

ABPI submission to the Wellcome Trust and Royal Society Future Partnership Project consultation

What does an “ambitious and close partnership for research and innovation” look like in practice?

A. Introduction

- A1. The Association of the British Pharmaceutical Industry (ABPI) is grateful for this opportunity to share evidence with the Future Partnership Project team.
- A2. The ABPI represents innovative research-based biopharmaceutical companies, large, medium and small, leading an exciting new era of biosciences in the UK. We represent companies who supply more than 80 per cent of all branded medicines used by the NHS and who are researching and developing the majority of the current medicines pipeline, ensuring that the UK remains at the forefront of helping patients prevent and overcome diseases. Globally our industry is researching and developing more than 7,000 new medicines (1).

B. Elements that underpin successful partnerships

Question 1: Thinking of existing models, agreements, or international partnerships, what features have made them a success?

Access to the best talent

- B1. The UK’s position as a leader in Life Sciences is underpinned by the ability to attract, develop and retain a highly skilled workforce. A key feature of this has been the ability for talented people to move and collaborate freely.

The UK’s leading institutions attract the brightest students from around the world. This talent pool provides the fuel for UK start-ups. Big pharma are drawn to this combination of a thriving start-up ecosystem and skilled workforce - one reason that the UK currently “punches above its weight” as a base for global pharma companies within Europe. In a virtuous cycle, this further drives the UK’s highly skilled Life Sciences talent base.

The next wave of medical innovation will create new, highly skilled roles across the value chain, from R&D to advanced manufacturing. Taking advantage of this opportunity places a renewed imperative on developing the UK talent pipeline for the skills of the future. However, there will always be a need to access talent from abroad. The inability to do this would be a fundamental challenge to the UK’s position as a world-leading Life Sciences environment, ultimately risking the long-term erosion of the UK science base.

IMI – a UK-EU collaboration case study

- B2. Collaborations are increasingly essential to reach the necessary scale for breakthrough discoveries. The UK currently plays a leading role in EU-wide collaborations; for example, leading the highest number of Innovative Medicines Initiative (IMI) projects which speed up the development of better and safer medicines for patients, boosting innovation in Europe (2).

B3. The IMI, launched in 2008, is the world's largest medical research Public Private Partnership (PPP), bringing together the pharmaceutical industry with academia, small and medium sized enterprises (SMEs), and others, to accelerate medicines discovery and development. To date, the UK has received 28% (€302.8m) of total IMI funding from the EU commission, the largest amount of any country (2).

The overarching goal of IMI1 was 'significantly improving the efficiency and effectiveness of the drug development process with the long-term aim that the pharmaceutical sector produce more effective and safer innovative medicines' (3). The recent successes of IMI have been attributed to:

- The principle of open innovation, which means creating a dynamic, networked, multi-stakeholder, collaborative innovation ecosystem;
- Expanding its stakeholder base to draw in a wider range of expertise and knowledge;
- Acting as a neutral broker in order to help project partners overcome challenges and deliver results that could not have been achieved without the public-private partnership model (3).

C. The shape of an ambitious new partnership

Question 2: What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

EU research funding & collaboration programmes

C1. The UK has been one of the largest recipients of research funding in the EU. The EU Horizon 2020 Framework Programme has a total budget of €75bn (2014-20) for all EU member states (4). Between 2007 and 2013, the UK received a total of €8.8bn in direct EU funding for research, development and innovation activities (4).

Recent analysis shows that the UK's share of Horizon 2020 funding decreased by 20.5% between 2015 and 2017. This may be, in part, attributed to the uncertainty that the UK leaving the EU presents to a number of potential European partners (5).

C2. The ABPI welcome the UK Government's commitment to underwrite funding beyond the date the UK leaves the EU for Horizon 2020 projects approved while the UK is an EU member (6). Subsequently, we welcome the joint agreement with the EU Government that the UK will continue to participate in the Union programmes financed by the Multiannual Financial Framework (which includes Horizon 2020) until their closure (7). This will hopefully lead to a reversal in the downward trends since existing projects are guaranteed funding and the eligibility for UK participants to apply to participate will be unaffected.

C3. However, the future beyond 2020 is uncertain. The UK/EU government joint report from December 2017 stated the UK "may wish to participate in some Union budgetary programmes of the new MFF post-2020 as a non-Member State" (7). Access to EU R&D funding could be retained, for example, through the UK gaining "associate member" status for Horizon 2020's successor (as achieved by Switzerland and Israel for Horizon 2020). This would also allow UK-based academics to lead and participate in EU-wide collaborations.

C4. As discussed in the response to question 1, Horizon 2020 also supports a range of public-private partnerships, which the UK is involved in. For example, the IMI, the world's largest medical research PPP, which brings together the pharmaceutical industry with academia, SMEs and other stakeholders to accelerate the discovery and development of new medicines.

Recommendation: The UK should seek to negotiate continued access to long-term European funding and collaboration programmes for science, through:

- Reaching an agreement to maintain access to the successor of Horizon 2020 and EU collaboration programmes;
- Seeking continued participation in the European Investment Bank (EIB) and European Investment Fund (EIF), including shareholding, financial contributions and, as a result, a seat at the Board. This will be the most effective way equity for UK Venture Capital can be maintained.

Mobility of researchers and access to talent

C5. Currently, non-UK EU nationals make up around 17% of Science, Technology, Engineering and Mathematics (STEM) academics at UK research institutions (8). The UK's position as a leader in Life Sciences is underpinned by the ability to attract, develop and retain a highly skilled workforce. This is particularly crucial in skills gap areas such as clinical pharmacology and bioinformatics. The ability to attract top talent will be critical if the UK is to become a leader in emerging skills areas e.g. device technologies, digital health, physiological modelling, genomics and advanced manufacturing.

C6. As the UK leaves the EU there needs to be a UK immigration system that is needs-based, straightforward and rapid – not just for EU but also for other workers. The Life Sciences Sector Deal stated the government will change immigration rules to enable world-leading scientists and researchers endorsed under the Tier 1 (Exceptional Talent) route to apply for settlement after three years; make it quicker for highly-skilled students to apply to work in the UK after finishing their degrees; and reduce red tape in hiring international researchers and members of established research teams, by relaxing the labour market test and allowing the UK's research councils and other select organisations to sponsor researchers (9).

Recommendation: The UK should seek to negotiate an agreement with the EU that facilitates the ease of movement for highly skilled talent in Life Sciences, through:

- Delivering a UK immigration system that is needs-based, straightforward and rapid;
- Agreeing a reciprocal arrangement with the EU that facilitates ease of movement for scientists, researchers and highly-skilled workers, maintaining current systems such as the Intra-company Transfer process;
- Guaranteeing the rights of scientists, researchers and highly skilled EU citizens already in the UK, alongside securing the rights of UK citizens working and operating in the EU.

A common regulatory framework with Europe

C7. A robust and harmonised regulatory framework will be important in order to facilitate research partnerships and collaboration.

Recommendation: For the mutual benefit of patients and the life sciences sector in the UK and the EU, the UK should seek to negotiate alignment and commonality with the EU for the regulation of medicines, through:

- Seeking a regulatory cooperation agreement between the UK and EU;
- Agreeing continued alignment of current and future regulations;
- Ensuring continued UK participation in EU regulatory processes and supervision of medicines, e.g. the Falsified Medicines Directive.

Practical steps to achieve such a partnership

Question 3a: What practical steps are needed to realise the overall model you describe in Question 2?

C8. To summarise the previous answers and recommendations, the following factors are key to driving success of future research collaborations:

- Involving a wide range of experts to draw on a broad range of knowledge;
- A neutral co-operative platform for collaboration;
- Shared objectives with strong governance structures;
- Flexible funding structures;
- Data sharing to accelerate innovation or reduce cost.

Question 3b: Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

C9. Factors which may affect the ability to implement a shared vision on research and innovation include:

- Poorly defined objectives;
- Limited mobility of researchers;
- Regulatory divergence on clinical trials and data;
- Reduced access to funding and collaboration programmes.

C10. In order to protect public health and patient safety in the UK and EU, an implementation period is necessary to accommodate the considerable changes needed to make the changes ultimately required by a new UK-EU partnership framework for research and innovation.

D. References

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Sections of text for this response were drawn from the following reports / previous responses, the full versions of which may be of interest:

UK EU Life Sciences Steering Committee. Maintaining and growing the UK's world leading Life Sciences sector in the context of leaving the EU [Internet]. 2016. Available from: <http://www.abpi.org.uk/media/1375/uk-eu-steering-group-report.pdf>

Association of the British Pharmaceutical Industry & BioIndustry Association. Written evidence from the Association of the British Pharmaceutical Industry (ABPI) and the BioIndustry Association (BIA) to the Health Select Committee inquiry on Brexit – medicines, medical devices and substances of human origin [Internet]. 2017. Available from: <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/health-committee/brexit-the-regulation-of-medicines-medical-devices-and-substances-of-human-origin/written/71991.pdf>

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January 2018

Introduction

The Academy of Medical Sciences promotes advances in medical science, and works to ensure that these are translated into healthcare benefits for society. Our elected Fellowship includes the UK's foremost medical science experts drawn from academia and industry. This submission is informed by the expertise of our Fellowship and elements have been adapted from our previous work, including submissions to relevant Select Committee inquiries and joint work with the Wellcome Trust on EU Regulation of Research and Innovation.

Elements which underpin a successful partnership

The most successful models of collaboration are those which are driven by shared scientific interests and objectives. This "bottom up" approach supports the involvement of best people to deliver a project. Successful collaborations are built on mutual trust and respect between research partners which is best achieved by a self-organising approach.

This does not, however, preclude appropriate intervention by Governments and other actors. For example, it is the role of these organisations to create the conditions that facilitate collaborative and productive relationships. This can include a range of policies and practices, from immigration systems which support movement of researchers and their dependants, to the creation of collaborative partnerships, which bring together individuals to discover shared scientific interests. These facilitating factors, with specific examples where appropriate, are explored in more detail below.

Ease of movement of research personnel

A key facilitator of international collaboration is the ease of movement of researchers between participating countries. This must encompass researchers at all levels and career stages, from established world-leaders to early career researchers, PhD students as well as technicians and support staff. It must allow for short term visits between collaborators, secondments and placements, and long-term or permanent relocation. Whilst productive collaborations and scientific relationships do not necessarily require long-term residency, a permissive immigration system must form part of a concerted approach to ensure that the UK remains, and is seen to remain, open to researchers from both within and outside the EU. This must also include wider environmental factors such as access to healthcare and education systems.

A fair, transparent and efficient immigration system is required not only to support academic research, but also the highly international workforces of research-intensive private companies.

Alongside an appropriate immigration system, funding which supports movement of researchers at different stages of their career can have transformative effects, particularly on early career researchers. These opportunities can expose individuals to different research cultures, practices and ideas and can drive the establishment of lifelong collaborations. Existing EU programmes funded by the Marie Skłodowska-Curie actions (MCSA) such as Individual Fellowships and Innovative Training Networks

represent some of the most productive examples of these schemes.¹ UK-based researchers have been highly successful in securing these awards in recent years, for example UK universities host the highest number of Marie Skłodowska-Curie fellows.² Continued access to these or similar schemes should form part of the future partnership.

Funding and infrastructure that is accessible to all partners on equal terms

International research collaborations are supported by mutually accessible funding streams. EU Framework Programme funding facilitates a range of activities which cannot be supported at a national level, these include funding for multinational consortia, such as through the Future and Emerging Technologies programmes or the European Research Council (ERC), through its Synergy Grants, which support joint bids from between 2 and 4 Principal Investigators.^{3,4} Schemes such as the Innovative Medicines Initiative (IMI) link academia and industry. IMI provides access to expertise of over 7,000 researchers across Europe and 55 public-private consortia, facilitating access to regulatory bodies, associations and patient organisations from around Europe. It would be challenging to replicate these examples on a national scale.

Alongside these consortia, ERC grants now provide a significant proportion of the individual grants awarded to UK-based researchers and are firmly established as an important stream of funding for UK researchers.⁵ ERC grants provide important support at different career stages through Starting, Consolidator and Advanced grants. Recipients of these grants are able to recover up to 100% salary, providing increased flexibility for their recipients. In addition, Academy Fellows believe that these awards provide an important marker of international excellence that cannot be matched by national funding sources.

The Academy believes that the UK should seek to attain the closest possible relationship with future EU Framework Programmes, as an essential component for securing successful future partnerships with EU27. A clear commitment from the UK that we wish to continue to participate in EU Framework Programmes must be accompanied by ongoing financial commitments. The Government's pledge for financial contributions that will cover the continued participation in the remainder of Horizon 2020 is welcome, although certain existing programmes, such as IMI, extend beyond this date. There must be a seamless transition into the future partnership such that existing collaborations are not jeopardised or negatively affected by any period of uncertainty.

The future involvement of the UK in EU Framework Programmes should include the continued ability of UK-based researchers to participate on equal terms, including the ability to lead and shape specific programmes. At present, the UK is an attractive research partner due to its excellent research base and research infrastructure. This is enhanced by the ability of UK researchers to fully participate in EU framework programmes. Erosion of this ability to participate would be detrimental to the attractiveness of the UK as a research partner. As stated in the report of the European Commission's High Level Group on maximising the impact of EU Research & Innovation

¹ https://ec.europa.eu/research/mariecurieactions/about_en

² Technopolis (2017). The impact of collaboration: The value of UK medical research to EU science and health <https://acmedsci.ac.uk/file-download/32381033>

³ <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/future-and-emerging-technologies>

⁴ <https://erc.europa.eu/funding/synergy-grants>

⁵ Technopolis (2017). The role of EU funding in UK research and innovation <https://acmedsci.ac.uk/file-download/70343877>

Programmes, “Lab-Fab-App”, the “full and continued engagement with the UK within the post-2020 EU R&I programme remains an obvious win-win for the UK and the EU”.⁶

In addition, a future partnership should provide ongoing access to shared EU infrastructure. For example, European Research Infrastructure Consortium (ERIC), provide a special legal status to facilitate shared research infrastructures. At present 14 ERICs exist, including the Biobanking and biomolecular resources research infrastructure (BBMRI) ERIC, which pulls together biobanks from around the EU into a pan-European facility. This allows access to collections of partner biobanks and biomolecular resources, as well as their expertise and services.⁷ UK access to existing ERICs should be protected and provisions made to consider participation in future consortia.

