

RSB response to the Science and Technology Committee of the Commons Brexit science and innovation Summit inquiry

February 2018

The Royal Society of Biology (RSB) 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 policymakers, 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.

The UK bioscience community has fundamental needs, the provision of which is imperative during and following Brexit if this sector is to **realise its full potential to benefit society in the UK and internationally**. As part of this, **ongoing consultation** with the community is key to ensure that **decisions are made on the basis of sound scientific evidence and expertise**. **In summary**, these needs are:

- Continued and unfettered access to EU and global networks, funding, expertise and infrastructure. This exchange must be two-way, allowing international communities, including less economically developed countries, access too.
- Citizen and movement rights maintained and aligned for EU and UK citizens within the scientific community.
- Legislative and regulatory alignment with the EU, pending detailed community consultation and ensuring due consideration is made to the needs of all parties.
- Continued collaboration and communication between UK regulatory agencies, European regulatory agencies, EU Reference Networks and the network of EU Reference Laboratories. This is crucial to enable maximum UK capacity for innovation, and efficient knowledge and resource sharing, with direct impact on public and animal health and welfare, and the economy.
- A welcoming environment for science-based businesses, with focus on employment opportunities in science, technology, engineering and medicine (STEM) shortage sectors.

The remainder of this response provides further detail on the fundamental needs of the UK bioscience community through Brexit. It is laid out under the following numbered headings:

1. UK Community
2. International Community
3. Regulation and Infrastructure
4. Business, Research and Development.

For each section, these concise messages are supported by a correspondingly numbered appendix (1, 2, 3 and 4) containing more detailed advice and evidence. This evidence is derived from our members, and from submissions made to a range of inquiries in the run up to and following the Referendum and subsequent policy development.

1. UK COMMUNITY *(please see Appendix 1 on page 4 for supporting evidence)*

- 1.1 Ready access to EU networks and infrastructure, and mechanisms allowing ease of movement for those studying and working in science at all levels.** To ensure that funding streams remain stable and UK universities remain competitive, current tuition fee status and access to higher education structures should be maintained for students studying in the UK and EU, with continued involvement in programmes such as Erasmus+.
- 1.2 EU citizens who are current members of the UK scientific community (through employment or study), and their families, need continued rights to live and work as originally planned, this is vital. The same should be true for UK citizens within the EU scientific community.**
- 1.3 Maintained growth in research and development in the UK through continued collaboration with researchers in the EU.** An imperative element of this will be continued eligibility and access to UK/EU infrastructure and research programmes up to and after 2020 (e.g. Horizon2020 and successor frameworks, and funding assigned through the European Research Council). To supplement continued funding through UK/EU structures, it is also essential that Government work to facilitate and secure additional direct funding and international collaborative mechanisms to maintain and grow the research environment. Ring-fencing of funds for this would provide much needed stability for forward planning.¹
- 1.4 Maintained stakeholder engagement:** ongoing communication with the science community to help inform policy and long term investment strategies.

2. INTERNATIONAL COMMUNITY *(supporting evidence in Appendix 2, page 7)*

- 2.1 A secure, sustainable future for UKAid.**
- 2.2 Continued access to EU budgets** (including EuropeAid, Horizon 2020 and its successor programmes, and other relevant budget lines); less economically developed countries (LEDCs) may stand to benefit.

¹ Derived from a report from the Royal Irish Academy Brexit Taskforce on the implications of Brexit for Higher Education and Research in Northern Ireland.

2.3 Support for effective and efficient international communication, collaboration and knowledge exchange networks is imperative for the UK to remain competitive in research and development, and to contribute towards global goals for society.

2.4 Support for the international movement of skilled experts and trainees, through UK visa systems that harmonise with those of the EU to meet the specific needs of the community working and studying in STEM related subjects.

3. REGULATION AND INFRASTRUCTURE *(supporting evidence in Appendix 3, page 7)*

3.1 Maintained engagement with regulatory development at EU level. The UK presently takes a leading and influential role in setting EU regulation, and this influence should be preserved as much as is possible in the circumstances. Pending detailed community consultation wherever possible, UK legislation and regulation (e.g. regarding environmental protection, the availability and safety of medicines, chemicals, food standards and other science based assessments, in addition to visa systems which allow efficient flow of expertise into the UK) should remain congruent with that of the EU, or aligned to similar standards. Ensuring this will support the mobility and capacity for straightforward collaboration and trade relevant to the STEM community, and its output. Additionally, it will maintain the applicability of research output across international borders- critical for biomedical research and development.

