January 2024

THE ROYAL SOCIETY

Royal Society representations to the Spring Budget (2024)

The Royal Society is the UK's national academy of science. Our fundamental purpose is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity. This submission outlines how the government can support and enhance UK science for the long-term good of society and our economy.

Key policy recommendations:

- To maintain its global leadership in science and innovation, the UK should lead the G7 on R&D investment as a percentage of GDP and seek to be among the top science nations globally.
- Spending should be supported by a long-term strategy for science which considers the system as a whole, over cycles of a minimum ten years, providing the stability needed by researchers, innovators and investors.
- Building on association to Horizon Europe, the Government should create a comprehensive international strategy for science collaboration, with long-term, cross-government support.
- Horizon Europe underspend should be ringfenced to enable talented researchers to pursue groundbreaking ideas and discoveries.
- Up-front visa costs for researchers should be reduced in line with other leading science nations.
- An evidence-based net zero technology roadmap should be produced that identifies the key sectors and technologies that need investment.
- The Government should invest in the construction of large-scale hydrogen storage facilities if it is to reach legally binding net zero targets by 2050.
- The post-16 education system should be reformed to offer a broader and more expansive curriculum, including the study of maths to 18. This should be accompanied by more funding for Core Maths and expanded provision of teacher CPD.
- The Government should re-evaluate the content and implementation of the legacy EU regulations that govern crops improved with the GM method and consider how to reduce the burden of those that add no value to the risk assessment process.
- Decisive steps should be taken to improve the UK clinical trial environment. Steps should include the implementation of novel trial designs suited to testing the ability of single drugs to combat multiple diseases in older and multimorbid patients, enabling world-leading UK geroscience research to leave the lab and deliver public health benefit.

Introduction

Science and technology produce enormous value for society. They enable us to tackle the most pressing challenges of our time, from pandemics to climate change, and they drive growth, innovation and prosperity across the UK.

The UK is a global leader in science and technology, with world-class research, talent and infrastructure. We led the world in developing an effective Covid-19 vaccine, building on a strong base in biological science that had been cultivated over decades. British physicists pioneered radar during the Second World War to protect the country from attack. From the steam engine to machine learning, science has fuelled the creation of countless jobs and turbocharged our economy in every part of the country.

We must not take that position for granted. The UK is not alone in seeking to grow its domestic R&D capabilities, and we need to keep pace with rapid global change. If the UK is to continue to flourish, we need a high-functioning science system the brings the knowledge, capacity and skills to adapt and respond. This cannot be created on the fly, and the necessary long-term investment decisions must be put in place now to ensure that science and technology can deliver the advances that underpin a more secure, prosperous and resilient future.

An R&D landscape fit for the future

The Society supports the sustained increase in government R&D spending to £20 billion per year by 2024/25, as confirmed by the Chancellor in the 2022 Autumn Statement.

However, our ability to pursue the technologies and innovations which underpin future prosperity and resilience is greatly hampered by the prevalence of short-termism and stop-start investment in science.

Providing long-term stability is not just valued by the researchers, innovators and the investors the UK is seeking to attract, but also necessary as we face some of the biggest global-scale challenges humanity has ever seen. The Society is currently working on a major project, *Science 2040,* which will map out in greater detail what the science system could and should look like in the future.

- *The Government should implement a long-term strategy for science which takes a long view of the UK's research and innovation priorities and opportunities – at least 10 years ahead with a regular review cycle – and consider the system as a whole.*

The UK is not alone in seeking to grow its domestic R&D capabilities. China, for example, is increasing its R&D spend by 7% every year until 2026, while the USA has committed an additional $250 billion to core science and technology budgets. France meanwhile is trebling the budget of its National Research Agency.

- *The UK should lead the G7 on R&D investment as a percentage of GDP and aim to be among the top science nations globally.*

The UK's success as a leading science nation depends on being open to the rest of the world, and we strongly welcome the UK's association to the European research programmes, Horizon Europe and Copernicus.

- *Horizon Europe underspend should be ringfenced to enable talented researchers to pursue groundbreaking ideas and discoveries.*

International collaboration extends the impact and reach of scientific discoveries and innovations. That in turn translates into advances in economic performance, the health and security of people and the planet, and our resilience to national and global-scale shocks.

The Society's paper, *Why the UK needs a comprehensive international science strategy (Dec 2023)*, discusses how an international strategy would facilitate the global diffusion of people and ideas, instil confidence in the UK as a stable environment for foreign direct investment in science-based industry, and allow us to demonstrate global leadership in science in support of foreign policy objectives.

- *Having secured association to Horizon Europe, the UK now needs to develop a comprehensive international strategy which builds on that association and is backed by long-term, cross-government support.*

Urgent action is needed to remove further barriers to international collaboration and to ensure we are an attractive destination for the world's best and brightest.