Harmonised Regulation

A continued close relationship in research and innovation will be greatly facilitated by regulatory alignment with existing EU regulations. The UK has employed a science-led, risk-proportionate approach to earn public confidence in the regulation of research and innovation. By employing this approach the UK has successfully promoted better research regulation in the UK and EU. Following EU exit, the UK’s ability to influence future EU regulation will be diminished. However, the future partnership between the UK and EU27 should place a value on harmonisation to existing and incoming regulation. Regulatory divergence in the future, where deemed appropriate by the UK, would not be precluded by this broad approach.

At present clarity is urgently required for those operating under existing regulations, particularly within clinical research and the pharmaceutical sector. Illustrative examples of how this should be achieved are provided below.

Use of animals in research

Shared regulations for the use of animals in research, as governed by the EU Directive 2010/63 and implemented in the UK through the Animals (Scientific Procedures) Act (ASPA) 1986 Amendment Regulations 2012 have provided a common framework for research using animals across the EU. This harmonisation has raised the required standards of welfare across the EU, facilitating pan-European collaboration and enhancing the attractiveness of the UK for commercial research involving animals.

The UK should maintain the existing standards to protect animal welfare, ensure public support and permit collaborative research. In the longer term, ASPA must keep up to date with emerging science, and the UK’s relationship to EU regulation should be monitored to allow the UK to diverge at a point in the future if necessary.

Clinical trials

The UK coordinates the third highest number of pan-European clinical trials and the highest number for rare and childhood diseases.⁸ This collaboration is supported by harmonised frameworks for conducting multinational trials. As therapeutic interventions become increasingly targeted to individuals, research must be based on smaller patient cohorts making international collaboration essential. Thus, collaboration is not only

⁶High Level Group on maximising the impact of EU Research & Innovation Programmes (2017) LAB – FAB – APP, Investing in the European future we want https://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/hlg_2017_report.pdf

⁷ <http://www.bbmri-eric.eu/BBMRI-ERIC/about-us/>

⁸ Technopolis (2017). The impact of collaboration: The value of UK medical research to EU science and health <https://acmedsci.ac.uk/file-download/32381033>

important for patients with rare diseases, but for patients across Europe. Therefore, harmonisation to the incoming EU Clinical Trials Regulation and access to the portal that it will create should be prioritised by the UK.

Licensing of medicines, medical devices and in vitro diagnostics

The European Medicines Agency (EMA) is able to issue a single approval licensing a product across the EU. This approval from the EMA provides access to approximately 25% of the global pharmaceutical market. The UK alone represents approximately 3% of the global market. Nevertheless, the UK's Medicines and Healthcare products Regulatory Agency (MHRA) provides substantial support to the EMA, acting as Scientific Advice Co-ordinator in at least 20% of EMA medicine approvals and conducting a substantial amount of work in inspection and enforcement standards on behalf of the EMA.⁹ Continued collaboration between the two agencies would be mutually beneficial.

Alongside the licensing of new drugs, the EMA also conducts post-marketing efficacy and pharmacovigilance studies across the EU. For example, the agency coordinates pharmacovigilance data from 28 member states through its EudraVigilance database. The UK has robust data collection which adds significant value to the data captured in this database. Recent trends to accelerate approval regimes, have seen innovative medicines enter the market at earlier stages in their development. These innovative licensing schemes further necessitate the need for evaluation of risk-benefit profiles on the basis of much smaller clinical trial data. Therefore, the rigorous collection, monitoring, and evaluation of post-licensing safety and efficacy data becomes increasingly important.¹⁰ This is best conducted at an international level and is currently facilitated by the EMA.

New EU legislation to regulate medical devices and In vitro diagnostics (IVD) will come into force in 2020 and 2022 respectively. This legislation represents an improvement on existing regulation, providing a more robust regulatory framework for devices, including more emphasis on evidence generation around their effectiveness. There is strong support in the sector for maintenance of regulatory alignment for devices between the UK and EU. A survey by the Association of British Healthcare Industries found that only 3% of members who responded supported regulatory divergence with the EU.¹¹

In addition, continuity in the CE marking system will ensure that products developed in the UK continue to be recognised in the EU and around the globe, and that products developed in the EU can continue to be recognised in the UK. This is important to maintain NHS patient access to innovative devices, and facilitate access for UK device companies to the EU and broader market. The system of Notified Bodies granting CE marks should therefore be maintained and mutual recognition of the existing UK Notified Bodies should be explored.

Challenges

Securing UK participation in future EU Framework Programmes will be subject to certain tensions, in particular the adherence to the principle of freedom of movement. It is promising that the recently published Lab-Fab-App report, called for future framework

⁹ Technopolis (2017). The impact of collaboration: The value of UK medical research to EU science and health <https://acmedsci.ac.uk/file-download/32381033>

¹⁰ EL Jackson, P Feldschreiber, and A Breckenridge (2017), Regulatory Consequences of "Brexit" for the Development of Medicinal Products. *Clinical Pharmacology and therapeutics*, Vol. 102, no. 2

¹¹ <http://www.abhi.org.uk/membership/members-area/updates/2017/july/impact-of-brexit-2017-member-survey-results/>

programmes to be “open to the world”, by opening association to the best and participation to all.¹² A globally facing Framework Programme 9 should allow full and continued participation of the UK.

Whilst it is likely that the ability of the UK to formally influence future research programmes will be diminished from outside the EU, active UK participation through non-governmental channels must continue. This should include contact through specialist societies, Academies and European umbrella bodies, such as the Federation of European Academies of Medicine.

Recent announcements have provided welcome clarity that the jurisdiction of the European Courts of Justice will continue during the implementation period. This is absolutely necessary to provide time to adapt to future arrangements. However, the transition period will only be useful if the future requirements are established early on in the negotiations. For example, in the pharmaceuticals sector uncertainty around the mutual recognition of qualified persons in batch testing of medicines is driving organisations to invest in facilities outside the UK. This is necessary to ensure that medicines manufactured in the UK can continue to be sold within the EU in the event that mutual recognition of qualified persons is not achieved. This would not be a desirable outcome, but indicates that pharmaceutical companies are being forced to make decisions in the absence of clarity on future relationship to ensure secure supply chains in the long-term.

Additionally, regulatory harmonisation will depend not only on enshrining of EU standards in UK law through the EU (withdrawal) bill, but the ongoing relationship with the relevant EU bodies and agencies, such as the EMA, the European Chemicals Agency and ultimately the European Courts of Justice. A pragmatic solution must be found enabling, for example, the MHRA to operate as a sovereign regulator, whilst maintaining an ongoing relationship and equivalence with the EMA. The recent concessions over citizen’s rights and the ability to make technical referrals to the ECJ may offer a potential model.

Finally, the UK and EU negotiators might consider placing scientific collaboration and a shared research and innovation partnership at the forefront of negotiations. This mutually beneficial outcome would achieve an optimal outcome for research, innovation and patients across Europe as well, perhaps, as paving the way for a productive future partnership in other areas.

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¹² High Level Group on maximising the impact of EU Research & Innovation Programmes (2017) LAB – FAB – APP, Investing in the European future we want
https://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/hlg_2017_report.pdf

Future Partnership Project

AMRC response to the Wellcome Trust and Royal Society's
call for evidence
January 2018



The Association of Medical Research Charities (AMRC) is a membership organisation of the leading medical and health charities funding research in the UK. We represent 140 medical research charities including the Wellcome Trust, Cancer Research UK, the British Heart Foundation and Arthritis Research UK. In 2016, at least eight million people donated to medical research charities.¹

Our submission to the Wellcome Trust and Royal Society Future Partnership Project highlights examples of successful international partnerships that our member charities are involved in. With each example we present key underpinning success factors that could be drawn on in shaping the UK's future partnership with the EU.

Summary

Elements that underpin successful partnerships

- Successful international partnerships that AMRC members have been involved have a number of common features:
 - mechanisms and means to share data;
 - recognition of the assets that charities bring to partnerships;
 - utilisation of charity assets including their ability to align partners around an unmet patient need, ensuring that the patient voice is at the heart of the partnership, providing funding and bringing together scientific expertise;
 - pooling international academic expertise and patients, particularly in rare disease research with low patient numbers; and
 - regulatory alignment for clinical trials and medicines across EU member states.

The shape of an ambitious new partnership

- It is vital that the UK's future research and innovation partnership agreement with the EU recognises the key role of charities in the UK's medical research landscape.
 - Since 2008 charities have invested over £11 billion in UK research to save and improve the lives of patients.
- It is vital that patient involvement is included as an element of a future research and innovation partnership agreement between the UK and the EU.

Practical steps to achieve such a partnership

- As negotiations continue to determine the UK's new relationship with the EU, **it is vital that the deal reached ensures that there is no negative impact on patients**, both within the UK and across the EU.
- This means patients must be able to continue to participate in vital pan-EU clinical trials; have speedy access to new medical innovations; experience no disruption in the supply of medicines and treatments and, crucially, patient safety must not be compromised.

Elements that underpin successful partnerships

Question 1 - Thinking of existing models, agreements, or international partnerships, what features have made them a success?

Case study 1: International Cancer Research Partnership (ICRP)

¹ <https://www.cafonline.org/about-us/publications/2017-publications/uk-giving-report-2017>

Established in 2000, [International Cancer Research Partnership](#) (ICRP) is a unique alliance of cancer organisations working together to enhance global collaboration and strategic coordination of research.

ICRP partners are from Australia, Canada, Europe, Japan, United Kingdom, and the United States. Partners share funding data with the ICRP in a common format.

ICRP maintains the only public source, worldwide, of current and past grants, totalling over \$50 billion in cancer research since 2000 from 22 ICRP Partners and 124 international funding organisations.

The UK's National Cancer Research Institute (NCRI) is a partner and other UK organisations involved include Cancer Research UK, Bloodwise, Prostate Cancer UK, Tenovus, the Department of Health and the Medical Research Council. The French government's DGOS-Ministère de la Santé is also involved.

The partnership aims to improve access to information about cancer research being conducted and enable cancer organizations to maximize the impact of their independent efforts, for the benefit of researchers and cancer patients worldwide.

Features contributing to success:

- A key feature of the partnership is the ability to share data; the development of underpinning agreements with a clear description to facilitate this was crucial.
- The initiative is viewed as an equal partnership based on a truly collaborative process. Membership fees are tiered but small organisations are treated in the same manner as large organisations. Each organisation has an equal vote.
- Government and non-profit organisations are given equal opportunities to participate and there is recognition that the main player in a country may not be a Government funder. For example the ICRP's UK partner organisation is NCRI (non-profit), while the US partner is the government – the National Institutes of Health (NIH).

Case study 2: The Dementia Consortium

The [Dementia Consortium](#) brings together the voluntary, academic and private sectors in order to tackle the growing problem of dementia.

The Consortium seeks to end the ten-year wait for a new dementia treatment by closing the gap between fundamental academic research and the pharmaceutical industry's drug discovery programmes. It provides funding, expertise and resources to support new drug targets emerging from academic research that hold the promise of patient benefit.

The partnership between the private and non-profit sector includes AbbVie, Alzheimer's Research UK, Astex, Eisai UK, LifeArc, Lilly UK and MSD. It represents a new model for translating medical charity research into treatments for patients.

The Consortium supports collaborative target validation and drug discovery projects from academia and SMEs. It seeks promising research from academia and considers appropriate funding and development routes. Once complete, successful projects may be moved towards the clinic by industry, and all parties share in the success.

Features contributing to success:

- Alzheimer's Research UK was crucial in establishing the consortium and plays a key leadership role in bringing partners together and catalysing investment.
- The charity acts as point of coalescence, aligning partners around the unmet patient need and ensuring that the patient voice is at the heart of the partnership.

Case study 3: The Everest Centre for Research into Paediatric Low Grade Brain Tumours

The Everest Centre, based in Heidelberg, Germany, was set up in June 2017 as a result of a £5 million investment from The Brain Tumour Charity. It will fund several research projects to increase understanding about paediatric low grade brain tumours and trial new treatments.

The collaboration represented by the centre is the first time that paediatric low grade brain tumours have been investigated in a co-ordinated international programme in Europe. It will bring together renowned international researchers from the German Cancer Research Institute (DFKZ), UCL Great Ormond Street Institute of Child Health and Queen Mary University of London.

As part of this programme, researchers within the centre are working with the European Society of Paediatric Oncology to run a clinical trial called Low Grade Glioma in Children (LOGGIC). LOGGIC is the first clinical trial to undertake ongoing assessments of the burden of tumours and corresponding treatments on aspects of quality of life including visual and neurological function.

Over the course of its seven year term, the trial aims to recruit 4,000 participants, which would make it the largest brain tumour trial globally. The funding from The Brain Tumour Charity will enable the LOGGIC clinical trial to be able to recruit patients at an earlier stage in the term.

Features contributing to success:

- International collaboration is crucial to pooling academic expertise and patients in a rare disease area with low patient numbers.
- The collaboration is underpinned by the regulatory alignment for clinical trials across EU member states.
- The collaboration recognises the assets brought by the charity partner – The Brain Tumour Charity – in providing funding, bringing together scientific expertise and ability to share and access data.

