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Response to the Department for Business, Innovation and Skills call for evidence for the National Innovation Plan

What follows are excerpts from existing Royal Society positions that were submitted to an online survey conducted by the Department for Business, Innovation and Skills

How best can our regulators drive innovation and make the UK the regulatory test bed capital of Europe?

For the UK to provide an optimal environment for innovation, it is essential that the design and implementation of policy is informed by appropriate evidence and advice at every stage of the policy-making process. Policies and regulation are essential to enable rapid development and application of new science and technologies in ways that best support economic growth and wellbeing.

The Society supports appropriate and proportionate regulation of new and emerging technologies. This approach will allow for the design of flexible regulations that can keep pace with innovative research and its applications, in order to support rapid and safe realisation or commercialisation. In developing new regulations, regulators should keep in mind the full breadth of the innovation ecosystem and ensure that legislation does not inadvertently have a negative impact on the sector as a whole. The Society is undertaking projects surrounding cyber, machine learning and use of data; flexible regulation will be essential for the suitable governance and growth of technologies such as these.

Evidenced based decision-making should be embedded throughout any new regulatory process. As new technologies emerge, the scientific community will play a vital role in providing this evidence to help policy-makers clarify to what extent existing regulations apply and where new regulations are required. Regulators should engage with experts, for example through the National Academies, such as the Royal Society, to draw on the expertise of their Fellowships to provide independent and authoritative scientific advice from both industry and academia.

New regulatory processes should also involve both public and stakeholder dialogue. Policymakers must ensure that the laws and legal frameworks governing research and the use of new technologies are informed by the latest scientific evidence, as well as public opinion, to ensure that the public can have trust in the regulatory processes which are in place to protect their safety. Results from an [Ipsos MORI Public Attitudes to Science Survey](#), commissioned by BIS in 2014, showed there is an overwhelming desire for regulators, government and scientists to engage in dialogue with the public. Seven out of 10 people (69%) think that scientists should listen more to what ordinary people think. Even more feel that the Government should act in line with public concerns about science (75%) and that regulators need to communicate with the public (88%).¹

How can we deliver real culture change within public procurement?

The Government can support the sustainability and growth of UK businesses by being a good customer. The UK public sector spent approximately £242 billion on goods and services in 2013–2014,² which is significantly higher than the 2013 annual investment in all aspects of science, engineering and technology.

Given the challenges of getting new technologies to a wide market, there is a role for government, and others in directly supporting a broad range of SMEs through procurement contracts. Financing schemes

¹ Ipsos MORI 2014, [Public Attitudes to Science](#)

² House of Commons Library 2015, [Public Procurement](#)

should support early-stage companies as they establish their customer base and prove the viability of innovative ideas and approaches. These schemes should seek to establish a sustainable and vibrant community of SMEs that are well-placed to anticipate and respond to emerging issues, and to generate better solutions for existing problems. Government should expand its engagement with SMEs and academic researchers through procurement mechanisms such as the Small Business Research Initiative (SBRI).

As of July 2015, more than £270 million worth of contracts had been awarded via the SBRI since its inception in April 2009.³ The Society calls for the continuation of the SBRI and recommends that it is promoted more widely, across sectors, to ensure its optimal use. In the absence of many major corporate labs in the UK and other long-term technology 'incubators', ways to support the maturing of technology for longer are needed and the Society recommends the SBRI as a means to provide long term investment.

The culture of government procurement was discussed during a recent [PolicyLab event](#) hosted by the Society, and that discussion might be of interest in the development of the National Innovation Plan.⁴

How can we ensure that we put the UK at the forefront of open data opportunities?

The Royal Society welcomes the ambitions set out in the [Cabinet Office's consultation on Better Use of Data](#) to share data more effectively across government with a view to improving policy outcomes. Policy and legislation should be developed within the context of increasing data usage, creating a system with the flexibility to adapt to advances.

The Society advises that any release of data should be clearly signposted and effectively communicated. Government should develop policies for opening up scientific data that complement policies for open government data, and support the development of the software tools and skilled personnel that are vital to the success of both. Judging whether data should be made more widely available requires assessment of the public benefits from sharing this data and the need to protect individual privacy and other risks. Guidance for researchers should be clear and consistent.

There are both opportunities and financial costs in the full presentation of data and metadata. Industry sectors and government should work together to determine which approaches to sharing data, information and knowledge best serve the public interest. This should include negative or null results.

Where can we maximise the opportunities for innovation, as we deliver high quality infrastructure that unlocks broad economic opportunities?

The Royal Society supports efforts to use new technology to build high-quality infrastructure. In order for this to be realised, regulation and policy regarding emerging technologies should be designed in a flexible manner.

