

12 August 2020

Response from the Royal Society of Biology to the BEIS R&D survey consultation on the UK R&D Roadmap 2020

The Royal Society of Biology (RSB) welcomes BEIS' call for views on the Government's UK Research and Development (R&D) Roadmap. Due to the breadth of the biosciences community we support, we have recently published several policy outputs where our recommendations are pertinent to aid Government in developing the proposals in the roadmap into a comprehensive R&D plan. These have been informed by our community of members and member organisations. Alongside this we extend the offer of assistance to the BEIS team, and other involved team members such as those based in UKRI, where we can provide further detail, community expertise and insight to aid development of the R&D plan for the UK.

Summary of key points:

The RSB is pleased to provide comments under headings below and recommends that the best outcomes can be served by a policy that takes a holistic and inclusive approach to the entirety of the R&D landscape in the UK, and its integral national and international network of connections and interdependencies.

In summary we recommend that an R&D Roadmap Government should ensure:

- there is connection and consistency with other relevant frameworks including the 25 Year Environment Plan;
- join-up across government departments to ensure consideration of the importance of procurement decisions for the R&D landscape;
- inter-disciplinarity is encouraged;
- the right regulatory environment, including around genetic resources and technology is established;
- societal objectives and discussion is incorporated early and throughout development;
- talented and diverse people have the opportunities to join and flourish in the R&D endeavour;
- research institutes and other infrastructures are encouraged and included in development planning;
- the UK can play its part in global science and development;
- the road to COP26 is considered to the full in planning and development;
- support for collaboration and data sharing for development.

1. Increasing our knowledge and understanding through research and innovation

1.1. Resources must be directed into the right areas to drive development to meet current and predicted societal challenges (both known and unknown), which are often complex and involve interplay between economic, environmental and social issues. The Roadmap astutely points out that the R&D ecosystem is complex and so an R&D plan must be coherent and efficient, incentivising collaboration rather than duplication. We welcome plans to "ensure the implementation of UK government strategies and policies that impact on R&D, along with devolved administration equivalents – align". To achieve this, a first step should be to **lay down a clear framework – encompassing all other relevant and current national strategies, pillars and plans**, to reduce siloing and maximise joined up work and information sharing across Government, its arm's length bodies and other organisations, nations, sectors, disciplines and communities. Doing so should create a clear drive and focus for R&D effort across our communities, bringing greater impact through the focus of resources. With this in mind, we broadly welcome the Roadmap's pledge, alongside continued implementation of the key

messages of the Government Science Capability Review, and close engagement with UKRI, for Government to “map the UK’s research and innovation organisations to identify potential synergies and to ensure they have the right relationships across the whole of the UK government and devolved administrations [and to] identify where capabilities could be strengthened, linked strategically or where a new organisation may be required to tackle a particular mission”. Successful implementation of this strategy would be a great achievement; establishment of a strong network of CSAs has already provided a step in the right direction, should this be maintained.

- 1.2. The RSB has highlighted in earlier responses to Government’s consultations how investment in the life sciences can contribute towards meeting the Grand Challenges set out in the Industrial Strategy¹ and support UK economic growth². However, we note that although the Industrial Strategy and sector deals³ are explicitly mentioned in the R&D Roadmap, and Government pledges to “look at how institutions can work together on shared objectives, for example achieving net zero carbon emissions” the **25 Year Environment Plan** is not explicitly mentioned. The Society’s responses to recent relevant inquiries and consultations^{4,5,6} provide our positioning and advice on environmental policy in these areas. Given the importance of the challenges of climate change and biodiversity loss to our society – both of which are linked to the pressing challenge of response to the current pandemic and many other emerging infectious diseases – it is paramount that the community agreed aims and planning of the 25 Year Environment Plan be completely intertwined with those of any future R&D Plan for the UK. The same should be said of other linked strategies and plans such as the Clean Air Strategy⁷, in which Government have pledged to make the UK a world leader in technological solutions to address air quality – of clear relevance to an R&D Plan.
- 1.3. A key element of this joined-up, big picture approach will be enabling **interdisciplinary and intersectoral knowledge exchange**, discussion, collaboration and decision-making. We are glad to see a focus in the Roadmap on removing barriers to multidisciplinary collaboration and working closely with structures such as UKRI on further development of cross-disciplinary support schemes facilitating researchers’ access to funding and other resource opportunities for interdisciplinary projects⁸. This in mind, the Society is supportive of the Roadmap’s statement that “we will mandate open publication and strongly incentivise open data sharing where appropriate, so that reproducibility is enabled, and knowledge is shared and spread collaboratively”, since our members see a lack of data sharing as a present concern (for further points on our positioning on open access, see section 5 below), and reproducibility as highly important for efficiency and validity in the system. Combining data from many studies can potentially deliver far more than looking at the results of each study individually. However, agreement on IP and issues over valuation, security and rights to sharing of raw data can prevent or hold up new collaborations. Our members have commented that this can be a problem when data have been obtained in part by Government funding, and so Government could act to clarify sharing policy and practice. The Roadmap statement that Government will “require that