Case study 4: Critical Path for Parkinson's

The [Critical Path for Parkinson's](#) (CPP) was developed from a partnership between Parkinson's UK and the Critical Path Institute² in the US in 2015.

By facilitating global collaboration among scientists from the bio-pharmaceutical industry, academic institutions, government agencies, and patient-advocacy associations, the CPP aims to serve as the main international vehicle to develop new, regulatory-endorsed drug development tools based on the most current scientific insights into early Parkinson's. It combines detailed patient data; expertise in clinical trials from companies and academia; and the unique neutral facilitator role of non-profit organisations.

CPP has collected and standardised patient-level data from Parkinson's patients around the world to develop a global integrated unified database. CPP aims to achieve global regulatory endorsement of novel translational biomarkers and drug disease trial models for use in clinical drug development trials.

Features contributing to success:

- Parkinson's UK view that a number of enabling agreements underpin the CPP including: an individual funding agreement to manage the consortium (UK law); and a wider consortium agreement – including data sharing and governance (US law).
- CPP develops drug development tools through established regulatory processes with cooperation and involvement of both the FDA and the EMA.

² The [Critical Path Institute](#) is an independent, non-profit organisation dedicated to bringing scientists from the FDA, industry and academia all together to collaborate and improve the drug development and regulatory process for medical products.

- The CPP recognises the value that non-profit organisations bring to partnerships. Parkinson's UK provides not only funding but scientific expertise and key datasets. The patient perspective that Parkinson's UK provides also brings a unique and urgent driving force to the project.

Case study 5: myAirCoach

[myAirCoach](#) is an EU-funded project under Horizon 2020 (grant agreement No. 643607). The project started on the 1 January 2015 and will last for 3 years.

The project aims to develop an asthma monitoring system using personalised mHealth. One of the main goals of the project is to help patients manage their health through user-friendly tools that will increase their awareness of their clinical state as well as the adherence and effectiveness of medical treatment they follow. myAirCoach will create an ergonomic and compact sensor-based inhaler that will be connected with the patients' smart devices. Through them, the central system of myAirCoach will analyse the data and propose tailored asthma plans.

The project is pan-EU and the study will help pool resources to develop a rigorous proof of concept that will work in multiple countries rather than just one.

Asthma UK led on the patient and public involvement (PPI) for the project. This involved establishing the user needs requirement to ensure that the project is aiming to solve problems posed by people with asthma and making sure it addressed genuine need.

The myAirCoach Consortium consists of 12 complementary partners from 6 different EU countries, namely Greece (Thessaloniki, Patras), UK (London, Manchester), Germany (Frankfurt (Oder)), Netherlands (Leiden), Sweden (Solna, Danderyd) and Belgium (Brussels).

Features contributing to success:

- The study benefits from having a standardised set of regulatory rules around areas such as data protection and clinical trials. This allows the study to function in an easier format and builds on the close links between different European partners rather than focusing energies on aligning different rules and practices across multiple countries.
- The involvement of Asthma UK ensures that patients are involved in the development of the project and that it has the potential to result in maximum patient benefit.

The shape of an ambitious new partnership

Question 2 - What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective?

Recognition of the medical research charity sector as key partners

It is vital that the UK's future research and innovation partnership agreement with the EU recognises the key role of charities in the UK's medical research landscape. Since 2008 charities have invested over £11 billion in UK research to save and improve the lives of patients.

In 2016, AMRC's members:

- invested over £1.6 billion of research funding in the UK - more than either the Medical Research Council or National Institute for Health Research;
- made capital investments of £86 million in the UK;
- funded the salaries of over 17,000 researchers in the UK; and
- recruited 170,000 patients into clinical trials funded by charities.

Furthermore, key assets within the medical research charity sector extend beyond financial commitments. Of particular importance are the assets possessed by charities in:

- understanding and implementing patient priorities and perspectives;

- providing access to patient communities, particularly rare disease communities; and
- functioning as 'honest brokers' to bring together key partners and catalyse innovative collaborations.

Inclusion of patient involvement

The role of charities in bringing the patient voice and perspective to research collaborations is particularly important. It is vital that patient involvement is included as an element of a future research and innovation partnership agreement between the UK and the EU.

Horizon 2020 includes patient involvement³ and the European Medicines Agency also has good patient involvement within its structures.⁴ Patients and consumers are involved in many activities at the EMA, ranging from reviewing information prepared by the Agency on medicines, to being involved in the preparation of guidelines, to taking part in scientific advisory groups and being members of the EMA's scientific committees. There are also many patient organisations across the EU (represented by the European Patients Forum⁵) that represent the patient voice.

Medical research charities can contribute a richness of information to these efforts. The UK has a distinct environment whereby charities fund research and represent the patient voice. This combination allows charities to work across the research and innovation pathway.

Only patients, their families and carers can really understand what matters when a disease is diagnosed and hopefully treated or managed. Charities are in a prime position to listen to this voice, to highlight patient needs and act as the conduit between the communities they represent and the researchers undertaking studies.

The following case studies illustrate how AMRC members include the patient voice in the research they fund.

Case study 6: Kidney Research UK - patients say prevention, early detection and curing kidney diseases should be research priorities

Kidney Research UK undertook a survey of 2,158 kidney patients to determine the most important priorities in kidney research. Results indicated that discovering a cure for kidney diseases, prevention, early detection and finding new sources for organ transplants, should be the focus for future renal research.

Conducted in October 2016, this was the third Kidney Research UK nationwide patient survey. The survey was open to all UK kidney patients. It was sent to renal units across the UK and additional patients were invited to complete the survey by email and by using social media channels. Respondents were asked to choose their top seven priorities out of 20 renal research topics and to rank them according to importance. The results of the 2016 survey indicated change in patient priorities:

- 'Stem cell research' and 'improving methods of transplantation' moved into the top seven priorities;
- Early stage kidney patients tended to prioritise causes of kidney diseases and postponing the need for renal replacement therapy, whilst transplant patients prioritised improving transplantation; and
- Younger patients prioritised improving methods of transplantation, whilst, as age increased, the focus changed to early detection and prevention.

Kidney Research UK's director of research, Elaine Davies, said: "Patients are at the heart of our research, and it is by actively engaging and listening that we understand what research matters most to them. This survey outcome will influence how we review and set the strategic direction of our future programmes.

³ <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/public-engagement-responsible-research-and-innovation>

⁴ https://www.eupati.eu/patient-involvement/guidance-for-patient-involvement-in-regulatory-processes/#Appendix_1_Roadmap_on_Patient_Involvement_in_regulatory_processes_example_EMA

⁵ <http://www.eu-patient.eu/>

Case study 7: Alzheimer's Society – Implementation grant scheme

Alzheimer's Society's Implementation grant scheme aims to move evidence based interventions into a real-world setting, to translate research into practice. By doing this the Society intends to maximise the benefits of research outputs for people affected by dementia more rapidly.

Research-based interventions supported through this scheme are those that have potential to be delivered within the real world in a sustainable way. Applicants can apply for grants of up to £400,000 over 36 months that will either enable the scale-up of evidence based interventions that have been shown to improve care and are ready to be implemented at a larger scale, or; lay the foundations for the scale-up of evidence based interventions; testing the feasibility of bringing dementia research knowledge into the real world.

As a condition of the grant, applicants must:

- Demonstrate involvement of appropriate end users of the research in the development and delivery of the proposal;
- Proposals must demonstrate sufficient evidence, for example from up to date systematic reviews, that the intervention is ready to be implemented; and
- Use methods for enabling change that are grounded in theory.

Researchers must work in partnership with a decision maker from the organisation where the implementation activity will be taking place and this decision maker must be a named co-applicant on the proposal. Furthermore, at least one person affected by dementia must be listed as a co-applicant on the project.

Practical steps to achieve such a partnership

Question 3 - What practical steps are needed to realise the overall model you describe in Question 2?

As negotiations continue to determine the UK's new relationship with the EU, **it is vital that the deal reached ensures that there is no negative impact on patients**, both within the UK and across the EU. This means patients must be able to continue to participate in vital pan-EU clinical trials; have speedy access to new medical innovations; experience no disruption in the supply of medicines and treatments and, crucially, patient safety must not be compromised.

Medical research charities view that a number of areas should be prioritised:

The UK must be positioned as an attractive destination for global talent and expertise

- Immediate clarification on the status of research and healthcare professionals in the UK in order to mitigate potential damage to the UK's reputation and attractiveness as a place to do research.
- Development of an immigration system that recognises the intrinsically collaborative and international nature of science and research.
- Ensuring that valued individuals within the UK life sciences community – including researchers, innovators, entrepreneurs, legal and regulatory experts, skilled technicians and students – are attracted and retained.

An aligned and compatible regulatory framework between the UK and the EU for medical research must be implemented

- Compatibility with the forthcoming EU Clinical Trials Regulation so that UK patients can continue to be full participants in pan-EU clinical trials.
- Recognition of the importance of pan-EU patient cohorts for rare disease and special population research.
- Consideration of how future regulatory frameworks can continue to foster innovation and support cooperation in a collaborative research ecosystem.

- Continued harmonisation with EU Data Protection laws after the UK exits the EU to ensure continued cross-border data sharing for medical research.

Co-operation with the European Medicines Agency on EU regulatory frameworks and agreements for medicines and medical devices to ensure patients have timely access to new health innovations

- Ensure that patients have early access to medicines by securing maximum co-operation and alignment with the European Medicines Agency (EMA) on the regulation of medicines and medical devices.
- A transitional arrangement with the EU on regulatory frameworks, databases and medicines protocols to ensure a smooth transition and patient safety.
- A phased approach and/or managed transition in relocating the EMA, to avoid delays for patients.
- Pragmatic solutions to allow patients to benefit from the UK's participation in EU systems such as pharmacovigilance and the clinical trials portal and databases post-Brexit.

Continued participation in EU funding programmes and collaborative opportunities to progress the discovery and understanding of diseases and ill-health

- An environment for medical research that enables innovative collaborative research across the UK and the EU for maximum patient benefit.
- Secure predictable access, and ability to shape, EU research programmes and schemes including Horizon 2020 and future programmes such as Framework Programme 9 (FP9).
- Urgent clarity on UK researcher participation in the remainder of Horizon 2020, once the UK leaves the in EU in 2019. Issues of access and eligibility must be resolved before the window of opportunity disappears.
- Special attention on research for rare diseases and special populations to ensure continued close collaboration with EU partners on rare diseases.

Ensuring no disruption in the supply and trade of medicines and other health technologies from day one of the UK's new relationship with the EU

- Ensure that patients do not suffer as a result of possible disruptions in the supply and trade of medicines and other health technologies when the UK leaves the EU.
- An agreement that allows for 'frictionless' trade of medicines and other health technologies as well as medicinal products for clinical trials.

Arthritis Research UK and Arthritis Care response to the Wellcome Trust/Royal Society Future Partnership Project consultation

1. Arthritis Research UK, incorporating Arthritis Care, is the fourth largest medical research charity in the UK and welcomes the opportunity to respond to the Wellcome Trust/Royal Society Future Partnership Project consultation. Arthritis Care and Arthritis Research UK have joined together so that we can do more to help people with arthritis to live full and active lives. We would be pleased to expand on the case study example below and can provide access to those involved in the establishment and running of this international collaboration to support the work of the project.
2. Arthritis and other musculoskeletal are mainly long-term painful conditions with symptoms that fluctuate over time that can significantly impact people's quality of life, limiting independence and the ability to participate in family, social and working life.
3. Arthritis Research UK invests in breakthrough treatments, the best information and vital support for everyone affected by arthritis. We combine cutting edge research and the expertise of people with arthritis to make everyday life better for all 10 million people with these conditions in the UK.¹
4. Over the past decade, Arthritis Research UK has invested more than £200 million into UK research and current funds more than 300 research awards, worth in excess of £120 million across more than 70 institutions in the UK.
5. Arthritis Research UK currently funds £23 million in a range of schemes to support training in research, clinical and allied health professional careers, across 24 different research locations in the UK. Over the past decade the charity has supported over 400 fellows, postdoctoral trainees and students through our centres of excellence fellowships and research grants.
6. Our research portfolio involves a number of international collaborators and collaborations and below we have highlighted just one example of an international partnership between UK, EU and non-EU partners and the factors which drove this collaboration. **Summary points:**
 - **International collaboration is essential in driving forward the musculoskeletal research agenda, especially for rarer forms of arthritis, including inflammatory and juvenile forms of the condition.**
 - **Data sharing agreements with robust oversight are essential to drive forward increasingly complicated meta-analyses of patient data and must be a central component of any framework to guide international collaboration.**

- **Large-scale international knowledge-sharing research collaborations require a number of years to develop trust and systems in order to bring outputs to fruition. The UK Government should ensure that partnership agreements should do not inadvertently lengthen this timeframe through the development of barriers such as significant regulatory divergence or restrictions on free movement of researchers at all career stages.**

Consultation question:

1. ***Thinking of existing models, agreements, or international partnerships, what features have made them a success?***

The Arthritis Research UK Centre for Genetics and Genomics

7. The Arthritis Research UK Centre for Genetics and Genomics demonstrates the value of integrated international collaboration.² The centre was established in 2013 and has established an international reputation for research identifying genetic markers of susceptibility to and outcomes of inflammatory arthritis and for training researchers of the future.
8. Led by the University of Manchester, the centre draws from the knowledge and expertise of their American partners based at The Broad Institute in Boston, Massachusetts as part of their ongoing international relationship. They have also an extensive network of international collaboration from both within the EU (Karolinska University Hospital, Sweden; Universitat Zurich, Switzerland; Universitätsklinikum Erlangen and Goethe University Frankfurt, Germany; St Vincent's University Hospital, Dublin, Ireland), American institutes (Feinstein Institute for Medical Research, New York; Harvard Medical School, Massachusetts; Cincinnati Children's, Ohio) and those further afield. This world-leading centre in the field of arthritis genetics, has not only contributed to leading international collaborative research in the field, but had been critical to its success and driving the research field forward.