3.2 Support for UK regulatory agencies, which rely on capacity and knowledge sharing with European regulatory agencies and the EU Reference Networks and network of EU Reference Laboratories. Such communication and collaboration must continue to enable the efficient sharing of resource, knowledge and specialised expertise, in addition to the development of guidelines, frameworks and standards of benefit to society as a whole.²

4. BUSINESS, RESEARCH AND DEVELOPMENT *(supporting evidence in Appendix 4, page 11)*

4.1 A welcoming environment for science-based business, enabling continued expansion in order to: a) reduce the loss of large and important enterprises, which happened in the case of the EMA, and b) to enable an expanding science job market – maintaining incentive for people to enter the UK science pipeline- particularly in STEM shortage sectors.

4.2 In line with comments under Regulation and Infrastructure, regulatory alignment with the EU, and collaborative support mechanisms (such as the European Community Patent) where due consideration is made to the needs of all parties, is of great importance to maintained and sustainable growth in UK business, research and development. It is key to reduce unnecessary regulatory burden, bureaucratic complexity and financial cost, which may otherwise prevent broad access to protection for intellectual property, or the straightforward exchange and trade of services, materials and equipment, which are imperative for innovative research and development. With this support, science-based business in the UK will remain competitive on a global stage.

² How will Brexit affect health and health services in the UK? Evaluating three possible scenarios; Fahy, Nick et al.; The Lancet , Volume 390 , Issue 10107 , 2110 - 2118

Appendix

The majority of the following advice and evidence, intended as background to the fundamental needs highlighted previously in this document, derives from the RSB responses to:

- The House of Commons Select Committee on Science and Technology inquiry into the Implications and Opportunities of Leaving the EU for Science and Research³.
- The BEIS consultation on the UK Bioeconomy⁴.
- The BEIS consultation on Building our Industrial Strategy⁵.
- The House of Lords Select Committee on Science and Technology inquiry into Life Sciences and the Industrial Strategy⁶.

Appendix 1

1.1 UK institutions benefit from the ability to bring in scientists freely from other EU countries, both directly from their expertise, and indirectly through forging partnerships. It is vital we maintain the ability of researchers, scientists and other technical personnel to enter and work in the UK efficiently and effectively. An immigration system is needed that maintains and enhances the UK's ability to attract and retain the best staff and students from a global talent pool. The opportunity for researchers from the UK to live and work abroad, often returning with new skills and collaborations, must also be maintained. The Erasmus programme⁷ also offers researchers and students an opportunity to gain new knowledge and skills, as well as to build new networks in other European countries (and vice versa); it is valued and should be protected or replicated. New visa barriers and immigration rights may make this impractical or may even be detrimental to recruitment of postdoctoral workers who are highly skilled but modestly paid. The threat of an uncoordinated departure from the EU is likely to hinder collaboration; already there are reports of scientists working in the UK looking to leave – both those of EU and UK origin and indeed non-EU nationals – raising the prospect of a further brain-drain to the US, Germany, China, and other countries.

Access to data is also an important aspect for food security; mechanisms like the Irish Universities Nutrition Alliance were enabled by the EU and have been successful.

The UK has also been successful in coordinating EU networks, and has benefitted enormously from close collaboration with scientists and research centres in the rest of the EU. The loss or restriction of access to research facilities in the EU will leave UK scientists isolated, and

³ Royal Society of Biology response to the House of Commons Science and Technology Committee Select Inquiry into the Implications and Opportunities of Leaving the EU for Science and Research
<http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/science-and-technology-committee/leaving-the-eu-implications-and-opportunities-for-science-and-research/written/36017.pdf>

⁴ Royal Society of Biology response to the BEIS consultation on the UK Bioeconomy
https://www.rsb.org.uk/images/RSB_response_to_the_BEIS_Bioeconomy_consultation_Final_response.pdf

⁵ Royal Society of Biology response to the BEIS consultation on Building our Industrial Strategy
https://www.rsb.org.uk/images/article/policy/RSB_response_to_BEIS_consultation_Building_our_Industrial_Strategy.pdf

⁶ RSB response to the House of Lords Select Committee on Science and Technology inquiry into Life Sciences and the Industrial Strategy; https://www.rsb.org.uk/images/RSB_response_Life_Sciences_Industrial_Strategy_inquiry_submitted.pdf

⁷ Erasmus Programme <http://www.erasmusprogramme.com/>

diminish networking opportunities. Many EU institutions have developed expertise in particular areas, and removing access to these from UK researchers will be detrimental. It is unrealistic to expect the collaborative opportunities we currently enjoy with the EU to be replicated with non-EU partners soon, if at all. Strategic investment in particular areas may be needed where the UK has previously relied on international collaborations to supply necessary expertise.