¹ The Royal Society of Biology, (2017). Response to the BEIS Consultation on ‘Building our Industrial Strategy’. Pages 8-11, 12-13. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_BEIS_consultation_Building_our_Industrial_Strategy.pdf

² The Royal Society of Biology, (2017). Response to the BEIS Consultation on the UK Bioeconomy. URL:

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

³ Response from the RSB to the Science and Technology Committee of the House of Lords’ inquiry on Life Sciences and the Industrial Strategy, 2017: https://www.rsb.org.uk/images/RSB_response_Life_Sciences_Industrial_Strategy_inquiry_submitted.pdf

⁴ Response from the Royal Society of Biology to Defra’s consultation on “Health and Harmony: the future for food, farming and the environment in a Green Brexit, May 2018; URL:

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

⁵ Response from the Royal Society of Biology to the Environmental Audit Committee inquiry into the Government’s 25 Year Environment Plan for the Environment, February 2018; URL:

https://www.rsb.org.uk/images/RSB_response_25_Year_Environment_Plan_inquiry_Submitted.pdf

⁶ Response from the Royal Society of Biology to the consultation on Environmental Principles and Governance after EU Exit held by Defra, August 2018; URL: https://www.rsb.org.uk/images/RSB_response_Defra_Environmental_Principles_inquiry_submitted.pdf

⁷ Response from the Royal Society of Biology to the Clean Air Strategy Consultation held by Defra, DHSC and BEIS, August 2018; URL: https://www.rsb.org.uk/images/Policy/RSB_response_to_the_Clean_Air_Strategy_consultation_for_submission_for_the_website.pdf

⁸ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee’s inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.1.1-3, page 4-5. URL:

https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

research outputs funded by the UK government are freely available to the taxpayer” is a step in this direction but may not waylay IP concerns. To facilitate the development of cutting edge techniques and approaches, forged through interdisciplinary connections, there should also be ample opportunities for research personnel including early-career researchers and technical staff to upskill with continued career development and training opportunities, including secondments and apprenticeships. As the Roadmap describes, the response to the COVID-19 pandemic has stimulated novel and interdisciplinary approaches to research and development. The Society has recorded several examples of these on our webpages⁹ and in our information bulletins¹⁰. A panel at our upcoming Policy Lates event on Discovery Research in the era of COVID-19¹¹ will also provide a platform for further discussion and we would be pleased to provide follow-up information to the UK R&D Roadmap team at BEIS, who have been invited to attend.

- 1.4. Achieving a **balance of publicly-funded research across equally important and interdependent fundamental (aka discovery), translational and applied programmes**¹² will also be key¹³. To achieve this balance, there is a huge need for more funding for discovery research in the UK, particularly with uncertainty about future access to EU grants^{14,15}. In many areas of bioscience, long, stable funding periods are necessary to accomplish full projects, for instance in plant and animal breeding¹⁶. The Society therefore welcomes Government’s pledge in the Roadmap to devote a significant proportion of the growing public investment in R&D to increase support for long-range discovery research, balancing this with applied research, development and implementation, and generally supporting projects for a longer timeframe.
- 1.5. Balance to achieve **the right regulatory, funding and social environment to support collaborative and international activity** is also vital. In parts of the life sciences, for instance crop breeding, current strict rules on genome editing are likely to prohibit potential UK growth in this area, and for relevant businesses to base related research in the UK. The announced review of genome editing regulations presents an opportunity to consider how to build on the UK’s strength in this area¹⁷. We are pleased to see the Roadmap recognise the requirement for thorough and early consultation “dialogue” with all communities who stand to be impacted¹⁸ (see section 2) by proposed changes in UK regulations. This consultation should also consider internationally agreed **standards**, the benefits of international alignment for UK overseas collaboration, and the UK’s leading role in ongoing development of best practice in oversight and regulation of novel technologies. Due consideration to this broad dialogue and recognised and agreed standards should be a mainstay of Government’s promised review and changes to evaluation processes to reduce unnecessary bureaucracy and “cutting red tape” in the R&D and related systems.