International collaboration is essential to advance musculoskeletal research

9. Rheumatoid arthritis is an inflammatory condition and is the second most common form of arthritis in the UK. A third of people diagnosed with rheumatoid arthritis will have stopped work within two years of onset, with the cost of this condition to the UK economy estimated at £3.8 – 4.8 billion.^{3,4} Rheumatoid arthritis develops as a result of a combination of genetic and environmental factors, however little is known about the exact causes of the condition.
10. Through open international collaboration and sharing of data and samples, the Centre for Genetics and Genomics, with their international partners, have identified 101 rheumatoid arthritis genetic risk loci.⁵ Such a comprehensive analysis of genetic data could not be possible without strong collaborations. Through this research, fundamental understanding about rheumatoid arthritis risk and disease processes have been uncovered, along with potential new drug therapies.

Success factors in international collaboration

11. This ground-breaking collaboration arose as a result of the recognition that genetic susceptibility to rheumatoid arthritis could not be fully explained by analysis of available evidence, and the need for studies with larger sample sizes than could readily be identified by one group in order to adequately power studies.
12. Following successful initial sharing of data between UK- and USA-based groups for combined analysis,⁶ additional data from groups in Japan, Sweden and the Netherlands drove a series of meta-analyses and further added to the knowledge base defining the genetic basis of rheumatoid arthritis.^{7,8,9,10}
13. The series of high profile publications resulting from this initial sharing of published data formed the basis for continued stronger collaboration, and UK- USA- and Sweden-based research groups came together to form the Rheumatoid Arthritis Consortium International (RACI) to stimulate and encourage data sharing. Groups agreed to exchange genotype data and basic clinical data with analysis carried out centrally by the UK-based group. This project was managed via telephone conferences and face-to-face meetings. As a result of this, the first analysis based on sharing of *raw* data was published in 2012.¹¹
14. As rheumatoid arthritis data sets have increased in size and complexity, there has been a need to set up a facility to maximise exploitation of the huge investment in collection and analysis of samples, established by the Centre for Genetics and Genomics' collaborators based in the USA at the New York Genome Centre. This facility and service operates based on a Memorandum of Understanding (MOU), which clearly outlines the operation of the facility, including:
 - that all data is held securely in the facility
 - that data depositors can have access to all data but analyses are all carried out remotely
 - that only the results of analyses can be exported
15. Independent researchers can apply for access, and a panel drawn from leading international research experts, including those at the Centre for Genetics and Genomics, considers applications. As the facility allows for storage not just of clinical data, serological results and genotypes but also for sequencing data, it supports data sharing for a range of future research studies.
16. This case study clearly illustrates the importance of ensuring international data sharing can occur in appropriately regulated and centralised manner, and should be considered essential in the formation of any framework to guide international collaboration.
17. In addition, from the initial bilateral collaborative publication to the breakthrough multinational study was a period of approximately six years, highlighting the timeframe required to establish, nurture and grow these large-scale partnerships. Therefore, agreements should seek to ensure that this timeframe is reduced, and not increased. This could be achieved by ensuring further multilateral harmonisation of regulations, guaranteeing free movement of the international research community at every career stage and providing sufficient access to international funding to encourage and support the development of productive and impactful collaborations.

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Professor Enric Banda

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Elements that underpin successful partnerships

Q.1 Thinking of existing models, agreements, or international partnerships, what features have made them a success?

The most successful model is the bottom up (ideas upfront). The Framework Programmes have been partially successful (money upfront). I would **revise the mechanisms of bottom up support to basic research**.

Intergovernmental institutions (CERN, ESA, etc) seem to work reasonably well (difficult to generalise). Some work on a “just return” basis. It is an advantage in terms of agreeability. It is a disadvantage in terms of competitiveness.

Part of the success comes from **generosity** (a value difficult to emerge).

Inclusivity is also a value to take into account in any project that has the ambition to be global

I am not aware of any mechanism that has worked particularly well in innovation (money upfront is fine but not enough).

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective. Please comment how these would be prioritised.

To start with it has to be made clear that the research and innovation system is complex and multicomponent. Therefore **we should think of the whole (eco)system**.

It should also be made clear that research and innovation respond to completely different processes. They have different timings and different needs (e.g. financial). Although the couple may be as an indicator of progress they need different treatment.

Practical steps to achieve such partnership

Q3. What practical steps are needed to realise the overall model you describe in question 2?

Establish a **slim structure able to stimulate collaboration at the basic research level**. Not funding but stimuli.

Ensure legal issues such as **mobility** (including people, pensions, etc)

One way or another, the **UK will have to “buy” Framework Programmes**. It is debatable whether the best model is the one adopted by Switzerland or Norway. Perhaps a more creative system can be thought. However, although the ERC is fine, it may not be enough.

British Council

Global Science Team

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

The British Council, as the UK's international organisation for cultural relations and educational opportunities, has supported science and research exchanges and partnerships between the UK and other countries at the individual and institutional level for many years. One key principle that underpins the success of these partnerships has been the notion of true **mutual benefit**.

As one of the UK delivery partners in the £735 million, 7-year Newton Fund programme funded by the UK Department for Business, Energy and Industrial Strategy, British Council has worked with 18 emerging economies (Brazil, Chile, China, Colombia, Egypt, India, Indonesia, Jordan, Kazakhstan, Kenya, Malaysia, Mexico, Peru, Philippines, South Africa and wider Africa, Thailand, Turkey, Vietnam) to support work that promotes economic development and social welfare through science and innovation partnerships. The feature that sets the Newton Fund apart from many other research programmes of this scale and reach – including the Global Challenges Research Fund – is that all participating countries **co-own, co-fund** and **bilaterally shape** the work programmes.

Building on government-to-government umbrella agreements with the UK that outline tailored and **mutually agreed strategic priorities** for each of the 18 Newton Fund countries, British Council (as well as the other UK delivery partners) enters into partnerships with individual counterpart organisations – including government-level/research funding agencies; national academies; charitable foundations and individual HE/research institutions – to implement individual funding schemes.

In the case of the British Council, these schemes include mobility and capacity building opportunities for early career researchers, bilateral workshops and institutional research collaboration grants, all of which require **matched funding** (in cash or in kind) from the in-country partner organisation and in the majority of cases would involve joint strategic planning and (funding) decision making. In addition, most of our grant schemes require individual applicants to develop and submit their funding proposals jointly with their partners (be that their proposed institutional host, their project partner or their workshop co-Chair). In our experience, it is this joint commitment and a **'hard-wired' requirement to work together from the outset** at programming/funding agency level as well as at project/researcher level that lay the foundation for linkages that continue beyond the lifetime of individual funding programmes.

Another important feature of the Newton Fund that can increase buy-in is that it serves as a **common 'frontend'** or gateway for partner countries to access the entire UK public research funding sector and spectrum of support mechanisms (ranging from PhD-level and early career researcher mobility and professional development opportunities to larger scale research projects and innovation-focussed grant schemes involving industry and the not-for-profit sector). Often, physical manifestations of this 'frontend' would be managed engagement and brokerage events coordinated by a (UK) ministerial representatives in-country to introduce potential partner organisations to their counterparts and to the breadth and diversity of the UK offer available under the Newton Fund banner. The ability to pick and choose from a large array of possible schemes enables partner countries to develop bespoke versions of the Newton Fund tailored to their specific strategic and a suite of activities suitable for their context without – at least initially – worrying about which UK funder is their 'best match'.



Wellcome Trust and Royal Society Future Partnerships Project – Part 2

Response from the British Heart Foundation

January 2018

Key points

- Research is a truly international endeavour. The global nature of research drives excellence, allowing us to share and challenge ideas, promote efficiency and stimulate innovation.
- Negotiations about the future of the UK's involvement in EU-wide research programmes must recognise the contribution of the UK's research community to both research and health across Europe, and acknowledge the increased impact and progress we can achieve in addressing some of Europe's leading health challenges by working collaboratively.
- Many existing successful international research partnerships are underpinned by synergistic expertise between research institutions, ease of mobility for researchers between consortia, the centrality of researchers to decisions about project themes and funding, and the opportunities available for researchers to collaborate with industry.
- Maintaining these practical features will be crucial for the success of any future partnership.

Introduction

- The British Heart Foundation (BHF) is the largest independent funder of cardiovascular research, and the third largest charitable funder of medical research in the UK.
- Each year, thanks to the generosity of our supporters, we fund around £100 million of new research across all four nations of the UK, which accounts for more than half of the funding for cardiovascular research in the UK. Our funding portfolio extends from laboratory science to clinical trials and population studies. We fund people from PhDs to professors as well as investing in large programme and project grants.
- Since the EU referendum in June 2016, we have been working closely with others in the medical research sector to highlight the potential impact of leaving the EU on the UK research environment.
- Health is global, and the BHF's vision for a world where no one dies prematurely from heart or circulatory disease is shared by countries across Europe. The leading health challenges we face in the UK, such as cardiovascular disease, diabetes and cancer, are shared by all EU member states. It is therefore in all of our interests to ensure that we create a research environment that cultivates the very best research and helps us prevent, diagnose and treat these devastating conditions.
- Negotiations about the future of the UK's involvement in EU-wide research programmes must recognise the contribution of the UK's research community to both research and health across

Europe, and acknowledge the increased impact and progress we can achieve in addressing some of Europe's leading health challenges by working collaboratively.

Q1. Thinking of existing models, agreements or international partnerships, what features have made them a success?

1. Research is a truly international endeavour. For the BHF, between 2010 and 2014, almost half of BHF-funded research papers had international co-authors across 95 different countries. The global nature of research drives excellence, allowing us to share and challenge ideas, promote efficiency and stimulate innovation.
2. As a medical research charity funded by the generosity of the British public, the BHF defines the success of research agreements and partnerships in terms of research outputs, i.e. the benefit that the research brings to improving our understanding of the diagnosis, treatment and prevention of medical conditions.
3. As a member of the EU, the UK supports programmes which enable countries to grow their expertise, where research infrastructure is less developed. The BHF recognises that these partnerships can lead to long-term benefits for populations across Europe, where leading public health issues such as cardiovascular disease, diabetes and cancer - and their causes - are prevalent.
4. There is evidence to suggest that international collaboration improves the impact of UK research. Medical research publications that report collaboration between the UK and the EU have a much higher citation impact than those produced in isolation by either the UK or other EU countries alone¹. This also holds true for cardiovascular research publications.
5. Crucially, a number of practical features enable international research partnerships and projects to exist and achieve success:
 - a. **Synergistic expertise:** Productive partnerships depend on different partner institutions providing complementary and mutually beneficial expertise, with each partner 'adding value' to the collaboration as a whole.
 - b. **Mobility:** Researchers, innovators and technicians often need to be able to travel internationally in order to collaborate. Agreements that allow individuals to move freely across borders are important for international research partnerships and projects. Researchers based in one European country often need to have access to high-cost specialist equipment in another. For example, Dr Elisabetta Brunello, a BHF Intermediate Research Fellow at King's College London uses the European Synchrotron Radiation Facility (ESRF) in Grenoble, France for x-ray diffraction work.² Her research looks at ways to optimise the performance of the heart muscle.
 - c. **Involvement of researchers in decisions about thematic research programmes and how they are funded:** Many successful programmes ensure that researchers from across Europe are included in early decisions about project themes and how funding will be allocated. In our researchers' experience, this 'bottom-up' approach leads to better research

¹ Technopolis Group, The impact of collaboration: The value of UK medical research to EU science and health, 2017

² <http://www.esrf.eu/>

outcomes than the ‘top-down’ approach adopted by other existing programmes, in which decisions about funding allocation are made by individuals unconnected from the research theme.

- d. **Long-term stability of the funding partnership:** Partnerships between a funder and researcher should be recognised as an investment in the researcher, as well as the research. Many researchers look at the future prospects for receiving funding and development opportunities through the funding body. Researchers – like all working people – are keen to ensure their work will not be disruptive for their family or personal lives. They look for reasonable certainty that their current funding will last for the medium or long-term (i.e. at least five years). The best researchers tend not to apply for funding if there are no guarantees of its longevity. Prior to leaving the EU, BHF funding was attractive to researchers from across the EU across different specialities and career stages. However, uncertainty about the future of existing sources of funding available to European citizens in the UK after we leave the EU is already starting to impact some excellent researchers’ decisions about applying for funding. The BHF recently ran a survey of 255 BHF-funded researchers across a range of nationalities and career stages. This showed that:
- i. Almost half of BHF-funded researchers are ‘more likely’ to take up a post outside the UK than before the UK’s vote to leave the EU, rising to 80% among non-UK EU nationals.
 - ii. Those who said they are more likely to take up a research post elsewhere cited concerns around availability of funding, the rights of EU nationals, and opportunities for collaboration.
 - iii. 70% of those who have advertised posts in the past year said they have seen a reduction in the proportion of applicants from EU27 countries.
 - iv. The majority of researchers (58%) are less likely to apply for EU research funding following the result of the Brexit referendum.
- e. **Opportunities for researchers to collaborate with industry:** Many Europe-based companies collaborate with UK-based research institutions by providing the latest technical equipment that researchers need. The obvious value of such partnerships for researchers is that they can benefit from access to the latest equipment. Moreover, many researchers want to be involved in the development of equipment that is useful for their research. These partnerships undoubtedly have numerous benefits for manufacturers as well, as they are able to develop equipment using the expertise of researchers. For example, King’s College London’s School of Biomedical Engineering and Imaging Sciences has strong research collaborations with industry, including with Siemens, which funds scientists based at the school. Professor Rene Botnar, a BHF-funded researcher, is joint Interim Head of School.³

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

6. The BHF agrees that all of the elements highlighted in the consultation overview are essential for ensuring that a future partnership is close, valuable and effective: mobility of researchers, innovators, technicians and their families; regulation of research and research outputs; research

³ <https://www.kcl.ac.uk/lsm/research/divisions/imaging/index.aspx>

funding; research infrastructures (physical and digital); and the commercialisation of research outputs.