1.3 Horizon2020 (and successor framework programmes), ERC, Erasmus, Marie Skłodowska-Curie and Structural Funds are all examples of EU initiatives and programmes which contribute to the UK life science sector, and the bioeconomy. Marie Skłodowska-Curie fellowships, are particularly valuable to early career researchers in what is an intensely competitive funding environment.⁸ These research efforts require infrastructure that is beyond the scope of any individual country; international collaboration and outlook is key. The European Union as an environment allows for collaboration within the Bioeconomy and other sectors. Therefore, reasonable steps should be taken in a UK outside of the EU, to create policies that enable continued international collaboration by letting researchers, scientists, students and other technical personnel enter and work in the UK efficiently and effectively.

The highly successful European Research Council (ERC) provides much needed responsive mode funding for blue skies research, which is especially valuable for early career researchers and accommodates collaboration between research institutions internationally- the UK after exit should try to retain access to funding and (less likely) influence on programme design, for the proven benefits this will bring to various sectors of the economy, including the bioeconomy. Similarly, retaining access to Horizon2020 and its successors as an Associated Country would ensure that UK scientists are still able to participate in collaborative projects as they currently do. However, due to likely rescindment of the UK's involvement in strategic decision making after Brexit, the UK will need to consider how to employ indirect influence to shape decisions in these areas.

UK researchers have been highly successful in securing EU funding to supplement the UK Government's investment in science. Total investment in UK science will be significantly reduced following the loss of funding obtained through Horizon2020 and its successors, responsive mode funding provided by the European Research Council,⁹ Marie Skłodowska-Curie fellowships¹⁰ (particularly valuable to early career researchers), and the Innovative Medicines Initiative¹¹. The Government should seek to retain the closest possible association with these programmes as part of the Brexit deal, as well as increasing its investment in science. Britain currently spends less on research and development than other countries: roughly 1.7% of GDP, compared with 2.8% in

⁸ A member of the BES reported: "Countless UK researchers have launched their careers on Marie Curie fellowships, and brought their knowledge and experience back to the UK with them. We risk short-changing our early career scientists if we don't provide them with the same or equivalent access: I know lots of incredibly talented people who likely wouldn't be working in science now if they hadn't been given the opportunity of an EU fellowship."

⁹ European Research Council <https://erc.europa.eu/>

¹⁰ Marie Skłodowska-Curie actions - Research Fellowship Programme <https://ec.europa.eu/research/mariecurieactions/>

¹¹ The IMI <http://www.imi.europa.eu/>

the US and 2.9% in Germany.¹² The Government should keep the pledge made in the Conservative Party manifesto 2017 to increase investment in R&D to 2.4% of GDP within ten years – meeting the current OECD average – with the longer-term goal of 3%.¹³ We strongly urge an accelerated trajectory towards these aims.

As an example of social benefit through the structural fund mechanism, the European Regional Development Fund has supported the development of the University of Exeter's Penryn Campus, including the Centre of Ecology and Conservation, and the Environment and Sustainability Institute. As these funds were locally directed they offered support to science in less research-intensive institutions with pockets of excellence and established links to the local economy.

To continue to thrive the UK needs a multiplicity of funding approaches and involvement with the broadest talent pool. If the UK wishes to increase global collaboration in relation to the bioeconomy then it must increase the funding and support to make it possible, ideally encouraging collaborations both in Europe and further afield. A survey by the Biochemical Society ahead of the Referendum (receiving 376 responses) highlighted collaboration as a main theme for the Biochemical Society's membership, with 87% feeling it was essential or very relevant. Further comments in relation to the survey stated that "mobility restrictions [on the movement of labour into and out of the UK post Brexit] will impair the recruitment of top scientists, engineers, health professionals and technologists, which in turn would jeopardize the economic development of the country". It must also be noted that collaborations with non-EU nations may well include partnerships with EU collaborators.