2. Applying research and innovation for maximum impact

⁹ <https://www.rsb.org.uk/about-us/covid-19/additional-covid-19-resources>

¹⁰ <https://www.rsb.org.uk/about-us/covid-19/covid-19-bulletin>

¹¹ https://www.rsb.org.uk/events?event_id=3067

¹² Response from the RSB to the Science and Technology Committee of the House of Lords’ inquiry on Life Sciences and the Industrial Strategy, 2017: https://www.rsb.org.uk/images/RSB_response_Life_Sciences_Industrial_Strategy_inquiry_submitted.pdf

¹³ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee’s inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.3.1, page 7. URL:

https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

¹⁴ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee’s inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.1.1-3, page 4-5. URL:

https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

¹⁵ [unpublished] Response from the Royal Society of Biology to the Science and Technology Committee (Commons) inquiry into a new research funding agency for the UK.

¹⁶ [unpublished] Response from the Royal Society of Biology to the Science and Technology Committee (Commons) inquiry into a new research funding agency for the UK.

¹⁷ [unpublished] Response from the Royal Society of Biology to the Science and Technology Committee (Commons) inquiry into a new research funding agency for the UK.

¹⁸ The *Growing the Future* Report, 2019: <https://www.rsb.org.uk/policy/groups-and-committees/ukpsf/about-ukpsf/growing-the-future-report>

- 2.1. The direction of any R&D support should be made with a focus on the impact to be achieved (i.e. any development which enables us to tackle pressing societal challenges, such as climate change). Such directional decision-making for supporting R&D should be based on the **joined-up and big picture planning** described in section 1 above and on a thorough understanding of ‘what worked before’.
- 2.2. In terms of the ‘**what worked before**’ there is a risk that a narrow focus on impact intended as commercial applications could encourage a culture of short-termism in which research generating longer term, or alternative beneficial impacts/outcomes to those for commercial application, is neglected. **Stable, long term processes for efficient and collaborative monitoring, recording, assessment and reflection on diverse outcomes** from research across sectors (including training the next generation) should become common place to avoid this¹⁹. With this in mind, we are supportive of Government’s approach as laid out in the Roadmap, that research findings, in the broadest sense, be assessed long-term, informing a system of continuous refinement of research, and that ‘failures’ incurred by a balanced approach to risk where the benefits of investment are worthwhile, are reflected back to influence and direct future R&D support decisions – an approach which can easily make them as useful as the ‘successes’.
- 2.3. The development and sharing of **impact measurement expertise** is likely to be a key component of an effective and efficient system. Additionally, Government should take into account the **existing body of evidence**, such as the Science and Innovation Audits and the Research Excellence Framework, as well as the advice of stakeholders across the research communities to inform decisions on research funding allocations²⁰. The RSB is currently undertaking work on measuring the impact of our activity and would be happy to further engage with BEIS on this topic for shared benefit.
- 2.4. The Society is supportive of a dual support system, which aims to be proportionate and reach a balance between funding in response to specific directional calls from funders, and quality-related funding based on the assessment of research outcomes and impact by the Research Excellence Framework²¹. With this in mind, we welcome Government’s pledge in the Roadmap to refresh their relationship with universities and the broader higher education sector in England, especially in the context of the Roadmap’s stated plan to review the mechanisms used to support university research in England. The RSB hosts a group comprising the Heads of University Biosciences²² across the UK, and we would be pleased to facilitate further engagement on this front. The strong links between universities in England and those in the devolved nations and internationally cannot be underplayed; they do not work in isolation.
- 2.5. The Society is also keen to engage with the plan to create an **Innovation Expert Group**. We predict that this group will be unlikely to provide the right guidance to deliver the broad range of positive impacts society needs from innovation, unless it includes a **wide range of voices with applicable expertise and lived experience**. This can be achieved through representation from, and transparent discussion with, people from diverse backgrounds and communities across society both nationally and with international insight – engendering all important trust in the decisions made and the outcomes produced. **Collaboration and co-development** between researchers (notably including social scientists) and institutions, practitioners and industry, and – importantly – end-users and other affected communities, is fundamental to plan the direction of research, and maintain its trajectory to ensure that it is focused in the right areas so that discoveries can deliver benefits “on the ground” to the communities that require them, while preventing negative externalities as a result. These interactions and relationships must be supported throughout the life of a research project – not merely