7. We feel that the most important elements, in order of priority are:
 - a. **Mobility of researchers, innovators, technicians and their families:** Research is internationally collaborative. The most valuable asset in medical research is people's minds. We can have the best equipment and the best research infrastructure, but if we don't have the best minds, we won't have the best research.
 - b. **Access to EU funding:** UK-based researchers and research institutions must continue to be able to access funding from the EU if it is to remain a close, valuable and effective partner. We would like to see the UK remain full partners of such programmes, with UK-based researchers and institutions taking part in the decision-making process and prioritisation of research themes.
 - c. **Regulation of research and research outputs:** There must be harmonisation in how we deliver products to market across Europe – from regulation of research to the licensing of new technologies.
 - d. **Greater involvement of researchers in decisions about thematic research programmes and how they are funded:** A partnership infrastructure that facilitates researchers and innovators from all sectors to share expertise and in-kind research will help to ensure that funding decisions in thematic research programmes are effective and relevant. For funders of basic science research this is particularly important, as it would enable us to help set the research agenda and output aims, rather than just facilitate innovation. The BHF is currently exploring opportunities for funding international strategic challenge-based science and we would welcome a similar model within EU funding programmes.

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

8. **The UK government needs to secure an agreement on ease of movement for UK-funded researchers, innovators, technicians and their families who are EU citizens currently based in the UK.** The status of EU nationals in the UK must be clearly and consistently communicated to those living and working in the UK. After Brexit, we need a simple immigration system that aids the retention, access and movement of those who lead, undertake and support research and innovation including researchers, skilled technicians and healthcare professionals. This must include PhD students.
9. **The UK government must involve UK and European industry bodies in the development of a new partnership between the UK life sciences sector and the EU to ensure a new partnership is valuable for industry.** This could lead to opportunities for research staff to maintain ease of movement between research consortia, and will help to maintain the ability of innovative technologies to flourish that have a strong UK research base.
10. **UK and EU research legislation must remain aligned to prevent the creation of regulatory hurdles and enable future collaborations.** Much of the regulation which governs UK research currently comes from the EU.
 - a. We welcome the Government's pledge that the UK will look to continue to work closely with **the European Medicines Agency** to ensure that patients have access to medicines

as soon as they are available. The needs of patients should be paramount and there should be no negative impact on UK patients' ability to access cutting edge treatments.

- b. The legislative and ethical framework with which we can carry out **cross-border clinical trials** needs to remain coherent. This is particularly important to enable researchers to develop new treatments and technologies that support small patient populations.
- c. The UK government must secure UK research institutions' ability to exchange data with institutions based in the EU on an equal basis.

11. In Brexit negotiations, the UK government must ensure continued UK participation in existing EU research programmes, such as Horizon 2020 and other framework programmes. We believe this is the most effective way for UK-based researchers to retain access to collaborative funding opportunities. While the BHF does not receive funding from the EU, many of the researchers that we fund also receive EU funding to support their research. The European Commission is the largest external source of funding leveraged from BHF-funded research, making up around a quarter of further funding sources.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

12. Resistance to any concession or negotiation on ease of movement, from both within UK government and among the wider UK public.

13. Perception among European researchers and decision-makers that the UK is turning its back on the continent: This will also adversely affect the development of a shared vision, much less its implementation.

14. The UK's technology infrastructure, specifically European technology companies withdrawing their UK bases to the detriment of the wider research infrastructure.

15. Prioritisation of other policy issues in EU negotiations: It is inevitable that the UK government will need to make concessions during the EU negotiations. If medical research and the research and development sector are not prioritised in negotiations, it is likely to adversely affect the implementation of a shared vision on research and innovation.

If you would like any further information on any of these issues, please contact Rosie Collington, Public Affairs Officer (collingtonr@bhf.org.uk).

Cancer Research UK response to the Wellcome-Royal Society Future Partnership Project

Part 2

Cancer Research UK (CRUK) is the world's largest independent cancer charity dedicated to saving lives through research. We support research into all aspects of cancer and this is achieved through the work of over 4,000 scientists, doctors and nurses. In 2016/17, we spent £432 million on research in institutes, hospitals and universities across the UK. We receive no funding from the Government for our research and are dependent on fundraising with the public. CRUK wants to accelerate progress so that three in four people survive their cancer for 10 years or more by 2034.

CRUK is involved in several multi-lateral and bilateral international research and innovation partnerships. We have drawn on our experience in these partnerships to understand what elements make them a success. However, the UK exiting the EU is an unprecedented event. Our response, therefore, represents considered thoughts as well as drawing on examples of initiatives CRUK is involved in. There may be several ways to achieve the same goal, but we have focused on key principles that would support CRUK's work in the future.

We believe a two-part process is required to achieve the best outcome for research and patients:

1. Develop a **framework** for the new relationship between the UK and the EU. This should address the fundamental, underpinning aspects that support research collaboration such as an agreed legislative framework and principles for a mutually beneficial relationship in the long term. This would lay the foundation of a continued close collaboration for research and innovation, and for the development of individual partnerships. *We refer to this aspect as 'framework' throughout.*
2. The development of **individual partnerships** for specific initiatives. Partnerships are generally created for a specific purpose within a given timeframe, and would require bespoke arrangements to ensure success. An example of a specific partnership would be the UK's interaction with Framework Programme 9. *We refer to this aspect as 'partnership(s)' throughout.*

Elements that underpin successful partnerships

Q1: Thinking of existing models, agreements, or international partnerships, what features have made them a success?

A framework for the UK-EU relationship

When identifying potential partners, consideration needs to be given to the feasibility of collaborating with another country (or countries). For example, whether similar regulatory or healthcare systems are needed. Consideration should therefore be given to:

- Aligned regulation, standards, policies and processes: aligned ethical and regulatory standards are necessary to ensure that research collaborations can take place. This includes clinical standards, regulation of clinical trials, ethical patient consent/participation, data

protection, animal research, researcher integrity, diversity and inclusion, and policies regarding intellectual property. For example, aligned ethical standards for using animals in research is essential in funding projects as part of our Grand Challenge. The International Rare Cancers Initiative (IRCI) has found that fundamental differences in practice between the US and Europe have made collaboration in trials for rare diseases unfeasible in some instances.

- Open access and knowledge/data sharing: the ability to share knowledge and data between the different partner countries is necessary to the success of international research. This includes access to and storage of samples and data in places that are accessible to all involved parties. It is not only essential the right agreements enable this data to be shared and stored, but there should also be resource to provide guidance on how to access the data. In our experience in the International Cancer Benchmarking Programme (ICBP), researchers often need guidance to understand what data is available in different jurisdictions and assistance to understand the mechanisms needed to access that data. The ICBP facilitates data sharing between the researchers and the different countries and gives researchers six months to scope out projects properly so they can refine the project and understand what data is available.
- People and building relationships: scientific collaboration relies first and foremost on relationships between researchers. It is essential that researchers and other people involved can travel easily between partner countries as required to ensure collaboration runs smoothly and efficiently. With our Accelerator Award, the partner funder organisations have regularly visited each other and agreed to the principle of staff exchange between funder organisations. The Accelerator Award can also fund collaborative multi-institution training programmes for funded researchers (e.g. lab secondments for PhDs/clinicians in different countries). This should also include meaningful patient and public involvement where relevant to help set priorities.

Partnership considerations

We have drawn on our experience from several international partnerships CRUK is involved in. Further details of these partnerships can be found in **Appendix A**. There are many features and themes – prior to starting a partnership and once initiated - that are consistently mentioned as important in making international partnerships a success.

Early shared priority setting: this is fundamental to the success of any partnership. It is vital that partners agree on what the core global issues are and that this is clearly articulated in an agreement. This should be mutually beneficial to all partners. It is important to first establish “what” the partnership is attempting to achieve before determining “how” this will be achieved.

Clear aims, strategy and governance: once the priorities have been set, clear aims should be defined for the partnership and a coherent strategy developed, agreed and shared. The governance of the partnership also needs to be clear and transparent to ensure success. Any strategy should be monitored and evaluated regularly and there should be procedures in place should there be any disagreement between partners. If there is disagreement over an aspect of the partnership, there needs to be a procedure for resolving this and, if needed, a neutral arbitration procedure if escalated.

Clearly agreed funding model: for any partnership to be successful requires sufficient funding and aligned funding models or processes. In the ICBP, partners pay a contribution into a central funding pot based on the population size of their country to make it fair. The funding needs to be centrally held and flexible enough to support the highest quality research in a way that can genuinely lead to impact. In our experience, problems can arise if there is no central flexible funding model. For example, the IRCI found that multiple funding jeopardy can occur if partner countries agree on a research programme that relies on subsequent agreement from national funders¹. This means that time and resource can be wasted if a national funder decides not to proceed with a particular funding programme. This issue can be avoided if there is central funding that can be spent across all the countries, or if national funders are involved at an earlier stage. As part of the funding model, there also needs to be clear and transparent currency agreements (e.g. fixed exchange rates).

Time and processes to initiate and build relationships: Any funding model should allow time and expenditure for researchers to come together to build relationships and for good collaborative ideas to emerge that are worthy of funding. The Grand Challenge Expression of Interest phase is a good example of this.

Operational considerations in partnership working

Good organisation: to ensure excellence, there should be dedicated resource assigned to organisation and co-ordination. This may take the form of a secretariat or a team dedicated to running any programmes that are part of the partnership. There should be resource to provide any infrastructure necessary to organise and co-ordinate the partnership.

Regular, transparent and co-ordinated communication: successful partnerships have effective and co-ordinated communication. The type of communication that works well will depend on the nature of the partnership but generally communication should be regular and involve elements that are face-to-face, video/virtual/tele conferencing, email/electronic communication, and regular information sharing. The partnership also needs to present a unified front externally.

Appropriate capacity and equitable access to resource and materials: there needs to be sufficient capacity and resource in all partner locations to make the partnership a success. This might include ensuring sufficient overhead costs are covered, time for researchers to participate in programmes, access to patients, access to drugs/investigational medicinal products, access to biological/clinical samples and other materials required to carry out research. If the operating environments in partnership jurisdictions are too different, it will make it more challenging for a partnership to be successful. This will be important when making comparisons in clinical settings and it may make it more difficult to secure buy-in from the clinical community with divergent operating environments.

The shape of an ambitious new partnership

Q2: What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

It is vital that patients and research are prioritised in Brexit negotiations and that the best possible future research and innovation relationship is secured between the UK and the EU. The features

¹ International Rare Cancers Initiative (IRCI), 5 year progress report (2017) http://www.irci.info/wp-content/uploads/2017/12/irci-progress-report-newsletter_2017.pdf

described in our response to Q1 are all important when considering what a future UK-EU research and innovation relationship would look like.

We believe a one-size-fits-all approach is unlikely given the complexity across the different types of research and innovation, in addition to the timescales involved. We therefore believe a two-part approach is required.

Part 1 – developing a framework for the UK and EU future relationship

The overarching priority must be to establish an agreement between the UK and EU on the fundamental, underpinning, aspects that support research collaboration. This should set the foundation for continued collaborative working across the UK and the EU, regardless of specific initiatives. This framework should include the following elements:

An agreed legislative framework

As mentioned in our answer to Q1, a key part of a collaborative framework is ensuring alignment and mutual recognition of regulations and policies. As the UK will no longer be a Member State, it will be crucial to quickly clarify what the UK, EU and Member States would need to reflect in legislation to allow collaboration to work in practice. Within this, we believe the following should be prioritised:

- **An aligned and optimal regulatory environment for clinical trials and approval of medicines:** The UK and the EU must come to an agreement to ensure the UK can adopt and align with the EU Clinical Trial Regulation, for the benefit of patients in the UK and the EU. This is particularly important for clinical trials where more than one country is needed to recruit the appropriate number of patients, such as those for rare or paediatric cancer. Our policy statement on alignment with the EU Clinical Trial Regulation can be found [here](#)². The UK and EU must also come to an agreement to ensure the future drug licensing system does not exacerbate delays in access to the most innovative treatments for patients, both in the UK and across the EU. Our policy statement on drug licensing following the UK's exit from the EU can be found [here](#)³.
- **Support for a vibrant and mobile research workforce:** It's vital that the global research workforce can continue to work effectively together to make the best use of our combined talent and resources. While the UK will develop its own immigration system post-Brexit (the components of which we have set out in our policy statement found [here](#)⁴), it is crucial that an agreement between the UK and the EU is sought that recognises the importance of researcher mobility to and from the UK and EU.

Principles of a mutually beneficial working relationship

As set out in Q1, the relationship must be mutually beneficial. The framework must therefore outline the overarching financial model and principles of continued engagement. Regarding the latter, it is important that all parties can contribute to ongoing developments in the environment in which it is working. The research landscape will undoubtedly change in the coming years and the UK has played a strong role in informing the direction of travel in the past. For example, the MHRA has been

² http://www.cancerresearchuk.org/sites/default/files/dec2017_cruk_policy_statement_eu_clinical_trial_regulation.pdf

³ http://www.cancerresearchuk.org/sites/default/files/cruk_policy_statement_on_brexit_and_drug_licensing_final.pdf

⁴ http://www.cancerresearchuk.org/sites/default/files/sept17_cruk_policy_statement_researcher_mobility.pdf

instrumental in designing and delivering a robust regulatory environment across the EU. It's vital the agreement acknowledges that the UK can continue to help shape decisions about how to best support a thriving research environment across the EU. The UK would also continue to value expertise from the EU in informing decision making. This framework should also establish the parameters for a transitional arrangement.