Furthermore, effective international responses to global challenges, e.g. climate change, depend on effective international science collaboration and the free flow of people and ideas. Whilst it will remain important to retain and foster good collaboration with our near neighbours in Europe, it will also be important that the UK government facilitates new arenas for international research collaboration beyond the EU. Closer relationships and collaboration could be developed with the United States, for example, as the world's leading producer of research, as well as strengthening links with Canada, Australia and New Zealand. India and China have expanding science research and development communities and an increasing science output and UK universities and institutes are already establishing strong bonds; this should continue. The relative economic growth of several African nations is helping to fuel increased investment in science that has huge potential to have impact in their developing economies and internationally. This applies to science research in general, including that related to the bioeconomy.

¹² UK election: science spending pledges overshadowed by Brexit. <https://www.nature.com/news/uk-election-science-spending-pledges-overshadowed-by-brexit-1.22067>

¹³ Forward together: the Conservative and Unionist party manifesto 2017. <https://s3.eu-west-2.amazonaws.com/manifesto2017/Manifesto2017.pdf>

1.4 Brexit has far-reaching implications for the Life Sciences¹⁴ sector, and there are significant concerns within the community that need to be addressed. We welcome the fact that the Department for Exiting the European Union and the Department for International Trade both now have Chief Scientific Advisers.¹⁵

Appendix 2

2.1 and 2.2 As a member of the EU, the UK makes annual contributions of some £1.0 billion in development and humanitarian aid through Brussels. This has beneficial impacts via rural development and food security-related projects under EuropeAid and the European Development Fund (EDF), much directed at tropical and sub-tropical developing countries. UK contributions to the EU aid funds are likely to continue until the end of the current budget cycle in 2020. However, in light of Brexit, the community needs assurance of what will happen to the UK's contribution once the current budget cycle ends. The EU institutions are the world's fourth largest bilateral donor, while the UK is the third. When the UK withdraws, it will be difficult to continue committing 0.7% of GDP to foreign aid. The community needs assurance on whether DfID, or another Government department, body or collaboration will take on this extra budget.¹⁶

International development support funds, for example through EuropeAid, have provided a mechanism for UK involvement with EU funded projects. Access to international scientific collaborations and research infrastructures, such as EMBO and ELIXIR, is not necessarily dependant on EU membership and the UK could maintain its seat in the European Strategy Forum on Research Infrastructures among other things, if we secure Associated Membership.

2.3 The very nature of the agri-food sector necessitates trade in produce and cooperation in the sharing of knowledge, information and research funding, in order to enable these advances to be shared and built upon internationally. For example, Easter Bush Research Consortium (EBRC) is one of the largest veterinary research consortiums in Europe, which works to advance sustainable animal agriculture. The UK is a world- leading country in both livestock welfare and farm animal breeding, and genetics, and these aspects need Government's support to continue to flourish. It is imperative that the UK retains good ties with Europe and other countries globally post Brexit.

Appendix 3

3.1 There are many EU laws and regulations that affect the life sciences sector in a positive way. The use of animals in research (for example, in the development of medicines) has recently been harmonised across the EU through the development of Directive 2010/63/EU. Retaining

¹⁴ We use the terms biology, biosciences, life sciences, and biological sciences interchangeably to encompass all areas of the science of life from molecules, through whole organisms to ecosystems and across every specialism. For more detail on our definition of the life sciences, read our response to the House of Lords Science and Technology Committee inquiry into Life Sciences and the Industrial Strategy, submitted in September 2017:

https://www.rsb.org.uk/images/RSB_response_Life_Sciences_Industrial_Strategy_inquiry_submitted.pdf

¹⁵ Chief Scientific Advisers <https://www.gov.uk/government/groups/chief-scientific-advisers>

¹⁶ Derived from a statement made by the Tropical Agriculture Association on 11.12.17 <http://www.taa.org.uk/latest-news.asp?menuId=42>

harmonisation and continuing to promote standard development would be a significant advantage for collaboration in affected industries related to the bioeconomy.

The fundamental principles of providing evidence of benefit and risk for medicines will continue to apply across the spectrum and thus ongoing cooperation in EU regulatory frameworks, and regarding data collection and sharing, should be considered as part of the future arrangements. UK standards must mirror those of our major current and future markets, as far as that is possible. To comply with different standards in the EU and UK would be an additional burden on UK businesses.

The UK has also signed and ratified important international conventions such as the convention on Biological Diversity (CBD) and its Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS)¹⁷. These have been regulated under common agreed EU mechanisms, with associated guidance. Moving outside of EU law will require new or adapted natural environmental legal regulations, and guidance, to be put in place in the UK, which, in addition to the resource costs involved, may also hinder future collaboration in research and development, between UK scientists and those in EU member states.