¹⁹ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee’s inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.1.1-3, page 4-5. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

²⁰ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee’s inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.1.1-3, page 4-5. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

²¹ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee’s inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.1.1-3, page 4-5. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

²² <https://www.rsb.org.uk/education/hubs/hubs-membership>

at the end of it – to truly drive innovation. End-users in particular should take active roles in shaping projects at the outset, maintaining links with researchers during projects to ensure that innovations are relevant and useful, and after completion to inform impact assessments²³. These processes of consultation, in addition to evidence-based decision making processes, are imperative to consider trade-offs and needs in the fullest sense – including how the legislative and regulatory environment in the UK meets the requirements of international partnerships to enhance research, as mentioned in section 1 above²⁴.

3. How can we encourage innovation and ensure it is used to greatest effect, not just in our cutting-edge industries, but right across the economy and throughout our public services?

3.1. The Roadmap makes clear that Government is aware that the ‘**translational/ start-up gap**’ in sources of funding for research in early stages of commercialization still persists²⁵. Lack of adequate resourcing in technology transfer compounds the lack of attractive, sustainable careers for bright and competent individuals from diverse backgrounds²⁶. We are pleased to see that procurement is accepted as underutilised in the Roadmap, with steps mapped to make better use of this lever. As part of Government’s plan to unlock funds to finance growth in innovative firms, following the Patient Capital Review, Government attention could indeed be targeted at providing stronger “innovation pull” by using public-sector procurement strategically, for instance encouraging procurement teams to spend on innovative ideas and linking them with researchers, funders and potential end-users from the start of projects. Lessons from Small Business Research Initiative (SBRI), which attempts to create demand pull through procurement, could be instructive; feedback from users and industry has been mixed, and there is a perception that public procurement budget holders are risk averse²⁷. Targeting resource at **training and skills** development will also be an important pillar in the system. The UK is already an attractive destination for investment because of its creative and skilled science base²⁸. However, training could encourage a more innovative mind-set, early. We hear comments that, in contrast to those in some other countries, UK schools, colleges and universities tend to train students to be employees, but do not provide skills in entrepreneurship, business development or awareness of the applications of science to encourage students to become employers or innovators. It is suggested that in consequence fewer are willing to take on the risk of launching their own businesses²⁹. The Roadmap notes this shortage of skills, and this is an area in which the RSB and other learned societies, in addition to other membership organisations across sectors, and the academies, could provide assistance in assessing areas for development in curricula and training, also alongside equally relevant skills for sustainable environmental development.

4. Ensuring talented and diverse people hold R&D roles

4.1. A strong focus on nurturing talent in the next generation must be accompanied by balancing focus on attraction and retention of skilled individuals³⁰ and those with potential, at all qualification and

²³ [unpublished] Response from the Royal Society of Biology to the Science and Technology Committee (Commons) inquiry into a new research funding agency for the UK.

²⁴ Response from the RSB to Professor Adrian Smith’s call for evidence on future frameworks for international collaboration on research and innovation, 2019: https://www.rsb.org.uk/images/RSB_Response_to_Professor_Adrian_Smith_Evidence_Call_for_submission.pdf

²⁵ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee’s inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.1.1-3, page 4-5. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

²⁶ [unpublished] Response from the Royal Society of Biology to the Science and Technology Committee (Commons) inquiry into a new research funding agency for the UK.

²⁷ [unpublished] Response from the Royal Society of Biology to the Science and Technology Committee (Commons) inquiry into a new research funding agency for the UK.

²⁸ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee’s inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.4.2, page 7. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

²⁹ [unpublished] Response from the Royal Society of Biology to the Science and Technology Committee (Commons) inquiry into a new research funding agency for the UK.

