldgate House, 33 Aldgate High Street, London, EC3N 1EN
Tel: +44(0) 20 7382 2600
Fax: +44(0) 20 7382 2667
E-mail: technical@imarest.org
Website: www.imarest.org

Established in London in 1889, the IMarEST is a leading international membership body and learned society for marine professionals, with over 15,000 members worldwide. The IMarEST has an extensive marine network of 50 international branches, affiliations with major marine societies around the world, representation on the key marine technical committees and non-governmental status at the International Maritime Organization (IMO) as well as other intergovernmental organisations.

SCIENCE DIRECTORY

Institute of Measurement and Control

Contact: Steff Smith
Chief Executive
The Institute of Measurement and Control
297 Euston Road
London NW1 3AD
Tel: +44 (0) 20 73874949
E-mail: steff.smith@instmc.org
Website: www.instmc.org
Registration Charity number: 269815

The Institute of Measurement and Control is a professional engineering institution and learned society dedicated to the science and application of measurement and control technology for the public benefit. The InstMC 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

Contact: Elizabeth Chamberlain
Head of Policy
Institute of Physics, 37 Caledonian Road, London N1 9BU
Tel: 020 7470 4824
E-mail: Elizabeth.Chamberlain@iop.org
Website: www.iop.org

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

Contact: Philip Morgan (CEO)
Fairmount House,
230 Tadcaster Road,
York, YO24 1ES
Tel: 01904 610821
E-mail: phil@ipem.ac.uk
Website: www.ipem.ac.uk

Physicists, engineers and technologists play vital roles in delivering our healthcare. The Institute of Physics and Engineering in Medicine (IPEM) is the professional organisation that represents this diverse workforce. We are a charity with more than 4,600 members drawn from healthcare, academia and industry.

Our Mission is 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.

Our members, the professional community of medical physicists, biomedical engineers and clinical technologists working in hospitals, academia and industry around the world are the people who make it happen. We work to support them through professional development, community and leadership services and initiatives. 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 ADVANCING CHEMICAL ENGINEERING WORLDWIDE

The Institution of Chemical Engineers

The Institution of Chemical Engineers (IChemE) advances chemical engineering's contribution worldwide for the benefit of society. We support our members in applying their expertise and experience to help address the Sustainable Development Goals.

We are the leading professional qualifying body for chemical, biochemical and process engineers, and are the only organisation worldwide to award Chartered Chemical Engineer status.

We support the development of chemical engineering professionals, and provide connections to a powerful network of over 29,000 members in more than 100 countries.

Amit Verma, Policy manager
+44 (0) 1788 578214
averma@icheme.org
www.icheme.org

IET The Institution of Engineering and Technology

Contact: Joanna Cox
IET
Michael Faraday House
Six Hills Way
Stevenage
SG1 2AY
Tel: +44(0)1438 765690
Email: policy@theiet.org
Web: www.theiet.org

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 Europe, North America, and Asia-Pacific.

LGC

Contact: Dr Julian Braybrook
Queens Road, Teddington
Middlesex, TW11 0LY
Tel: +44 (0)20 8943 7000
E-mail: info@lgcgroup.com
Website: www.lgcgroup.com

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 community.

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.

L'ORÉAL UK AND IRELAND

Contact: Jagdeep Rai
Director of Scientific and Regulatory
Tel: +44(0)20-8762-4752
Email: jagdeep.rai@loreal.co.uk
Website: www.loreal.co.uk

L'Oréal employs more than 3,800 researchers world-wide and dedicates over €877 million each year to research and innovation in the field of healthy skin and hair. The company supports women in science research through the L'Oréal UNESCO For Women In Science Programme and engages young people with science through the L'Oréal Young Scientist Centre at the Royal Institution. L'Oréal also collaborates with a vast number of institutions in the UK and globally.