An additional point that should be considered when assessing UK regulation in relation to ABS is that, whilst it has broad implications that are supported in principle, some specific areas of concern have arisen for our members. Proposed elements of the regulation in relation to digital genetic sequence data may be difficult to implement, and therefore to comply with. There is concern that aspects of the Nagoya Protocol could limit researchers' sharing of information and genetic sequence data, on a country by country basis, depending on the provider country's ABS legislation. Continued stakeholder consultation and careful interpretation of the Nagoya Protocol (and other pertinent legislation) will be required.¹⁸ Regulations that enhance establishment and protection for UK innovation would help to improve the opportunity to grow UK business. However, such approaches to a UK-specific regulatory environment will be, of necessity, likely protectionist and unlikely to be sustainable.

On a related but separate note, the new EU data protection legislation (GDPR) could make it more difficult to share UK clinical trial data with EU partners, for example, via the European Clinical Trials Database (EudraCT)¹⁹, if UK legislation post-Brexit differs significantly on this issue.

Regulations in many areas will need to be aligned with the EU to avoid both restrictions on exports and the UK becoming a niche market for products manufactured abroad. For instance, this applies in the case of clinical trials, approval of medicines and the safety of products, supplements and food items. Failure to maintain an adequate degree of regulatory alignment could harm the development of SMEs, further the loss of multinationals, and make the UK unattractive to foreign businesses.

¹⁷ The Nagoya Protocol, <https://www.cbd.int/abs/about/default.shtml>

¹⁸ Response from the Royal Society of Biology to Defra's request for views and relevant information on potential implications of the use of Digital Sequence Information (DSI) on genetic resources for the three objectives of the Convention on Biological Diversity (CBD) and for the objective of the Nagoya Protocol on Access and Benefit Sharing (ABS). https://www.rsb.org.uk/images/article/policy/RSB_response_Defra_call_for_comment_on_DSI_and_Nagoya_protocol.pdf

¹⁹ <https://eudract.ema.europa.eu/>

Any changes to regulations following the EU Withdrawal Bill should be made only with full and appropriate community consultation and with parliamentary scrutiny. Proposed changes should uphold standards for the people and the natural environment of the UK, rather than weakening them. The EU has achieved many successes in limiting the effects of irresponsible commercial exploitation, including protection of workers' rights, the environment and animal welfare, and limiting antibiotic use in raising food animals; there is no indication that the referendum vote aimed to weaken these protections. Experience shows that, in the absence of strong oversight, administration change can invite development of a culture which is business-friendly to the extent of forgetting the importance of enforcing limits on what it can do. Business interests that lobby for a weakening EU regulation, or an inclination to do so within Government, must be counterbalanced by appropriate regulation. The EU Withdrawal Bill must introduce appropriate governance mechanisms to replace the supervisory and oversight influence of the European Commission.

3.2 Key examples of where these fundamental needs have implications for public health and UK agriculture, are as follows:

- i) withdrawal from Euratom, which has implications for the supply and transport of radioisotopes for scientific research, medical diagnostics and cancer treatments. Appropriate regulations need to be in place to allow the import of these essential radioisotopes from the EU²⁰.
- ii) a number of diseases previously limited to the tropics are moving across continental Europe due to climate change. For example, Bluetongue, which infects livestock, and African Horse Sickness, both transmitted by insects, are just two examples of viral diseases which, given the right conditions, have the potential to become endemic in UK animal populations. We need to collaborate with EU reference laboratories working on these diseases to prepare for, and prevent, related and significant impacts on animal health, welfare and productivity, with knock-on effects for human society and the economy. A similar situation is true for UK plant populations.
- iii) EU reference networks play a key role in tackling rare, low prevalence and complex human diseases²¹.

Further to this, the UK's departure from the European Union is likely to result in the relocation of EU Reference Laboratories hosted in the UK – for example, the Reference Laboratories on transmissible spongiform encephalopathies (e.g. BSE) and avian influenza housed in the UK Animal and Plant Health Agency.^{22,23} Losing these Reference Laboratories, and access to those hosted in other EU member states, is likely to entail a loss of expertise and specialist knowledge.