³⁰ The Royal Society of Biology Response to the Science and Technology Committee of the Commons’ inquiry on an immigration system that works for science and innovation, May 2018; URL:

professional levels, and from diverse backgrounds, across the STEM community. Amongst the factors that must be considered are: (a) supportive immigration policies³¹, especially after the UK exit from the EU (including the functions of the new Office for Talent) (b) policies that support potential and current STEM students and UK scientists to readily access equipment and knowledge exchange facilities (such as conferences) locally and overseas; and (c) support for positive movements between different sectors, such as academia and business^{32,33}.

- 4.2. We welcome Government's pledge to continue to work with the academies' wealth of expertise and experience, in the delivery of priorities in this area, and others set out in the Roadmap. Funding mechanisms should also actively seek to take advantage of the UK's strength across the charity and not for profit sector whose skills, knowledge and networks also underpin innovation and champion accessibility, inclusivity and diversity. Many organisations are very successful in providing specific support to underrepresented communities to study and work in STEM, and their tried and tested initiatives could be scaled up for greater effect³⁴. Some of these form part of the extended community of the Royal Society of Biology, including the Daphne Jackson Trust which works to provide opportunities to researchers to return to work at a level commensurate with their skills and experience after a career break for family, caring or health reasons. In practice the majority of those the Trust assists back to research careers are women; this contributes to addressing the gender and diversity gap in STEM³⁵. Another example is In2scienceUK, which "empowers young people from disadvantaged backgrounds to achieve their potential through life changing opportunities that give them insights into STEM careers and research"³⁶. EDIS³⁷, the Science Council³⁸ and the RSB³⁹ itself also collaborate and provide routes for collation, sharing of best practice to promote diversity, inclusivity and accessibility across our communities.
- 4.3. The COVID-19 pandemic and response has further thrown light on the growing wealth of evidence^{40,41} documenting inequalities suffered by underrepresented communities in STEM, and in many cases may have acted to exacerbate this disproportionate effect, for example including further imbalances in opportunity, access, support and career progression for black scientists, women, those with mental health problems, and those with caring or childcare responsibilities. Such inequality of opportunity can take many forms and is directly tied to research culture. Wellcome⁴² and others, including the Nuffield Council on Bioethics⁴³, have created a body of work on research culture, the learnings from which

https://www.rsb.org.uk/images/Policy/RSB_response_to_HoC_STC_An_Immigration_system_that_works_for_science_and_innovation_inquiry_for_submission.pdf

³¹ The Royal Society of Biology has also co-signed [a statement](#) highlighting costly visa must not hold back UK research and innovation. The RSB acknowledges progression of UK research is reliant upon a mix of domestic and international talent, therefore we have joined the research and innovation sector to call on Government to build an immigration system that cements the UK as attractive to global talent at all levels:

<https://www.immunology.org/sites/default/files/Costly%20visas%20must%20not%20be%20a%20barrier%20to%20boosting%20UK%20research%20and%20innovation%20-%20Statement%20from%20the%20RI%20sector.pdf>

³² The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee's inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.1.1-3, page 4-5. URL:

https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

³³ Response from the RSB to Professor Adrian Smith's call for evidence on future frameworks for international collaboration on research and innovation, 2019: https://www.rsb.org.uk/images/RSB_Response_to_Professor_Adrian_Smith_Evidence_Call_for_submission.pdf

³⁴ Response from the RSB to Professor Adrian Smith's call for evidence on future frameworks for international collaboration on research and innovation, 2019: https://www.rsb.org.uk/images/RSB_Response_to_Professor_Adrian_Smith_Evidence_Call_for_submission.pdf

³⁵ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee's inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.9.2, page 13. URL:

https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

³⁶ <https://in2scienceuk.org/>

³⁷ EDIS: <https://edisgroup.org/>

³⁸ <https://sciencecouncil.org/professional-bodies/diversity-equality-and-inclusion/>

³⁹ <https://www.rsb.org.uk/plan/2096-biosciences-for-all>

⁴⁰ https://royalsociety.org/-/media/Royal_Society_Content/policy/projects/leading-way-diversity/picture-uk-scientific-workforce/070314-diversity-report.pdf

⁴¹ The Society sponsored the 2016 [Athena Survey of Science Engineering and Technology](#) (ASSET); a web-based survey of experiences surrounding gender equality in STEM and the intersections with ethnicity, sexual orientation, disability and age.