The LINNEAN SOCIETY of London

Contact: Professor Gail Cardew
Chief Executive Officer
The Linnean Society of London
Burlington House, Piccadilly,
London W1J 0BF
Tel: +44 (0)20 7434 4479 EXT 212
E-mail: gail@linnean.org
Website: www.linnean.org

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

Marine Biological Association

THE MARINE BIOLOGICAL ASSOCIATION Est. 1884 Incorporated by Royal Charter 2013

Contact: Dr Matthew Frost
Marine Biological Association,
The Laboratory, Citadel Hill, Plymouth, PL1 2PB
Tel: 07848028388
Fax: 01752 633102
E-mail: matfr@mba.ac.uk
Website: mba.ac.uk

Since 1884 the Marine Biological Association has been delivering its mission *'to promote scientific research into all aspects of life in the sea, including the environment on which it depends, and to disseminate to the public the knowledge gained.'* The MBA represents its members in providing a clear independent voice to government on behalf of the marine biological community. It also has an extensive research programme and a long history as an expert provider of advice for the benefit of policy makers and wider society.

SCIENCE DIRECTORY

Contact: Matt Rooney, Engineering Policy Manager
Head of Content & Communications
1 Birdcage Walk
London SW1H 9JJ
Tel: +44 (0)20 7304 6833
E-mail: matthew.rooney@imeche.org
Website: www.imeche.org

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.

Contact: Kirsty McBeath
Met Office,
Fitzroy Road,
Exeter,
EX1 3PB
Email: kirsty.mcbeath@metoffice.gov.uk
Website: www.metoffice.gov.uk

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 Centre. 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.

Contact: Policy Officer
Microbiology Society
14–16 Meredith Street, London EC1R 0AB
Tel: 020 3034 4870
E-mail: policy@microbiologysociety.org
Website: www.microbiologysociety.org

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.

Contact: Dr James Claverly
National Physical Laboratory
Hampton Road, Teddington
Middlesex TW11 0LW
Tel: 020 8977 3222
Email: james.claverley@npl.co.uk
Website: www.npl.co.uk/contact-us

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.

Contact: John Jackson
Head of Science Policy and Communication
Natural History Museum
Cromwell Road, London SW7 5BD
Tel: +44 (0)20 7942 5257
E-mail: j.jackson@nhm.ac.uk
Website: www.nhm.ac.uk

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.

Contact: Nick Allen
Executive Officer, Office of the Vice Chancellor
University Drive, Northampton, NN1 5PH
Tel: 01604 735500
E-mail: nick.allen@northampton.ac.uk
Website: www.northampton.ac.uk

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.

Contact: Alex Miles
Deputy Director, External Relations (Public Affairs)
University Park, Nottingham, NG7 2RD
E-mail: alex.miles@nottingham.ac.uk
Mobile: 07917115197
Twitter: @AlextoMiles
www.nottingham.ac.uk

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.

Contact: Mark Hollingsworth
Chief Executive Officer
The Nutrition Society
10 Cambridge Court, 210 Shepherds Bush Road, London, W6 7NJ, UK
Email: office@nutritionsociety.org
Tel: +44 (0)20 7602 0228
www.nutritionsociety.org

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 of people, animals while balancing the health of our planet too.

Andrew Mackenzie
Head of Policy and Communications
Hodgkin Huxley House
30 Farringdon Lane
London EC1R 3AW
Tel: +44 (0) 20 7269 5728
E-mail: amackenzie@physoc.org
Website: www.physoc.org

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.

SCIENCE DIRECTORY

Contact: Garry Graham,
Deputy General Secretary,
Senior Management Team
New Prospect House
8 Leake St, London SE1 7NN
Tel: 020 7902 6678
E-mail: Garry.Graham@prospect.org.uk
www.prospect.org.uk

Prospect is an independent, thriving and forward-looking trade union with over 120,000 members across the private and public sectors and a diverse range of occupations. We represent scientists, technologists and other professions in the civil service, research councils and private sector.

Prospect's collective voice champions the interests of the engineering and scientific community to key opinion-formers and policy makers. With negotiating rights with over 300 employers, we seek to secure a better life at work by putting members' pay, conditions and careers first.

QUADRAM INSTITUTE

Contact: Andrew Stronach
Head of External Relations
Quadram Institute, Rosalind Franklin Road.
Norwich, NR4 7UQ
Tel: 01603 255000
Email: andrew.stronach@quadram.ac.uk
Website: www.quadram.ac.uk

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.

Contact: Tom Exall
External Relations Manager
Royal Academy of Engineering
3 Carlton House Terrace
London SW1Y 5DG
Tel: 020 7766 0600
E-mail: tom.exall@raeng.org.uk
Website: www.raeng.org.uk

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; and promote engineering at the heart of society.