Additionally, there has been a global effort to harmonise medicines regulation among regulators in different regions, e.g. the EMA, FDA (US Food and Drug Administration) and PMDA (Japanese Pharmaceuticals and Medical Devices Agency) to ease and speed the cost of

²⁰ BMA Brexit Briefing: Euratom and Brexit: <http://www.europarl.europa.eu/cmsdata/134202/bma-briefing-euratom-and-brexite.pdf>

²¹ European Reference Networks; Working for patients with rare, low-prevalence and complex diseases:

https://ec.europa.eu/health/sites/health/files/ern/docs/2017_brochure_en.pdf

²² TSE-LAB-NET: TSE European Union Reference Laboratory <https://science.vla.gov.uk/tse-lab-net/>

²³ FLU-LAB-NET: An EU funded Avian Influenza programme <https://science.vla.gov.uk/flu-lab-net/>

medicines discovery and development. At present the UK is an integral part of European regulatory frameworks. Our membership has helped to drive effective regulation to speed up patients' access to new medicines, through schemes such as PRIME.²⁴

Post-Brexit, the UK should remain committed to these efforts, and to the EMA, to the closest extent possible, and preferably via continued collaboration between the UK Medicines and Healthcare Products Regulatory Agency (MHRA) and the EMA. Failure to cooperate very closely with the EMA would likely see significant restrictions quickly imposed on exports to the EU – a major market. Non-cooperation with the EMA would also require the establishment of a UK equivalent to approve new medicines, resulting in a costly duplication of effort; the findings – and hopefully the standards – of the review process for medicines should not change according to the regulatory authority.

Life scientists in the UK also contribute significantly to EU-level agencies other than the EMA. The UK is an important source of expertise and advice for the European Centre for Disease Control and Prevention (ECDC) and the European Food Safety Agency (EFSA). It is important to note that these agencies operate across life science disciplines, drawing upon expert knowledge of human health, animal health, microbiology, and food- and agri-science, to name a few.

For example, monitoring and combating diseases such as SARS, Ebola, and international outbreaks of lethal E. coli (such as the Shiga toxin-producing E. coli O104:H4) at the EU level is the responsibility of the ECDC. There is a two-way exchange of information on infectious diseases between the UK and ECDC at regular intervals, and many UK citizens are employed by this organisation. Care must be taken to ensure that the flow of information to and from the ECDC continues after Brexit. Likewise, food safety at the EU level is the responsibility of EFSA. As a significant proportion of food consumed in the UK is imported, not just from EU Member states but also from countries outwith the EU, it is vital that the safety of such foods continues to be assured. Many UK citizens are either employed by EFSA, or are members of EFSA expert panels, and play a significant role in contributing to food safety and to animal health. It is vital to the UK that such co-operation continues.

The Society for Applied Microbiology (SfAM), and the British Pharmacological Society (BPS), both member organisations of the Royal Society of Biology, provide in their separate responses to the Brexit Summit inquiry further specifics on the importance of maintaining UK connections with the network of European Union Reference Laboratories and European Union Agencies.

Many UK companies in the life sciences sector also have subsidiaries or close links with companies in the rest of the EU. For instance, plant breeding companies have operations in warmer parts of the EU to shorten breeding programmes. Plant breeding is an application of life sciences on which we depend to maintain an adequate food supply, and it is vital that Brexit negotiations accommodate the operations of these systems.

Following enactment of the EU Withdrawal Bill, attention will also turn to the status of genome editing, regulation of Genetically Modified Organisms (GMO) and other applications for genetic technologies- for example in agriculture. There is community interest in ensuring that

²⁴ PRIME: priority medicines. http://www.ema.europa.eu/ema/index.jsp?curl=pages/regulation/general/general_content_000660.jsp

regulations can accommodate advances in this field since the current EU approval process is viewed by many scientists as burdensome and dissuading innovation. Brexit presents an opportunity to rethink the regulatory framework for the latest plant breeding methods, including the use of genetic modification (GM). This would enable scientists and farmers to use more of the available tools to produce food that has safe and beneficial characteristics in terms of nutrition, yield, or environmental impact. Changes to regulation in this area could reinvigorate science in biotechnology and crop protection, although internationally-harmonised criteria would be required to facilitate trade. However, this must be addressed in the full consideration of public, political and economic concerns and acceptability with full/ proper information sharing and communication. Legislative changes post-Brexit may allow the UK to develop a unique position in this area. All regulation should be balanced to protect public and ecosystem health, and to preserve trade and collaborative research with other EU nations.