⁴² <https://wellcome.ac.uk/reports/what-researchers-think-about-research-culture>

⁴³ The Nuffield Council on Bioethics, (2014). The culture of scientific research in the UK. Available at: <https://www.nuffieldbioethics.org/publications/the-culture-of-scientific-research>

Government should take into account when developing the People and Culture Strategy discussed in the Roadmap.

- 4.4. Many highly capable people may be deterred from pursuing particular careers in, for example, medicine or academic science, by a career pathway that can entail many years of short-term jobs, relatively low pay, relocation and uncertainty before obtaining a stable job, due to the short term nature of some contracts and the lack of permanent academic posts. This can be especially difficult for young couples or families⁴⁴.
- 4.5. At PhD level, many current PhD students are experiencing inevitable delays due to lack of current access to labs and inability to undertake travel/fieldwork. It is therefore going to be necessary to offer them extra time to complete and many organisations which fund PhD studentships (such as small charities) have strictly limited funding available, together with the potential for reduced income in the ongoing pandemic context. Increased funding needs for existing students may have impact on provisions for the next generation, unless adequate contingency and support mechanisms are made available – this is an area in which Government could consider providing assistance for long term benefit. Undergraduate student debt is also likely to be a discouraging factor for students from lower socio-economic backgrounds looking to apply for PhD posts.

5. How should we ensure that R&D plays its fullest role in levelling up all over the UK?

- 5.1. The Society is keen to engage on the Government's plans for an R&D Place Strategy and is a supporter of CaSE and their recent highly relevant work on The Power of Place⁴⁵.
- 5.2. Development of UK research and innovation must take into account the needs of devolved nations, through effective, efficient and wide-ranging community consultation and decision making. This includes the need to build regional research capacity to the level of international competitiveness⁴⁶. We are pleased to see the Roadmap makes a pledge to work closely with devolved administrations, and more broadly has a focus on “reviewing the geographical balance of decision makers and advisory boards” and leadership to ensure diverse perspectives. The membership of the Royal Society of Biology is affiliated with a network of branches⁴⁷ across the UK and abroad, and we would be pleased to help in this endeavour. The RSB Scotland Branch, for example, hosts a policy advisory network.
- 5.3. There are of course already successful R&D centres developing outside of the ‘golden triangle’, which provide good examples of successful support for investment in different parts of the UK. However, other parts of the UK show it is not always necessary for research establishments and businesses to be physically clustered or in a geographical hub to leverage the expertise and research assets that are within partner institutions⁴⁸. We welcome the statement made in the Roadmap to “consider the opportunities provided by publicly funded research institutes” since these are located across the country, including outside of the London-Oxford-Cambridge triangle, and they could act as catalysts for specialised research in their remit⁴⁹.

6. How should we strengthen our research infrastructure and institutions in support of our vision?

- 6.1. To achieve maximum impact and longevity from research in diverse regions, there must be sustained investment in, and access to, infrastructures and facilities that enable research to take place, for

⁴⁴ [unpublished] Response from the Royal Society of Biology to the Science and Technology Committee (Commons) inquiry into a new research funding agency for the UK.

⁴⁵ <https://www.sciencecampaign.org.uk/resource/placereport.html>

⁴⁶ Response from the RSB to Professor Adrian Smith's call for evidence on future frameworks for international collaboration on research and innovation, 2019: https://www.rsb.org.uk/images/RSB_Response_to_Professor_Adrian_Smith_Evidence_Call_for_submission.pdf

⁴⁷ <https://www.rsb.org.uk/regional-activity>

⁴⁸ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee's inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.1.1-3, page 4-5. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

⁴⁹ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee's inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.6.3, page 10. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

example: transport and communication links; biological resource collections; reference and high-containment laboratories; and databases and cloud infrastructure for genomic and other data.

Investments and funding agreements should ensure to build-in this baseline long-term support and supply for maintenance, development and training⁵⁰, and we are glad to see a point made on this in the Roadmap, alongside plans for a National Digital Research Infrastructure, for further community engagement. Our members have also stressed the importance of supporting staff scientists and technicians towards sustainable careers in infrastructure and service provision⁵¹.