Support for SMEs bringing innovative technologies to market can be achieved using the SBRI initiative, as mentioned above. Increasing access to finance for SMEs will support innovation, and consequently the availability of new technologies, to support the development of high-quality infrastructure.

Infrastructure is also important in supporting the research and development landscape itself. Technology and innovation centres, such as Catapult Centres, form part of the infrastructure for successful translational science and can support the development of long-term partnerships between academia and industry. Similar bodies, such as the Fraunhofer Centres in Germany, have demonstrated the success of this approach within their industrial landscape.

³ Innovate UK 2015, [SBRI brochure](#)

⁴ Royal Society, [PolicyLab Audio](#): What is the future of innovation support in the UK?

The Catapult Centres in the UK have been generally well received as a helpful initiative. Significant resources are required to undertake inherently risky translational research and for initiatives like the Catapult centres, funding and support needs to be long term. The Society supports plans to grow the Catapult network. However, if additional funding is to be made available for the Catapult Centres, it is important that it not be spread too thinly. A clear and transparent process should be used to identify areas in which to establish Catapult Centres in future.

There are opportunities for research funders, institutions, cities and businesses to work together to cluster facilities and expertise and embed strategically important research centres across the UK. Successful clusters are characterised by a critical mass of academic and commercial endeavour with exchange of people across these sectors, strong capital and financial infrastructure, and a highly educated local population. Aligning the planning and resourcing of science and regions could help turn regions into hubs of excellence with distinctive opportunities for investment from the UK or overseas. Strategic design of a modern infrastructure network will be essential for the growth and success of these clusters.

Where can the UK work alongside the private sector to create the deepest pool of innovation finance in Europe?

The Royal Society is calling on the UK Government to increase its investment in R&D to at least match the OECD average of 0.67% of GDP by 2020, which in turn would encourage industry to increase its investment and help the UK reach the target of 3% of GDP invested in R&D from public and private sources, as recommended by the House of Commons BIS Committee⁵ and the Science and Technology Committee.⁶ Greater public investment is required to ensure early stage innovations, which private investors tend to consider too risky, are supported. This will leverage additional private investment and support businesses to grow to a stage at which they can access third-party finance. The Government should also be mindful of the unintended impact financial regulation may have on individuals' and institutions' willingness to invest in science businesses.

Problems accessing finance can result in UK businesses either moving overseas, often to the United States, or being bought out by larger, foreign-owned companies and being moved overseas. While other factors beyond access to finance contribute to global business decisions, this suggests that the UK does not have a globally-competitive finance market for science businesses to access. A common complaint from Fellows is the desire, from investors, for short-term gains leading to short-term business decisions that negatively impact on businesses' ability to grow. If businesses focus on selling out rather than scaling up, it can reduce their spending on R&D and may be why the UK lacks large companies to rival those in the United States.

Despite Government schemes, such as the EIS and SEIS, venture capital for research intensive SMEs in the UK is too scarce. One financing opportunity would be to attract investment from funds that hold portfolios of other investment funds rather than investing directly in bonds, stocks or other securities. This might be achieved with matched or partly matched investment from the public sector. Policies to promote investment from longer-term investors such as pension funds, sovereign wealth funds, insurance companies and livery companies should be developed.

Many of those involved in investment have limited experience of science and technology and vice versa, so there would be value in greater interaction between these two communities. Support is also required in the form of sign-posting, training and mentoring; investors can make more informed decisions with better understanding of the scientific products that they are considering for investment. Likewise, entrepreneurs and businesses require support to help them understand and navigate the finance system and grow. The Society works with the Imperial College Business School to support the scientists we fund with training in aspects of innovation and business of science.

⁵ House of Commons BIS Committee, 2016, [The Government's Productivity Plan](#)

⁶ House of Commons Science and Technology Committee, 2015, [The science budget](#)

The replacement of some Innovate UK grants with new financial products could reduce their attractiveness to businesses and could discourage firms from undertaking R&D that does not have a high chance of success.

Current fiscal rules exempt research charities, including universities, from paying VAT on research buildings. However, if the amount of commercially sponsored research carried out within the building exceeds a limit currently set at 5%, VAT is to be paid on the entire building. This means that both universities and business are discouraged from working together. Removing this restriction would facilitate greater engagement between academia and industry, by making it easier for universities to do more commercial work. It would also allow them to support companies spun out from their research base for longer, incubating them in house in order to support them to grow.

The Higher Education Innovation Fund (HEIF) provides funding to universities to use for knowledge exchange, including research exploitation. Of the £601 million HEIF budget for 2011 to 2015, £318 million was invested in supporting researchers to commercialise their research.⁷ For every £1 of HEIF invested there was a return of £6 in gross additional income.⁸ The Government should make a long-term commitment to HEIF and increase its funding.