Appendix 4

4.1 Continued support for curiosity driven, translational and applied research and development programmes, in combination with support for productive and effective business interaction at all stages, is needed to maintain the strong and economically viable knowledge-base of the UK. It must be noted that the OECD average for R&D as a proportion of GDP across Europe (EU28) is 2.38%²⁵, and based on this, the UK has some ground to make up to meet the level of support in other EU countries. However, as a result of the 2017 Autumn and Spring Budget funding pledges, UK investment in R&D is nearing 2% of GDP by 2020. This is an increase that would be welcomed by the RSB and we strongly encourage the attainment of a higher level as soon as possible. Research support will become ever more important to enable UK competitiveness and collaboration post Brexit.

Our members suggest that, often, risk aversion to investment (particularly related to fundamental and translational research (e.g. early phase drug discovery), and lack of awareness of opportunities, are two very important causes for the lower rates of fixed capital investment in the UK. Improved incentives and information would likely aid investors in the decision-making process. Brexit is likely to increase uncertainty, a clear Industrial strategy could decrease it.

In relation to the UK science job market, enabling movement of skilled workers between countries helps to reduce skills gaps, and needs to be retained as far as possible after Brexit. A free flow of people from Europe and beyond (including North America) helps to deliver business and technical leadership. In scientific research, the UK benefits from the opportunity for its researchers (especially at post-doctoral stage) to move abroad and return with new skills. Marie Skłodowska Curie Fellowships are designed to facilitate international movement of early-career researchers, developing skills and experience.²⁶ The current EU Horizon funding programmes²⁷ allow for researchers to work in multi-disciplinary fields and enable exchange and networking

²⁵ Campaign for Science and Engineering, R&D investment factsheet; updated December 2016; URL: <http://www.sciencecampaign.org.uk/our-work/investment/r-d-investment-factsheet.html>

²⁶ Marie Skłodowska-Curie Actions: individual fellowships. http://ec.europa.eu/research/mariecurieactions/about/individual-fellowships_en

²⁷ Horizon 2020. The EU Framework Programme for Research and Innovation. <https://ec.europa.eu/programmes/horizon2020/>

between associated countries. The Government should aim for the fullest possible participation in EU funding schemes such as Horizon2020 and the Marie Skłodowska-Curie actions.

The UK also benefits from attracting international talent, but this has become significantly harder since the UK Government committed to exiting the European Union. There are many examples demonstrating that international researchers feel less welcome and so are choosing to leave the UK or to not work here in the first place. For example, among the 5,000 Spanish researchers in the UK, a survey circulated in late 2016 found that 30% had already changed their plans as a result of the Referendum, and a further 43% were waiting for negotiations to begin before making a decision.²⁸ Although there are polls showing considerable support among the British public for researchers coming to the UK,^{29,30} more must be done to incentivise the influx of international talent, for example through removing student numbers from immigration statistics. Allowing foreign graduates trained in the UK to remain and use their skills in this country will benefit the research base, as well as linking in to academic and industrial contacts around the world. Further, retention of workers in the UK who are currently considering relocation because of Brexit is a concern, with the danger of a ‘brain drain’.

4.2 Intellectual property (IP) is also an often complicated but pertinent issue, especially in relation to collaborations between business and academia. The role of IP in innovation policy should be considered alongside the Industrial Strategy, to enable appropriate protection to stakeholders, especially in light of Brexit and the resultant changes in EU collaborative networks that may ensue. IP advancements can be aided by improving the speed of obtaining IP and reducing the costs of their validation. One example of an initiative that could address these issues is the European Community Patent or “European patent with unitary effect”³¹, which, even post Brexit, the UK could seek to be involved in. Continued support for this is essential, to reduce the cost of protecting inventions made in UK academia and business. It is currently significantly faster and cheaper to obtain a patent in the USA, for example, than in Europe, despite a similar population size. The cost of validating a patent in each European nation state is prohibitive for universities and small businesses. The Scottish universities’ single IP agreement across all institutions to simplify IP issues for business is also an example of good practice, as is the Lambert toolkit³²; industry sectors could be encouraged to do something similar.

Further to this, many EU laws and regulations affect the life sciences sector in a positive way. For example, the British Society for Plant Breeders (BPSB) has spotted a major problem around how plant variety rights operate and generate royalty payments, which could mean that rights owners would lose their income stream in the UK post Brexit if this were not addressed.