Part 2 – developing individual partnerships on specific initiatives

Once the underpinning aspects of research collaboration have been agreed, bespoke partnership agreements can be negotiated for specific initiatives. The development of these partnerships should follow the principles set out in our answer to Q1, including early shared priority setting, governance agreements and funding models. The operational considerations should also be reflected. An example of an individual partnership that should be developed is the UK's participation in the future EU framework programme (FP9).

Practical steps to achieve such a partnership

Q3a: What practical steps are needed to achieve the overall model you describe in Question 2?

We have set out the practical aspects that need to be considered in establishing a future UK-EU research and innovation relationship in our responses to Q1 and Q2.

Collaboration between the UK and the EU is feasible, given the existing arrangements. But these will change as the UK exits the EU and so it is fundamental that both parties agree that a framework for a new relationship is worth pursuing. As we have set out above, it is vital to agree on the fundamental aspects that would support a collaborative approach, including alignment or mutual recognition of legislation that underpins research. Following this, bespoke partnership agreements can be forged on specific initiatives.

Q3b: Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

There are several underpinning aspects of negotiations which will impact on the ability to implement a framework for a new relationship, and subsequent individual partnerships. These include:

- The UK's relationship with the European Courts of Justice
- The UK having a separate, sovereign, immigration system
- The overarching financial settlement that the UK agrees with the EU in the long term.

Shared political will between all partner countries to work through these potential hurdles is required to negotiate a mutually beneficial research and innovation collaborative environment between the UK and the EU.

Appendix A – Some of CRUK’s international partnerships

We have drawn upon the following international partnerships that CRUK is involved in to develop this response.

Grand Challenge

Cancer Research UK's Grand Challenge is the most ambitious cancer research grant in the world - a series of £20m awards seeking international, multi-disciplinary teams willing to take on the toughest challenges in cancer - providing the freedom to try novel approaches, at scale, in the pursuit of life changing discoveries. In the first round, 9 teams were shortlisted from 56 entries. The generous support of partners (including the Dutch Cancer Society) and donors enabled 4 of these remarkable Grand Challenge teams to be funded. We are currently in application stage of the second round of Grand Challenge funding, which received 134 expressions of interest from 1570 investigators in 513 institutes in 41 countries. Of the applications we have received, 72.4% are led by international (non-UK) researchers.

Further information: www.cancerresearchuk.org/grandchallenge

International Rare Cancer Initiative (IRCI)

The IRCI is a joint initiative between Cancer Research UK (CRUK), the National Institute of Health Research Clinical Research Network: Cancer (NIHR CRN:Cancer), the National Cancer Institute (NCI), the European Organisation for Research and Treatment of Cancer (EORTC), the Institut National Du Cancer (INCa), Clinical Oncology Society of Australia (COSA), Japan Clinical Oncology Group (JCOG) and Canadian Cancer Trials Group. The aim of this initiative is to facilitate the development of international clinical trials for patients with rare cancers to boost the progress of new treatments for these patients.

Further information: <http://www.irci.info/>

International Cancer Benchmarking Partnership (ICBP)

The International Cancer Benchmarking Partnership (ICBP) is a unique and innovative collaboration that brings together clinicians, policymakers, researchers and cancer data experts. It aims to measure international differences in cancer survival and, crucially, identify factors that might be driving these differences. The partnership includes 22 jurisdictions across 8 countries and 3 continents, including: Australia (New South Wales, Victoria and Western Australia), Canada (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec and Saskatchewan), Denmark, Ireland, New Zealand, Norway, Sweden and the United Kingdom (England, Northern Ireland, Scotland and Wales).

Further information: www.cancerresearchuk.org/icbp

International Tobacco Control Programme (ITCP)

The aim of Cancer Research UK's (CRUK) International Tobacco Control Programme (ITCP) is to reduce tobacco-related disease and deaths in low- and middle- income countries (LMIC) by reducing tobacco prevalence and preventing youth uptake. The programme will support LMIC governments implement the Framework Convention on Tobacco Control (FCTC) with a particular focus on increasing tobacco taxes and reducing its affordability. The ITCP is a partnership with the

International Development Research Centre (IDRC), Canada University of Cape Town (UCT), South Africa and the American Cancer Society (ACS).

Further information:

http://www.cancerresearchuk.org/sites/default/files/international_tobacco_control_programme_externa_l_v05_no_crop.pdf

Accelerator Award

The Accelerator Award is funded through a partnership between CRUK, AIRC (Associazione Italiana per la Ricerca sul Cancro) and FC AECC (la Asociación Española Contra el *Cáncer*). It encourages cross-institutional collaboration to accelerate translational research.

Further information: <http://www.cancerresearchuk.org/funding-for-researchers/our-funding-schemes/accelerator-award>

Centre for Global Higher Education, UCL

The potential impacts of Brexit in both the UK and EU

The following evidence was provided by the project team working on CGHE's Project 3.5 on "Brexit, trade, migration, and higher education". The aim of this project is to investigate the implications, implementation and consequences of Brexit for UK universities, including the effects in relation to migration, international education and financial sustainability.

The eligibility of UK researchers and institutions to access EU research funds must be negotiated as soon as possible with the EU. If either formal association or an arrangement of similar ambition in research, science and innovation is not agreed upon with the EU, before the UK's official withdrawal in March 2019, research funding needs to be immediately increased to levels at least on par with the EU, taking into account compound annual growth, and through identified domestic funding mechanisms.

This funding must be ring fenced and remain available regardless of governmental shifts or upheavals, as can be expected during any transitional phase, to which no government can expect to be immune.

Furthermore, based on the fact that collaborative applications for EU research grants can take more than 18 months to complete, we stress that the government's lack of concrete progress is increasingly damaging to the UK research and science community, and any agreement is already behind schedule. This will impact the quality of UK bids for EU research funding, and ultimately impact the quality of British higher education and research.

Eligibility, criteria, and time constraints (EU research income)

The European Commission has made it clear it will not fund UK based researchers or universities and research organisations beyond the exit date of the UK in March 2019, hence before the end of Horizon 2020, should no deal have been reached:

If the United Kingdom withdraws from the EU during the grant period without concluding an agreement with the EU ensuring in particular that British applicants continue to be eligible, you will cease to be eligible to receive EU funding (while continuing, where possible, to participate) or be required to leave the project on the basis of Article 50 of the grant agreement (Horizon 2020 Participant Portal website, added on 06/10/2017).

This means the UK has just over a year to negotiate and ratify an international agreement or treaty with the EU in research, science, and innovation, in order to remain eligible for EU research funding, research collaboration and networking for the rest of Horizon 2020, notwithstanding its participation in Erasmus+ and intra-European mobility programmes, so crucial to the fabric, positive student experience, and quality of many degrees.

Furthermore, the "ambitious and close partnership with the EU" referred to in the UK's government "Collaboration in science and innovation: a future partnership paper" (September 2017, p.8) should be agreed upon even sooner, allowing researchers time to submit quality bids for EU research grants. Applications for a Horizon 2020 grant are extremely time consuming and it has been estimated a single application can cost an individual researcher several hundred hours, hence the necessity for any agreement to be agreed upon and implemented as soon as possible. The British

Academy has estimated that many collaborative research grant applications in the arts and humanities and the social sciences can take more than 18 months to complete. Therefore, an agreement should have already been reached 6 months ago.

However, the UK's position paper on "Collaboration on science and innovation: a future partnership paper" does not even mention the arts and humanities, nor the social sciences. The quality of UK bids for EU research grants will suffer, because of the time restraints that will *de facto* be placed on the British academic community, and the enduring lack of certainty regarding eligibility criteria will lead to fewer applications being made.

An obligation for the UK government to match any EU increase in research spending

The European Commission's "Investing in the European future we want" (July 2017), clearly recommended to dramatically increase the budget of the future 9th Framework Programme for research and innovation, the successor seven year programme to the current Horizon 2020 programme, that will end in 2020. While the High Level Group chaired by former Director-General of the World Trade Organization and European Commissioner for Trade Pascal Lamy recommended the research and innovation budget be doubled (to 160 billion EUR), it also identifies the absolute minimum requirement for the next seven-year budget for research and innovation to be in the region of at least €120 billion in current prices, which is equivalent to an overall increase of 66.7%. The report explains that this is because the future EU research budget should maintain the average annual growth rate of Horizon 2020 (the compound annual growth rate is around 6.5% in current prices), taking the budget foreseen for the programme's final year as a starting point (expected to be 13 billion EUR in Horizon 2020s' final year).

At a minimum, the budget should maintain the average annual growth rate of Horizon 2020, taking the budget foreseen for the programme's final year as a starting point. This would lead to a seven-year budget of at least €120 billion in current prices. Anything below that would break momentum and call into question the EU's commitment to deliver on its political priorities, as embodied in the Rome declaration of March 2017 in which innovation is considered crucial (European Commission, 2017, p.9).

On the other hand, the UK government has pledged to increase investment in research and development by 20% by 2020-2021 (Industrial Strategy, 2017, p.29). Even if this promise is upheld, it falls short of the expected increase in the EU research budget, as explained above through the compound annual growth rate. There is strong political momentum behind the recommendation of the High Level Group chaired by Pascal Lamy, as demonstrated through the Rome declaration (March 2017), signed by the leaders of 27 Member States, and the likelihood of the first recommendation being implemented is high, and its alternative a guaranteed minimum. It should be noted that Theresa May was the only EU leader that did not attend the commemoration of the 60th anniversary of the Treaty of Rome that produced the so-called Rome Agenda. As such, the UK government has not signified its intentions of sharing such goals.

The following evidence was provided by the project team working on CGHE's Project 1.4 on "The governance of higher education in Europe and the UK". The aim of this project is to explore the changing patterns of HE governance in the UK and the rest of Europe and to examine how global and system changes have impacted on institutional governance and what the institutional responses have been.

Replacing EU structural funds in the UK regions that need it the most

Many of the UK higher education mission groups have membership that benefited greatly from the EU structural funds and the loss of that funding is thought to be detrimental to some of their universities, just as it will be for the local communities that developed partnerships and projects with universities via those funds. One of the reasons some of the mission groups raised concerns is that they see the distribution of the UK research funding as highly concentrated and topped in favour of a few large players in the higher education field, while many smaller universities can't access such funds, even though they do valuable collaborative projects that greatly benefit local communities and the regional economy. In contrast, they see the EU structural funds as distributed in a less concentrated and 'elite university' focused way. One policy maker in a mission group argued:

So, one of the challenges is, first of all, to get the government to replace EU funding with domestic funding, and secondly to get them to distribute it in a similarly un-concentrated fashion." If the new money committed for the sector in the 2016 Autumn Budget "will be available to universities working with business in order to deliver local and regional growth... it will look a little bit like structural fund money.

The possible loss of access to the European Regional Development Fund (ERDF) is seen in most of our case study universities as a great threat to their work with local communities and the regions (this issue was mentioned as an important concern by most mission groups as well). As one of the Vice Chancellors put it, most smaller universities could not break into the UK "research council cartel" but were very successful with the ERDF, being able to develop Incubation hubs, engage with small and medium-size companies, support staff and students in being more entrepreneurial in their research and teaching, etc. Although they have some hopes that the 'UK industrial strategy' might replace some of that funding, they think that the "market failures" that have such a large impact on some UK regions and local communities will not be addressed or offset by UK funds.

Along similar lines, smaller universities are concerned that they will end up as teaching-only institutions as EU research money will dry up and the already existing inequalities in research funding (and dominance of large research universities) will be further magnified by the steeper competition and reduction of the overall amounts of funding.

Beyond research funding: the loss of access to European academic networks and universities

For some of the research universities, Brexit is not primarily a financial issue, although there will be serious financial consequences, but a loss of access to European academic networks and universities. It was argued that while being a member of the European Union did not have a strong impact on how universities are run in terms of their governance, they had a huge impact on how they operate in terms of academic work, research and research priorities. This will be greatly missed and although universities try and offset these impacts, they think that bi-lateral agreements (the types universities have with the USA, China, etc.) will not replace the privileges/advantages that come with embeddedness in larger networks, as it has been the case with Europe.

UK devolution issues

One of the country-specific issues in the case of the UK is the fact that higher education is a (partly) devolved matter, and so most higher education related issues fall under the remit of the Scottish Parliament, the National Assembly for Wales, and the Northern Ireland Assembly (research policies and research funding are still centralized to some degree). Thus, policy makers in the devolved nations had additional and/or different concerns and considerations to their English counterparts.

Scotland

In Scotland, the two policy makers we interviewed highlighted some of the following issues:

1. **Possible loss of EU staff, and how to replace them**, if visa restrictions are going to be introduced. As there is a particularly high concentration of EU staff in certain subject areas in Scotland, e.g. in STEM subjects, some fields/disciplines could be particularly hard hit.
2. **Possible loss of EU students**. In Scotland, because of the favourable fee arrangements for EU students as compared to England, there are a high number of EU students at certain universities and in certain disciplines. In some areas, it was argued, concentrations of EU students are so high, and currently their transition to the Scottish labour market is so smooth, that not only the HE sector would be hard hit, but also some areas of the labour market could suffer.
3. **Degree compatibility** and keeping an academic system that will stay compatible with Bologna/the EU systems.
4. Pushing for/**negotiating different student and staff visa arrangements for Scotland**, if the UK would go 'the hard way'. Some of the models they are considering are the ones in Canada, where different provinces can have different arrangements. One of the policy makers argued that from 2004 to 2008, before the SNP government came into power and relationships between London and Edinburgh changed, there was a pilot program in place – Fresh Talent Initiative (<http://www.gov.scot/Resource/Doc/47210/0025759.pdf>) – that allowed Scotland to have slightly different EU student-visa arrangements than the rest of the UK:

“the evidence that’s available ... indicates that the program didn’t create a problem in terms of general immigration by the back door, in other words you weren’t having a flood of people coming into Scotland via that and then heading to London or other parts of England “

Wales

In Wales, the two policy makers we interviewed expressed great frustration with the whole ‘Brexit process’. They argued that while the Welsh government put together a policy document that could be called *“Brexit, this is what we want - a list of all the things we consider to be important to sustain post-Brexit”* (https://beta.gov.wales/sites/default/files/2017-01/30683%20Securing%20Wales%C2%B9%20Future_ENGLISH_WEB.pdf) the issue for them is how strong the UK government will be during the Welsh-UK negotiations and *“the extent to which the Welsh Government will be able to prevail upon the UK Government for some of the money [not paid into the EU budget] to come back into Wales”*.