Contact: Office of the Science Directorate
Royal Botanic Gardens, Kew
Richmond, Surrey, TW9 3AB
Tel: 020 8332 5050/5248
Email: scienceadmin@kew.org
Website: www.kew.org

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 research.
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.

Contact: Daniel Callaghan
Head of Public Affairs
The Royal Society, 6-9 Carlton House Terrace
London SW1Y 5AG.
Tel: 020 7451 2500
Email: daniel.callaghan@royalsociety.org
Website: www.royalsociety.org

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 humanity.

Contact: Susie Rabin Associate Director of Parliamentary and Public Affairs,
Royal Society of Biology
1 Naoroji Street London WC1X 0GB
Tel: 020 3925 5607
E-mail: susie.rabin@rsb.org.uk
Website: www.rsb.org.uk

The Royal Society of Biology is a single unified voice, representing a diverse membership of individuals, learned societies and other organisations. We are committed to ensuring that we provide Government and other policy makers – including funders of biological education and research – with a distinct point of access to authoritative, independent, and evidence-based opinion, representative of the widest range of bioscience disciplines. Our vision is of a world that understands the true value of biology and how it can contribute to improving life for all.

Contact: Matt Davies
Public Affairs Manager
Royal Society of Chemistry,
Thomas Graham House (290),
Science Park, Milton Road,
Cambridge, CB4 0WF
Tel 01223 438 322
Email daviesm@rsc.org
Website: www.rsc.org

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

Society for Underwater Technology
Contact: Dr Cheryl Burgess
Chief Executive
HQS Wellington
Victoria Embankment, London WC2R 2PN
(correspondence address only)
T: +44 (0)7947 911992
www.sut.org
E Mail: jane.hinton@sut.org

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

SCI: where science meets business

Contact: Sharon Todd
SCI
14-15 Belgrave Square
London SW1X 8PS
Tel: 020 7598 1500
E-mail: sharon.todd@soci.org
Website www.soci.org

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 society. 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

SCIENCE DIRECTORY

Society of Cosmetic Scientists

Contact: Gem Bektas,
Secretary General
Society of Cosmetic Scientists
Suite 109 Christchurch House
40 Upper George Street
Luton Bedfordshire LU1 2RS
Tel: 01582 726661
Fax: 01582 405217
E-mail: secretariat@scs.org.uk
Website: www.scs.org.uk

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

Contact: Tessa Harris
SRP, DS009 Dartington Hall
Dartington, Devon TQ9 6EN
Tel: 01803 866743
Email: admin@srp-uk.org
Website: www.srp-uk.org

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.

UK INNOVATION & SCIENCE SEED FUND

Contact: Dr Andrew Muir
c/o STFC Innovations Ltd
Harwell Campus Oxford OX11 0QX
Tel: 0121 710 1990
E-mail: Andrew.muir@midven.co.uk
Website: https://ukinnovationscience seedfund.co.uk/

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. UK Innovation & Science Seed 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.

Understanding ANIMAL RESEARCH

Contact: Chris Magee
Head of Policy and Media
Understanding Animal Research
Hodgkin Huxley House
30 Farringdon Lane, London EC1R 3AW
direct tel: 020 3675 1234
email: cmagee@UAR.ORG.UK
http://www.understandinganimalresearch.org.uk/

Understanding Animal Research is a not-for-profit organisation that explains why animals are used in medical, veterinary, environmental and other scientific research. We aim to achieve a broad understanding of the humane use of animals in medical, veterinary, scientific and environmental research in the UK. We work closely with policymakers to ensure regulation is effective and are a trusted source of information for the national and international media. We are funded by our members who include universities, professional societies, trade unions, industry and charities.

University of Essex

Contact: Dr Rob Singh
Deputy Director, Enterprise
Wivenhoe Park
Colchester CO4 3SQ
T 01206 874278
E rjsingh@essex.ac.uk
W www.essex.ac.uk/business

Established in 1964, the University of Essex is ranked as one of the Top 20 universities in the Research Excellence Framework and is awarded Gold in the Teaching Excellence Framework. It is home to world-leading expertise in analytics and data science, with research peaks spanning the social sciences, sciences, and humanities. Pioneers of quantitative methods and artificial intelligence techniques, Essex is also in the UK top 10 for Knowledge Transfer Partnerships, and works with businesses to embed innovation into operations, through KTPs, knowledge exchange and contract research.