- 6.2. The R&D Plan should also support access to valuable resources and world-leading facilities that are not available in the UK, and which bring research groups together to share resources at scale, across disciplines. Future R&D funding environments must consider the needs of the fullest range of disciplines across the life science and STEM sectors, and beyond, and provide efficient and effective access to EU and global infrastructure, funding, skills and expertise at every level and stage of the research and development (R&D) cycle. An example of this in action is the H2020-funded Centre of Excellence in Computational Biomedicine (CompBioMed)⁵². Infrastructure should also include follow-on funding for impactful collaborative projects, for example those instigated by international PhD students or fellows studying and working in the UK, this option is included in some of the Marie Skłodowska-Curie Fellowships^{53,54,55,56}.

7. Global collaboration

- 7.1. Since the UK does not exist in isolation, careful consideration should be given to a UK R&D plan in the context of broad international frameworks and agreements. The Society welcomes Government's pledge in the R&D Roadmap to make science, research and innovation across the UK central to tackling the major challenges we face – with focus on the **UN Sustainable Development Goals** - and taking advantage of opportunities while continuing to contribute internationally for example through Official Development Assistance (ODA) schemes. Maintenance and further development of our international contributions to society is key. Appropriate and clear links for shared outcomes should also be made between an R&D Plan for the UK, and international strategic efforts such as the **Paris Climate Agreement, building on the UNFCCC, and the UN Convention on Biological Diversity**, not least since the UK will be well placed to lead discussions and initiate partnerships for related innovation, when hosting **COP26** in 2021. If the current pandemic has taught us anything, it is that we are a global community, and no problem for society is solved anywhere until it is solved everywhere.

- 7.2. **Collaborative sharing of research data and other outputs, including due access to the benefits derived** from research for involved communities⁵⁷, is also key to the UK remaining partner of choice for international collaboration in research and development. An example of the need for collaboration,

⁵⁰ Response from the RSB to Professor Adrian Smith's call for evidence on future frameworks for international collaboration on research and innovation, 2019: https://www.rsb.org.uk/images/RSB_Response_to_Professor_Adrian_Smith_Evidence_Call_for_submission.pdf

⁵¹ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee's inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.9.3, page 13. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

⁵² <https://www.compbioed.eu/>

⁵³ Response from the RSB to Professor Adrian Smith's call for evidence on future frameworks for international collaboration on research and innovation, 2019: https://www.rsb.org.uk/images/RSB_Response_to_Professor_Adrian_Smith_Evidence_Call_for_submission.pdf

⁵⁴ Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee inquiry on Brexit, Science and Innovation: Preparations for 'No-Deal', January 2019; URL:

https://www.rsb.org.uk/images/Policy/RSB_response_to_the_HoC_STC_Brexit_Science_and_Innovation_Preparations_for_No-Deal_for_submission.pdf

⁵⁵ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee's inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.9.3, page 13. URL:

https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

⁵⁶ Response from the RSB to the Science and Technology Committee of the House of Lords' inquiry on Life Sciences and the Industrial Strategy, 2017: https://www.rsb.org.uk/images/RSB_response_Life_Sciences_Industrial_Strategy_inquiry_submitted.pdf

⁵⁷ Response from the Royal Society of Biology to a request from Defra for views and information on potential implications of the use of Digital Sequence Information on genetic resources for the three objectives of the Convention on Biological Diversity and the objective of the Nagoya Protocol on Access and Benefit Sharing, July 2017; URL:

https://www.rsb.org.uk/images/article/policy/RSB_response_Defra_call_for_comment_on_DSI_and_Nagoya_protocol.pdf

which is of particular significance during the current pandemic, is the fact that access to patient records across the EU is required for many drug trials, especially for differing genetic backgrounds and rare diseases.⁵⁸ We are in favour of the development of innovative publication policies that deliver open access, and which are constructed with a view to: improving discoverability of research; assuring its long-term archiving; and promoting its availability for data mining and further research by researchers across bioscience disciplines and beyond. By transitioning to Open Access, the increased accessibility of resources will also lead to great engagement for early career scientists thus inspiring the upcoming generation.⁵⁹