They saw Wales as more restricted/determined by UK-level policy making than Scotland, because Wales is less able to go on ‘separate ways’ as it *“doesn’t have any prospect of independence, like Scotland, so they [May’s government] don’t need to keep Wales sweet”*. However, they argued that because of the “centrifugal forces” that push the Westminster government towards allowing more devolution, both outside of England (in the three nations – Scotland, Northern Ireland, Wales) and within England (the push for ‘city-regions’, such as London or Manchester), the combined negotiating power of these devolutionary forces might increase, benefiting Wales as well. Regardless of these processes, in the short-term, they’ve seen the negotiating power of the Welsh higher education sector diminished as higher education policy makers and institutional leaders can’t carry out direct negotiations with Westminster, they must go through the Welsh government:

“So, the only way we can influence is by making sure that they are as well informed as we could possibly get them to be, which we spend effort on. We can actually talk to officials and so on, but only in the margins of other

meetings, we wouldn't set up a proper meeting with them, it's not for us, it's for officials to do that."

As a result, they mainly highlighted issues like those emphasized by national-level policy makers, such as **staff and student mobility, research funding and collaborations**, etc. The only thing they pointed to as a much greater problem in Wales was the likely **termination of the structural funds and the European Regional Development monies**, which paid for

"an enormously large amount of PhD and post graduate training in Wales, but also for a large amount of infrastructure cost of Research and Innovation... for example, at Swansea University, almost all of the cost of a second campus built recently was funded by money advanced by the European Investment Bank."

Nonetheless, they also claimed that although Brexit will bring about some great difficulties for the Welsh higher education sector, and there will be some winners and losers,

"Fundamentally what's more of an issue for the higher education sector is short-term funding, which is more about the tuition fee policy of the Welsh Government than it is about Brexit, and their capacity and their resilience to withstand the perturbations of a broader context are really affected by that."

Northern Ireland

The civil servants interviewed in Northern Ireland highlighted the great difficulty of carrying out any meaningful collaborations and/or negotiations, either with Westminster or the other devolved nations, without a Northern Irish government being in place:

"I would have a quarterly direct engagement with my counterpart in GB/UK on a quarterly basis as well as the sort of monthly four nation basis and you know if there are any issues that are of a common interest to Scotland, Wales and Northern Ireland then we can interact together... the dynamic there has changed slightly given the lack of ministerial cover to actually have a policy position on some of the issues. So, you know, what is our ultimate policy position on Brexit? That's a matter for a minister as opposed to a matter for a civil servant. So, while Scotland and Wales have pretty defined positions on Brexit, it's more difficult for us at the minute. If we had a minister then you know it would be much easier to say, yeah, we're in the same space, really good for all of us together to go to DfE in England with this tripartite position, or not, as the case may be, depending on the policy position of your minister. But, you know, the current special circumstances I mean it's a difficult space for us to be in in terms of that sort of engagement."

The key issues in Northern Ireland, they argued, are – nonetheless – very similar to those in the rest of the UK:

- 1. access to international talent, both staff and students**
- 2. international student and staff mobility**
- 3. research collaborations and remaining part of EU wide research networks**
- 4. research funding from EU and its possible replacement with UK funding**
- 5. Erasmus, Erasmus+**

The three different issues which they highlighted:

1. the fact that **90 per cent of their EU students came from the Republic of Ireland** “so very much concentrated on one constituent or one country”;
2. the discussions/**negotiations that started around finding a certain arrangement between the UK and Ireland** around common travel, common borders, student mobility, trade, logistics, etc. and how to feed HE concerns and priorities into those discussions;
3. concerns that **post-Brexit there will be an increased risk of people not choosing the UK, and specifically Northern Ireland**, as a destination of choice for HE studies, which would raise serious financial sustainability issues for the HE sector in Northern Ireland:

“once we get a clear line of sight on visa arrangements and I suppose reciprocal north/south arrangements, or whatever we have, then the universities can plan. As part of the problem has always been poor planning horizons, because of the nature of the political stalemates we haven’t been able to give proper planning horizons. We haven’t had proper comprehensive spending reviews. For the past few years we’ve only been working on one year budgets. So, it’s very difficult then for the universities to properly plan based on the level of funding that they have. Brexit is another variable that’s going to potentially put that in a negative position as well. So, I suppose, unfortunately we just have to wait and see what comes out of these negotiations.”

- **The future partnership between the UK and EU on research and innovation**

The following evidence was provided by the project team working on CGHE’s Project 3.5 on “Brexit, trade, migration, and higher education”. The aim of this project is to investigate the implications, implementation and consequences of Brexit for UK universities, including the effects in relation to migration, international education and financial sustainability.

Association status

Opening up “association status” with global trading partners of a similar level of excellence was identified as an objective to be pursued by the High Level Group chaired by former Director-General of the World Trade Organization and European Commissioner for Trade Pascal Lamy. However, at present, based on the lack of information provided by both the UK government and EU negotiators, it is impossible to predict that the UK and the EU are on a trajectory to become global trading partners. In fact, quite the contrary. In a leaked memo (November 17, 2017) said by Politico to have been provided to Chief Brexit negotiator Michel Barnier for a “preparatory discussion” on the “framework for the future relationship”, it is revealed that the EU is of the opinion that because of the UK’s rejection of the European Court of Justice jurisdiction and issues around “regulatory autonomy”, it cannot be considered a “compatible” fit as a close trade partner. Hence association to the EU research and innovation programmes on this basis alone is highly at risk.

Furthermore, the UK, by being geographically speaking at least a European country, it is not the primary target of this new policy to open European research excellence to the world, which seeks to expand the EU’s soft power via science (science for diplomacy) globally. Indeed, the new proposed policy is considered a remedy to the current narrow geographical basis of EU research and innovation programmes, and explicitly justified as a means to widen the currently regionally biased scope of research and innovation excellence, so that it is “not confined to a particular part of the world” (European Commission, 2017, p.21), that currently being the greater European region and its immediate neighbourhood. Canada and Australia were explicitly mentioned as the partners of choice under this new EU strategy. The UK, by being part of Europe, would not be a partner of choice under

this new approach, as it would only further emphasise the regional bias of EU research and innovation programmes.

The missing UK's preliminary views on the 9th EU Framework Programme: a lack of vision?

Many EU states (Ireland, Finland, Slovakia, etc.) have now officially set out their preliminary positions on the 9th Framework Programme, including priority missions, criteria for the award of EU funding, specific challenges and themes to be pursued. This is the result of a consultation process with national stakeholders, government departments and agencies. The 9th Framework Programme will be the successor research funding programme to Horizon 2020, for 2021-2027. However, the UK government has provided no such input, and is instead more interested on book-keeping issues, such as the potential financial contribution the UK “may” need to pay to remain in the current research and innovation framework programme. There is a real risk that the focus on the necessary size of the financial contribution to build a framework for cooperation in research and science between the UK and the EU will overshadow all substance matters, and delay negotiations unduly.

There is a lack of a UK vision for research, science and innovation beyond the withdrawal date in March 2019. This is doubly damaging in light of the EU's clear commitment to research and innovation and constructive outlook towards the next decade. It has become increasingly clear that the government has not taken any steps to influence the shaping of the thematic directions and priorities of the future Framework Programme, even though other countries, in particular competing leading innovative knowledge economies, have already by now submitted their input. As such, the UK's longstanding influence in shaping the direction and thematic priorities of European research, science and innovation will be seriously hampered, if not outright forfeited. This will be equivalent to a national capitulation of leadership in regional research excellence that will take years to reverse, as the 9th Framework Programme will run until 2027.

Dr Andrew Conway Morris

Wellcome Trust Clinical Research Career Development Fellow, University of Cambridge
Hon Consultant in Intensive Care Medicine, Addenbrookes Hospital, Cambridge

I would like to submit my answers to your consultation on the future of UK-EU research partnership. I am writing as an individual.

My name is Andrew Conway Morris and I am an academic clinician based at the University of Cambridge, my clinical specialty is intensive care medicine and research area is immunology. I have undertaken international collaborations with industry (based in and outside the EU) and also collaborations within the UK. I have not applied for or worked on EU-funded projects. My perspective is as an individual, early career clinical scientist.

My responses are as follows

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

1. The principles of international research partnerships that make them successful are as follows: 1) Open and transparent relationship between all parties, with clarity over the degree of investment from each partner, stability of that investment and degree of commitment from senior parts of the respective organisations (be that Commercial senior management team, university or government).
2. Ability to involve whichever partners are required to deliver a project, irrespective of their national status –the key is selection of the best people and institutions to do a role, not restricted to only one geographic location.
3. A common framework for funding, ensuring that it is equitable but takes account of the varying cost levels in differing locations –again transparency in this is crucial.
4. Ease of movement between participating countries, both for short term (visits) and longer term (secondments, placements with partner organisations) – this is both at an institutional level, but also at a governmental level, as longer term placements require agreements on length of stay, access to healthcare/education and ability to bring dependents if required.
5. Common data standards and ability to share information freely between partners in a program, not falling foul of differing data requirements in different countries. This is especially important when dealing with patient-level data, and lack of common information governance rules can seriously impair the ability to work together on projects.
6. Easy accessibility –it is much easier to build strong partnerships if it is easy to travel and stay in the partner places and countries, making it pleasant and attractive for people to come.

At a wider level, the existing EU funding framework for research is successful in funding high quality research for a number of reasons. These include meritorious and competitive applications which are not restricted or divided by national considerations. Furthermore they are freely open to eligible researchers and institutions in participating countries, are not full of technical restrictions which act as barriers to suitable applicants from taking part and work to encourage collaborative efforts between EU-based academics and researchers. The impact of the wider regulatory structure across the EU cannot be underestimated, the ability to freely travel between member states, work within common clinical trials, data protection and medicines licencing frameworks, and even having common standards in training for animal experimentation all facilitate this powerful and successful aspects of British science in a European context.

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

The elements that must be included in an ambitious partnership include both high-level strategy and specific requirements.

At a high-level policy, a position of openness, equality of partners status and freedom of participation is vital. Similarly in terms of funding and funding strategy there has to be trust in both sides of a partnership that each side will commit to the programs and not change positions at short notice or capriciously. There needs to be stability of the residence rights and access to services for researchers and their dependents to facilitate movement between countries and institutions, minimisation of regulatory and other barriers to working in other countries and institutions.

In terms of specific requirements: freedom to move and work in partner nations is vital. Employing researchers from non-EU countries at present is a relatively slow and cumbersome process and puts off people from coming to the UK- it is vital that a similar encumbrance is not placed on EU scientists and researchers if we are to build a successful partnership in research. This freedom needs to include freedom from capricious decisions by government and immigration officials, or risk of deportation for minor infractions of the law as these make a country a less attractive place to work. Furthermore it is also vital that UK citizens have similar reciprocal rights in EU countries, as science is not a one-way progression from EU to UK, and partnership means UK nationals working in other places.

We need to ensure that regulated activities that impact on research and development are under common set of rule – medicines licensing, clinical trials, animal experimentation, data sharing, chemical safety, atomic safety all impact on research work and significant divergence on these issues will limit the ability of the UK to be an effective partner in many areas of science. Maintenance of pan-European patents, and regulatory harmonisation around drugs and devices is also key to ensuring that technologies developed in Britain can be used and exploited in the EU and vice-versa.

Funding needs to be fully open to all participants in a partnership, and the UK should aspire to be a full member of EU research and development programs not simply a 3rd country which gets some access. We should also aim to host core Europe-wide facilities, again not simply negotiate access to these when based in other countries.

Practical steps to achieve such a partnership

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

The UK government needs to acknowledge that UK science has a huge amount to lose if such a partnership is not achieved, and that it will damage our universities and research base which are at the heart of the future economy. The impact of being members of the EU on UK universities is clear, and can be seen on many metrics from university rankings to research output and 'impact' – without maintenance of this partnership these will be reduced and our economy and national standing diminished. In acknowledging this, the UK government will then have to tailor their negotiating strategy to ensure that achieving their stated aim of a 'deep and special partnership' is possible.

The major potential barriers are ignorance or disregard of the consequences of actions such as insistence on having no jurisdiction of the ECJ over UK as this places a major barrier on participation in programs that require freedom of movement or operation under common rules on medicines, animal experimentation, atomic safety or chemical safety. Announcements made for short term, internal (to the UK) political expediency without apparent thought to the consequences, and proclaiming to want a 'deep and special partnership' whilst simultaneously attacking the very people we wish to form that partnership with in public pronouncements will reduce any desire for the EU to want to facilitate such partnerships.