²⁸ The future of Spanish researchers in the UK, conditioned by Brexit. http://sruk.org.uk/wp/wp-content/uploads/2017/07/20170324-brexitepress-release_web.pdf

²⁹ New ComRes poll: majority of British public would like to see the same number or more international students. <http://www.universitiesuk.ac.uk/news/Pages/majority-of-british-public-would-like-to-see-same-number-or-more-international-students.aspx>

³⁰ Immigration: keeping the UK at the heart of global science and engineering. Report by the Campaign for Science and Engineering (CaSE), 2016. <http://www.sciencecampaign.org.uk/resource/casemmigrationreport2016.html>

³¹ https://ec.europa.eu/growth/industry/intellectual-property/patents/unitary-patent_en

³² The Lambert Toolkit; URL: <https://www.gov.uk/guidance/university-and-business-collaboration-agreements-lambert-toolkit>

Many plant breeding companies are global and make investment decisions from outside the UK about where to place breeding programmes globally, influenced by a generally long plant breeding timescale. The UK currently has a good pre-competitive environment that is attractive. However, should the 'Brexit effect' on variety rights not be appropriately addressed, this would be a crisis for the industry. Steps need to be taken urgently by Defra and other bodies, to give companies confidence to continue investment in breeding in the UK. Enabling related regulations to be harmonised with the EU, or at least to be similar in their creation of an environment as attractive as (or more attractive than) the EU, would be advisable.

The Society welcomes the Committee's inquiry on the Brexit science and innovation Summit. We are pleased to offer these comments, which have been informed by specific input from our members and Member Organisations across the biological disciplines (Appendix 5). The RSB is pleased for this response to be publicly available.

For any queries, please contact the Science Policy Team at Royal Society of Biology, Charles Darwin House, 12 Roger Street, London, WC1N 2JU. Email: policy@rsb.org.uk

Appendix 5: Member Organisations of the Royal Society of Biology

Full Organisational Members

Academy for Healthcare Science
 Agriculture and Horticulture Development Board
 Amateur Entomologists' Society
 Anatomical Society
 Association for the Study of Animal Behaviour
 Association of Applied Biologists
 Bat Conservation Trust
 Biochemical Society
 British Andrology Society
 British Association for Lung Research
 British Association for Psychopharmacology
 British Biophysical Society
 British Ecological Society
 British Lichen Society
 British Microcirculation Society
 British Mycological Society
 British Neuroscience Association
 British Pharmacological Society
 British Phycological Society
 British Society for Cell Biology
 British Society for Developmental Biology
 British Society for Gene and Cell Therapy
 British Society for Immunology
 British Society for Matrix Biology
 British Society for Medical Mycology
 British Society for Nanomedicine
 British Society for Neuroendocrinology
 British Society for Parasitology
 British Society of Plant Breeders
 British Society for Plant Pathology
 British Society for Proteome Research
 British Society for Research on Ageing
 British Society of Animal Science
 British Society of Soil Science
 British Society of Toxicological Pathology
 British Toxicology Society
 Daphne Jackson Trust
 Drug Metabolism Discussion Group
 Fisheries Society of the British Isles
 Fondazione Guido Bernardini
 GARNet
 Genetics Society
 Heads of University Centres of Biomedical Science
 Institute of Animal Technology
 Laboratory Animal Science Association
 Linnean Society of London
 Marine Biological Association
 Microbiology Society
 MONOGRAM – Cereal and Grasses Research
 Community
 Network of Researchers on Horizontal Gene Transfer
 & Last Universal Cellular Ancestor
 Nutrition Society
 Quekett Microscopical Club

Royal Microscopical Society
 SCI Horticulture Group
 Science and Plants for Schools
 Society for Applied Microbiology
 Society for Experimental Biology
 Society for Reproduction and Fertility
 Society for the Study of Human Biology
 Systematics Association
 The Field Studies Council
 The Physiological Society
 The Rosaceae Network
 Tropical Agriculture Association
 UK Environmental Mutagen Society
 UK-BRC – Brassica Research Community
 University Bioscience Managers' Association
 Zoological Society of London

Supporting Organisational Members

Affinity Water
 Association of the British Pharmaceutical Industry
 (ABPI)
 AstraZeneca
 BioIndustry Association
 Biotechnology and Biological Sciences Research
 Council (BBSRC)
 British Science Association
 CamBioScience
 Envigo
 Ethical Medicines Industry Group
 Fera
 Institute of Physics
 Ipsen
 Medical Research Council (MRC)
 MedImmune
 Pfizer UK
 Porton Biopharma
 Procter & Gamble
 Royal Society for Public Health
 Syngenta
 Understanding Animal Research
 Unilever UK Ltd
 Wellcome Trust
 Wessex Water
 Wiley Blackwell