- 7.3. Innovations in the open sharing of data and research outcomes internationally has taken on a new pace in response to the current pandemic, with many examples of benefits derived. However, this has come with challenges. Government's ongoing work alongside UUK on guidance for protecting sensitive information is noted, however, there are also challenges in relation to the assessment and value of the information itself, for example through peer review of research outputs – which can be difficult to achieve appropriately at pace. While we are pleased to see support for further development of diverse and modern methods of peer review and evaluation mentioned in the Roadmap, we flag that funding mechanisms must incorporate **resilient structures for efficient and effective peer review, which link assessment with international initiatives**. This will also provide an opportunity to design a system to promote a healthy research environment and build international trust and prestige as an outcome⁶⁰.
- 7.4. Historically, the UK has been instrumental in supporting the development of improved standards of research practice in partner countries, such as in the field of animal welfare⁶¹. Collaborative mechanisms for continued development and alignment of international **standards** must also be maintained in the application of research, this is particularly pertinent to the delivery of biosecurity strategies and measures in tandem with international partners, in the face of the COVID-19 pandemic.
- 7.5. The role played by international collaborations in supporting discovery research should also be considered carefully. For example, large-scale multi-national research consortia play a proportionally large role in some areas – e.g. physiology – and therefore the capacity to engage in these collaborative exercises is relatively important for these areas of bioscience.⁶² Current EU funding also encourages industry collaboration at a much earlier stage than many current UK funding programmes. There is also considerable support available for working with small and medium-sized enterprises (SMEs), as well as developing spinouts and start-ups from the project. For these reasons and others, it is imperative that the UK fully associates with **Horizon Europe and other EU funding schemes**⁶³. The Government's planned fall-backs including the Discovery Fund are well directed but unfortunately not equivalent⁶⁴.
- 7.6. The Roadmap does not anywhere mention the **Commonwealth**. The Commonwealth, with 54 countries, is another long established source of collaborations. Many of their leaders (political, academic, industrial) have been educated in the UK and maintaining these links gives the UK access

⁵⁸ Response from the RSB to Professor Adrian Smith's call for evidence on future frameworks for international collaboration on research and innovation, 2019: https://www.rsb.org.uk/images/RSB_Response_to_Professor_Adrian_Smith_Evidence_Call_for_submission.pdf

⁵⁹ Response from the Royal Society of Biology to the UK Research and Innovation (UKRI) Open Access Review Consultation, May 2020, URL: https://www.rsb.org.uk/images/Policy/RSB_response_to_UKRI_Open_Access_Review.pdf

⁶⁰ Response from the RSB to Professor Adrian Smith's call for evidence on future frameworks for international collaboration on research and innovation, 2019: https://www.rsb.org.uk/images/RSB_Response_to_Professor_Adrian_Smith_Evidence_Call_for_submission.pdf

⁶¹ The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee's inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.7.7, page 11. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

⁶² The Royal Society of Biology, (2018). Response from the Royal Society of Biology to the House of Commons Science and Technology Select Committee's inquiry on Balance and effectiveness of research and innovation spending. Paragraph 2.4.3, page 8. URL: https://www.rsb.org.uk/images/article/policy/RSB_response_to_HoC_STC_inquiry_on_research_and_innovation_spending_submitted.pdf

⁶³ The RSB has pledged its support to a new statement setting out how negotiators could secure an agreement on UK participation in Horizon Europe, alongside more than 100 other organisations and researchers: https://wellcome.ac.uk/sites/default/files/reaching-agreement-uk-participation-horizon-europe.pdf?utm_content=bufferb78f2&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer

⁶⁴ https://ec.europa.eu/research/participants/data/ref/fp7/90400/guideline-third-country-participants_en.pdf

to overseas development opportunities. Our members place importance on Commonwealth Scholarships which fund PhD students^{65,66}.

We would like to thank BEIS for this welcome opportunity for the community to engage on the initial Roadmap for the UK's ambitious new R&D Plan.

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.*

Appendix

* A full list of the member organisations of the Royal Society of Biology can be found here: <https://www.rsb.org.uk/membership/organisational-membership>

Collated published responses from the Royal Society of Biology to previous consultations and inquiries can be found in our online and searchable Policy Resource Library: <https://my.rsb.org.uk/item.php?orgresourceid=1>

⁶⁵ <http://cscuk.dfid.gov.uk/about-us/>

⁶⁶ <https://commonwealthfoundation.com/grants/>