Universities Federation for Animal Welfare

Contact: Dr Huw Golledge
Chief Executive and Scientific Director
The Old School, Brewhouse Hill
Wheathampstead, Herts. AL4 8AN.
Tel: 01582 831818.
Email: ufaw@ufaw.org.uk
Website: www.ufaw.org.uk
Registered in England Charity No: 207996

The Universities Federation for Animal Welfare (UFAW) is an international independent scientific and educational animal welfare charity and membership society.

UFAW's vision is a world where the welfare of all animals affected by humans is maximised through a scientific understanding of their needs and how to meet them. We promote an evidence-based approach to animal welfare by funding scientific research, helping develop the next generation of animal welfare scientists and sharing animal welfare science knowledge with both experts and the wider public.

The Welding Institute

Contact: Chris Eady
The Welding Institute, Granta Park,
Great Abington, Cambridge, CB21 6AL

Tel: 01223 899614
Fax:01223 894219
E-mail: chris.eady@twi.co.uk
Website: www.twi-global.com

The Welding Institute is the leading institution providing engineering solutions and knowledge transfer in all aspects of manufacturing, fabrication and whole-life integrity management.

Industrial membership provides access to innovative problem-solving from one of the world's foremost independent research and technology organisations.

Non-Corporate services include membership and registration, education, training and certification for internationally recognised professional development and personnel competence assurance.

TWI provides Members and stakeholders with authoritative and impartial expert advice, knowhow and safety assurance through engineering, materials and joining technologies.

SCIENCE DIARY

PARLIAMENTARY AND SCIENTIFIC COMMITTEE – ALL-PARTY PARLIAMENTARY GROUP

Email: office@scienceinparliament.org.uk
www.scienceinparliament.org.uk
follow us on Twitter @ParlSciCom

FORTHCOMING DISCUSSION AND OTHER MEETINGS

February 2024 (Date to be advised, at time of publication)
Discussion Meeting on 'Developing a UK sustainable battery industry'
In partnership with Imperial College London
5.00pm to 6.50pm, Palace of Westminster
Chairman's Reception 6.50pm to 7.30pm

Monday 4th March 2024
STEM for BRITAIN
Palace of Westminster

Monday 15th April 2024
Annual General Meeting
The Westminster Medal Award
Discussion Meeting (title to be confirmed)
In partnership with the Society of Chemical Industry
5.00pm to 6.50pm, Palace of Westminster
Chairman's Reception 7.00pm to 7.35pm

ROYAL SOCIETY OF BIOLOGY

For further details please contact
Karen Patel: events@rsb.org

ROYAL SOCIETY OF CHEMISTRY

For further details please contact
events@rsc.org

ROYAL SOCIETY

Details of all events can be found on the events calendar at events@royalsociety.org
For scientific meetings queries:
scientificmeetings@royalsociety.org

SCIENCE IN PARLIAMENT sip
2nd Floor,
201 Great Portland Street,
London W1W 5AB
Correspondence to:
office@scienceinparliament.org.uk

www.scienceinparliament.org.uk
Editor: Leigh Jeffes
Design Consultant: Mrs Val Warby
Printed by Premier Print Group Ltd

Published by Parliamentary and Scientific Committee – All-Party Parliamentary Group, 2nd Floor, 201 Great Portland Street, London W1W 5AB. Correspondence address: 1 Lych Gate Walk, Hayes, UB3 2NN. Published four times a year.
The 2021 subscripton rate is £80. Single numbers £20. ISSN 0263-6271

CHRISTMAS PARLIAMENTARY SCIENCE RECEPTION

more pictures on pages 29 – 31

Lord Tim Clement-Jones, Viscount Stansgate and Stephen Metcalfe MP

Clare Viney and Professor Helen Fielding

Orla Lappin, Dr Louise Leong and Dr Kate Baillie

Dr Tanya Sheridan and Greg Clark MP

All photographs – John Deehan Photography

ROYAL SOCIETY OF CHEMISTRY
BIOCHEMICAL SOCIETY
P & S
Royal Society of Biology
The Council for the Mathematical Sciences
IET The Institution of Engineering and Technology
IOP Institute of Physics
THE ROYAL SOCIETY
The Physiological Society
Applied Microbiology International
The Nutrition Society
Royal Academy of Engineering