The Society previously found that international researchers faced upfront costs of up to ten times higher than the average of leading science nations. The gap with other countries is likely to have widened further with the latest increase in visa fees and the UK Immigration Health Surcharge. This amounts to a punitive tax on talent for UK business and public/non-profit research organisations, which undermines our ability to attract the best international researchers and innovators to the UK.

- *To show the UK is open for business, upfront work and study visa costs for researchers should be reduced in line with other leading science nations.*

Scaling up net zero delivery

The Society calls on the Government to work with the research and innovation sector to fully deliver the recommendations made by Chris Skidmore's independent review of net zero. Not only do the benefits of delivering net zero outweigh the costs of inaction, this could also be the 'economic opportunity of the 21st Century'. A wealth of subsidiary benefits and considerations will be created, including protecting biodiversity and enhancing wider natural capital.

- *To do this, Government should immediately bring forward an evidence-led UK technology roadmap to accelerate the rate of decarbonisation and guide investment to fledgling sectors and technologies that will be critical for delivering net zero by 2050.*

The Prime Minister's New Year's message included commitment to "going further...to building secure supplies of energy here at home." In 2023, the Society published a major report on *Large Scale Electricity Storage (Sept 2023).* The report concluded that large scale electricity storage is essential to mitigate variations in wind and sunshine, and therefore has a critical role in meeting net zero targets. In particular, enhancing storage capability would guard against long-term variations in the wind, and keep the nation's lights on. Storing most of the surplus as hydrogen, in salt caverns, would be the cheapest way of doing this.

Storage on this scale, which would require up to 90 clusters of 10 caverns, is not possible with batteries or pumped hydro. This level of storage requirement is not currently foreseen by the government.

- *The Government should immediately kick-start the construction of large-scale hydrogen storage facilities if it is to meet its pledge that all electricity will come from low carbon sources by 2035 and reach legally binding net zero targets by 2050.*

Skills for productivity and future career resilience

As the Prime Minister has acknowledged, education is an essential component in unlocking our national potential and driving future productivity, growth and competitiveness. The problem-solvers of tomorrow, working across the UK's research & innovation landscape on global issues such as net zero, will need a solid foundation in science, maths, digital and data skills necessary for an adaptive economy.

It is the Society's view that students in England currently face an illusion of choice. In theory they are able to choose their own subjects for GCSE and A levels, but in reality, their choices are restricted, and entry requirements into higher education conspire to narrow options for many too early. Students are often making these choices without knowledge of the subjects and importance in future study, training and career opportunities.

- *The Government should continue to pursue an alternative to the current narrow A-level examinations. This would ensure that young people experience a more expansive education equivalent to that experienced by their counterparts in other high-performing economies, including an opportunity to combine technical education and academic options for some.*

The Society welcomed the Prime Minister's plans for students to continue to study mathematics in some form to age 18, and we were pleased to see additional funding allocated in the in the '*World Class Education System' paper (October 2023).*

- *Funding should be increased to ensure that all schools and colleges can offer a Core Maths qualification. This qualification is designed to provide students with the mathematical, statistics and data skills that they will need for further study in most subjects and for future employment.*

Accelerating teacher continuous professional development (CPD) would support a broadening of post-16 education by addressing the very high rate of teacher attrition.

- *The Government should guarantee teachers 35 hours of subject specific CPD annually, along with the establishment of an independent expert body to oversee its coordination and resourcing.*

Genetic technologies for food security

Plant breeding is essential for improving agricultural productivity, reducing dependence on chemical inputs, and increasing resilience in the face of climate change.

As detailed in the Society's report, *Enabling genetic technologies for food security (Oct 2023),* genetic modification, where genes are moved between species, enables some plant breeding outcomes that no other breeding technology can achieve. Disproportionate regulation of GM crops is stifling potential innovation involving the technology. The UK could now apply the GM regulatory framework transposed from the EU in a manner that is more proportionate to the known risks of GM crops. This would attract investment into the UK's world-leading plant science sector and open up opportunities for new start-up companies to turn the advances of the last 30 years into valuable innovations and products.

- *The Government should re-evaluate the content and implementation of the legacy EU regulations that govern crops improved with the GM method and consider how to reduce the burden of those that add no value to the risk assessment process.*

Enabling world-leading geroscience research

While life expectancy in the UK has increased considerably over recent decades, healthy life expectancy has not kept pace, leading to an increasing period of ill health at the end of people's lives.

In his 2023 annual report, the Chief Medical Officer considered crucial areas of action to improve the quality of life for older adults. Among those, a contribution from the Society focussed on the potential of the emerging field of geroscience, which examines the biological pathways that cause ageing-related diseases and provides an opportunity for the UK to excel in preventative and clinical medicine. To translate the UK's strengths in ageing research to clinical, public health and economic benefit, a more joined-up and strategic approach is required.

- *The Government should take decisive steps to improve the clinical trial environment. Steps should include the implementation of novel trial designs suited to testing the ability of single drugs to combat multiple diseases in older and multimorbid patients, enabling world-leading UK geroscience research to leave the lab and deliver public health benefit.*

For more information, please contact public.affairs@royalsociety.org