How can we ensure that the UK's inventiveness and creativity capitalises on our strong intellectual property system to generate growth and further innovation? Since the Lambert Review in 2003, universities have been more proactive in seeking economic return from their Intellectual Property (IP). The Research Councils have insisted that agreements exist between businesses and universities but helpfully have not been prescriptive about their contents. A strength of the UK's arrangements, when compared to many other countries, is the flexibility to tailor IP agreements and costs to deliver industrially significant projects of various types.

However, evidence has emerged that the increased interest from universities in IP might, in some cases, have proved a barrier to business-university collaborations. The commercial value of some intellectual property may be overestimated and rights exercised too early in the process of knowledge generation. Direct returns from technology transfer activities are relatively low in both the US and the UK. This suggests that the value of business-university collaboration comes from factors other than ownership of IP and that the strict control exerted by some university technology transfer offices may not be warranted. It is important that the search for short-term benefit to the finances of universities does not work against the longer term benefit to the national economy.

A more discriminating approach may be needed in identifying and supporting technologies that have the potential to deliver long-term economic value, as well as strengthening the collaborative and contract research that make up the majority of universities' income from collaboration with business. The Intellectual Property Office's May 2011 updated guide to IP strategy for universities recommended that universities adopt a more flexible, bespoke approach to IP management. The production of a more recently updated guide has been announced, however, the details of this are not yet known. One example of this flexible approach, is the Easy Access Innovation Partnership, in which a group of 11 universities including the University of Glasgow, King's College London and the University of Bristol have agreed not to enforce some patents, allowing businesses to use them for commercial purposes. By being less protective of their IP universities have the opportunity to harness increasing interest in open innovation from companies that are looking outwards for ideas.

There is still much that the scientific community can do through collective action to promote co-existence of intellectual property and openness. Database rights holders can publish their willingness to grant non-exclusive licences and terms of use. Patent pools can be set up to allow patent owners to agree coordinated licensing action and can help to avoid the problem of patent thickets - when a

⁷ HEFCE, 2012, [Strengthening the Contribution of English Higher Education Institutions to the Innovation System: Knowledge Exchange and HEIF Funding](#)

⁸ *Ibid.*

scientific domain is so clogged with IP that it is impossible to navigate. Patent clearing-houses could operate to administer patents in a particular field and levy returns for IP owners while facilitating access by others.

Is there anything else the UK could need to do to create the best possible framework for innovation?

People are the most important resource for research and innovation. The UK must provide concrete proposals to develop, retain and attract the skilled individuals the UK will need to fill the necessary jobs needed for a healthy research and innovation ecosystem. A diverse and inclusive scientific workforce draws from the widest range of backgrounds, perspectives and experiences thereby maximising innovation and creativity in science for the benefit of humanity. Identifying and addressing barriers to participation and success in STEM for underrepresented groups will be essential in truly attracting and retaining these skilled individuals. This will need aligning with the broader skills agenda in the UK to ensure a continuously refreshing, diverse pipeline of future research, technical and business experts. The UK needs to have the right policies in place to encourage valuable immigration, and minimise unnecessary barriers to the flow of talented researchers and students.

While academic qualifications are helpful for a career in research and innovation, many who undertake related studies move on to work in other professions such as financial services, or information technology. To ensure that academic courses are providing the requirements for researchers and innovators beyond academia, more emphasis should be given to a collaborative approach to learning between universities and non-academic employers. Multiple education and career pathways are needed, with more opportunities to move seamlessly between sectors and disciplines.

Increased mobility between academia and industry is one way to support effective knowledge exchange. In the UK moving from academia to industry is often seen as less prestigious within universities and hence a one way move. This perception could be corrected by offering more opportunities for scientists to spend part of their time in industry and part in academia. This might help break down the cultural barriers between the two. The Royal Society is helping to tackle this challenge through its Industry Fellowship scheme. Further initiatives would be welcome. Opportunities for action include secondments, internships, professional masters and entrepreneurship hubs.

While we expect that some measures proposed in the National Innovation Plan will focus on businesses specifically, creating the best framework for innovation requires a coherent research and innovation ecosystem. The Higher Education White Paper announced a number of changes to the higher education, research and innovation landscape, including the establishment of UK Research and Innovation. This could help strengthen the UK's already outstanding research sector and its contribution to the UK's economy. It will be important that measures set out in the National Innovation Plan, to support innovation by business and industry, are developed in the context of this broader research and innovation ecosystem, and government should work to ensure they collectively add up to a coherent strategic vision for research and innovation.

Many of the issues covered in this call for ideas were discussed at the national Academies' recent PolicyLab event⁹ on the future of innovation support in the UK.

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⁹ Royal Society, [PolicyLab Audio](#): What is the future of innovation support in the UK?