Development of a partnership requires mutual trust, commitment and stability – it is vital that the UK start working hard on these issues if there is to be any chance of developing such a partnership. We also need to acknowledge that much as internal politics is a major driver in the UK side of negotiations, so it is also an issue in other EU member states and expecting the EU to act in an entirely ‘utilitarian’ way without regard to the integrity of the EU and its structures is naïve. Whilst the strength of UK science is undeniable, we should not be under any illusions that the EU will want to maintain an EU-UK science partnership at any cost. The very aspects outlined above which are core to successful partnership (freedom of movement for research staff, regulatory convergence, common funding) are also core elements of the EU’s structure and it will be hard to implement them in a ‘bespoke’ manner simply for science and research.

Partnership should ideally be seamless with current arrangements, as any significant gap in UK participation will lead to EU based researchers looking elsewhere for collaborators – and by the time the UK is ready to rejoin its role as a global and European leader in science the opportunities will have moved on or diminished. Phased implementations are also problematic and research does not always run to neat timetables, whilst grants and similar funding structures have defined and often rigid timescales these fail to reflect the organic and social nature of research collaborations which build over time, often opportunistically or serendipitously and need a facilitatory environment in which to occur.

A successful partnership would see the UK remain a preeminent member of the European research community, continuing to both lead and be a key participant in large scale collaborative efforts within the EU. It would continue to attract significant levels of funding from core programs and be a valued partner which researchers from other nations would be keen to work with, and continue to exchange ideas, resources and people with.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

See notes above – the UK economy is currently underperforming relative to the EU and this may lead to disparity in funding of universities, research institutions and grant funding bodies which will weaken the UK infrastructure. A weakened infrastructure will make it harder for the UK to attract highly skilled academic and research staff, and these effects together will make the UK a less effective and attractive partner. Any attempt by government to influence the ability of universities to speak out without fear or favour, and to influence what is taught - especially in the fields of politics, economics and social studies, will diminish UK university reputations and again harm the chances of building an effective partnership.

Dr. Priya Bondre-Beil

Internationale Zusammenarbeit
Europäische Wissenschaftspolitik
Deutsche Forschungsgemeinschaft (DFG)

Please find below a short comment which I am sending as Head of European Science Policy at DFG.

The UK is Germany's second-largest cooperation partner in research and vice versa. Thus, the DFG faces a continuous demand from the German-British scientific communities for bilateral (or multilateral) funding opportunities in basic research.

The rationale for international cooperation within the DFG is to try to support and accommodate these demands. All DFG programmes are open for joint German-British projects, irrespective of whether the researchers are interested in a joint bilateral or a larger coordinated research project. For the DFG, joint funding of British-German research projects becomes easier the more flexible our British partners are with regard to reacting to demands from the scientific communities.

From the DFG's perspective, an "ambitious and close partnership for research and innovation" between the UK and the EU must therefore go hand in hand with continued possibilities for bi- or multilateral cross-border cooperation.

The DFG has maintained a close relationship with Research Councils UK for decades and will continue to foster this relationship also within United Kingdom Research and Innovation (UKRI). This relationship entails for example joint calls within the Open Research Area (ORA) in the Social Sciences, where either German-British projects are funded by the DFG and the ESRC or multilateral projects together with other partner organisations from France (ANR), the Netherlands (NWO), Japan (JSPS) and the US (NSF).

Research Councils UK (and other British funding organisations) should retain the necessary thematic openness and appropriate funding possibilities in order to continue these and similar forms of cross-border cooperation.

For a long time, the DFG has also been cooperating with British organisations with regard to shaping excellent framework conditions for cross-border collaboration within the EU. British research/funding organisations have been a valuable and often like-minded partner in organisations such as Science Europe, the European association of research funding and research performing organisations.

It is important that UK institutions will continue to feel a responsibility to further contribute towards our common goal of shaping a European Research Area – despite leaving the EU.

Durham University (Research Development and Research Operations' teams)

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

- *These could be principles or practical features, either directly associated with the partnership, or the wider enabling agreements between involved parties.*
- *Examples might include specific international research programmes and facilities, or broader international agreements such as on trade or the 'deep and comprehensive agreement' between the EU and Ukraine.*

Elements contributing to successful partnerships:

- Ease of mobility
- Focus on excellence
- Desire to collaborate
- Common interests
- Prior established working relationships (in some cases)
- Access to funding opportunities to support the development of new collaborations
- Funding model/agreement that allows funds to be distributed easily
- Collaboration agreements: set out agreed ways of working, including data and resource sharing, and budgets etc. Allows researchers to focus on the research.
- Common regulatory principles/frameworks, or MoUs between collaborating Institutions to set out principles of working.
- Ease of data and resource sharing, including access to facilities.
- Ability to build a critical mass of world-class researchers to form a highly competitive team.
- Research funding applications via a common process through a single common portal.

Examples: 1. Newton Institutional links – provides a means by which links can be established beyond the level of the individual researcher, allowing partners to collaborate internationally, and gain access to new research environments, facilities, knowledge, and expertise, in order to enhance the quality of their research and enable them to translate research and innovation into economic and societal benefit. Partners apply to a single call for this scheme, and terms for collaborative working are agreed before work commences.

2. Durham University internal International Engagement Travel grants and Latin America Mobility grants: funds to strengthen and support the development of international research links and/or raise the University's global research profile. Involves a simple and straightforward application process. Terms for collaborative working are agreed before work commences.

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

- *This could cover the principles behind collaboration, or address specific requirements in areas such as: mobility of researchers, innovators, technicians and their families; regulation of research and research outputs; research funding; research infrastructures (physical and digital); or the commercialisation of research outputs.*

- *Your answer could address novel scientific and research opportunities, or specific objectives, which a new partnership might be able to exploit.*

The new partnership would need to include the following:

- Ability to travel easily to visit collaborators/work with collaborators
- Allow easy transfer of funds
- Allow workers to be able to work in collaborating Institutions in other countries, including bringing their families for longer periods
- Allow easy access to Research Infrastructures in other countries
- Easy route to agreement re: exploitation/commercialisation of research outputs
- Ease of data sharing
- Allow lesser performing nations to benefit from UK expertise to encourage/support development of these countries and allow EU to maintain its international competitive edge
- Allow the UK to input into shaping the research agenda and priorities
- Ensure UK Institutions are able to recruit and retain the very best researchers from across the EU, and the UK is perceived as a country where the very best can work and live and contribute to the growth and development of the UK and the EU as a whole
- Ensure the UK is able to fully participate in, and make a positive contribution to the development and growth of the European Research Area.

Conceivably, all of the above could be achieved by classing the UK as an associate partner country so it can participate on the same level as EU countries.

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

- *This could include potential barriers; legal and governance arrangements – including ratification processes and court jurisdiction; risks to either side; and any precedents set.*
- *It could cover how the partnership might develop, for example phased implementation.*
- *You might wish to comment on how a successful implementation could be measured.*

Practical steps needed to realise the model include:

- Visa or equivalent for visiting researchers and families, possibly some sort of fast track system for those working on EU projects? In addition there should be no immigration limits for workers on EU projects (including students).
- UK workers on EU projects would need to have equal access rights to Research infrastructures across the EU
- Standardised terms for project/collaboration agreements (including data sharing and exploitation/commercialisation of project outputs) to facilitate project implementation
- Successful implementation could be measured by assessing the number and range of ongoing EU-funded research projects with UK partners in the years following implementation of the new partnership.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

☒ This could include factors such as economic pressures, or conflicting research priorities.

Factors likely to affect the ability to implement a shared vision on research and innovation:

- Economic pressure: “losing” funds to UK, and how much the UK is willing to contribute to EU Research and Innovation funding
- UK immigration policy – restrictions on freedom of movement
- Lack of engagement by the UK in strategic, high levels discussions regarding EU strategy, priorities and collaboration
- Conflicting research priorities
- Competition

Future partnership consultation: responses from EMBL-EBI

Profile of EMBL-EBI

The European Bioinformatics Institute (EMBL-EBI) is the premier European centre for services and research in bioinformatics. EMBL-EBI data resources cover the entire range of biological sciences from raw DNA sequences to curated proteins, chemicals, structures, systems, pathways, ontologies and literature. EMBL-EBI's mission to provide open and free and tools to the entire scientific community is supported by a world-class expert staff and decades of experience in serving open data.

The primary mission of EMBL-EBI is to collect, organise, add value, and make available biomolecular science data to the global life sciences community. This includes data resources that receive primary data depositions as well as curated-knowledge resources. A fundamental tenet of this mission is that all hosted data, tools and infrastructure are freely available worldwide, and that data is represented in and shared in a variety of structured and standard formats for consumption by both people and machines.

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

With regard to UK participation in EU funding programmes, particularly the EC framework programmes and the ESF, we are strongly in favour of a model that continues the status quo as much as possible, with the UK paying in to the system and UK scientists able to apply for funds on equal footing with scientists in EU member states.

EMBL-EBI's research and service activities are highly collaborative and we have extensive experience in managing both large and small partnerships. At present sixteen of our major databases are collaborations that are run jointly with many partners in over 20 countries in Europe, North America, and Asia, and most of our grant-funded research and development activities are collaborations as well.

In our experience successful partnerships have a few commonalities:

- 1) Funding should be based on an algorithm or model and calculated for each year. Negotiations only occur to define the model: thereafter distribution of funds is calculated using the model.
- 2) Partnerships should be non-exclusive in order to foster the free exchange of ideas and expertise.
- 3) Partnerships should have clear benefits to all members, which align well to the goals and missions of each organisation in the partnership.
- 4) Partners should have a strong desire to collaborate based on highly complementary expertise and skills set, existing strong relationships and a willingness to make a real commitment to the

endeavour. Each partner should have a unique area that they specialise in and bring to the collaboration.

- 5) Partnerships should have a well-structured agreement and a defined governance structure. For large-scale collaborations this governance should include an independent executive director responsible for operations and a board to give guidance to director and input strategically. For science/research activities a separate, and independent, scientific advisory board should conduct regular (usually annual) independent reviews of the partnership activities and report its findings to the executive director and the board. Partnerships should produce annual reports, with financial information, and should publish scientific advisory board reviews as well.
- 6) Many of EMBL-EBI's most successful collaborations have shown that co-location of staff is critical to rapid initiation, accelerated progress, and speedy transfer of knowledge. Co-location of researchers within a partnership is critical to success: the free flow of knowledge and ideas between disciplines and integration of scientists from different sectors is needed for projects to develop and deliver with quality. Therefore the physical location of a partnership should be considered with much care.
- 7) EMBL-EBI also engages in partnerships with industry. For those the key to success is in identifying areas of pre-competitive research, for example, furthering target validation to advance drug discovery, that allow open and rapid reporting of results to public data resources and in print.

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

- 1) Funding awards should be based on merit: geographical or political considerations should not affect activities.
- 2) Partners should have a shared vision and shared conviction that the project is worthwhile and needs to be done in collaboration.
- 3) Partnerships should practice a collaborative approach with lean management, low bureaucratic burden, swift decision-making and project management practices and tools. Research outputs should be target oriented, milestones driven and planned. Research outputs of publicly funded research should be FAIR: findable, accessible, interoperable, and reusable.

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

Implementation should be measured as much as possible using quantifiable indicators of activity, publication, data production, economic benefit, etc.

In practice qualitative indicators are almost always necessary as well: these should be used by independent reviewers to evaluate project activities.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

The two key factors in ensuring success of any UK/EU research partnerships are:

Funding awards must be based on merit alone: there should be no rationing based on location or political factors.

Free movement of people is crucially important: UK and EU partners, for any project, must be able to recruit staff without restriction in either direction. Additionally, free movement for travel to workshops, conference, advisory board meetings, etc., is also important.

Fundação para a Ciência e a Tecnologia, Portugal

Ministério da ciência, tecnologia e ensino superior, Departamento de Relações Internacionais

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

EFTA (European Free Trade Association) is an example that should be looked upon when it comes to think about a EU – UK partnership in the fashion of European free-trade association, which means, guaranteeing the four freedoms, i.e. the free movement of goods, capital, services and persons, and also aid guidelines to regulate competition and state, as well as the horizontal areas related to the four freedoms.

In the past, it sort of lost its force due to the process of integration that turned the European Economic Area to the European Union, but fully work for the countries that do not which to pursue fully political integration and the duties and obligations that come with it being a part of a structure such as the European Union.

The success of it relies in the maintenance of the regulation of the four freedoms without jeopardizing the sense of national sovereignty. Norway is a good example of it being an important player/partner of the European Union, enjoying a fruitful partnership.

Within the landscape of an EFTA partnership, the UK could, like Switzerland, develop bilateral agreements or complementary agreements that would regulate the 4 freedoms mentioned above, most importantly the free movement of people (which was one of the concerns that led to BREXIT, namely the growing immigration).

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective?

The shape of the partnership could follow the model of already existing partnerships like the Joint Initiative on Research and Innovation (JIRI) and the Common Research Area (CRA) with the Latin America and the Caribbean. The models are already accepted and validated by the European Union, like so, little adaptation could be required accordingly to the specificities of the United Kingdom; This Common Research Area is built around 3 pillars of major importance to science and innovation:

- 1- Mobility of researchers
- 2- Access to research infrastructures
- 3- Jointly addressing grand challenges (linked to the Sustainable Development Goals)

The implementation of the three pillars must be done in a systemic way - which can be a quite complex task when not performed under an integrative approach. Therefore it must be built

around a research and innovation agenda that assure an armored pledge to knowledge through multilateral cooperation around a common goal, in the fashion of the PRIMA Initiative, but that encompasses the thematic priorities of the Joint Initiative on Research and Innovation to be structured between the UK and the EU and the components of the Common Research Area to be established. This model has implicit the creation of funding mechanisms to guarantee compatibility of interest areas, synergic efforts and mapping of funding opportunities for both regions.

Practical steps to achieve such a partnership

Q3a. What practical steps are needed to realize the overall model you describe in Question 2?

Firstly it is imperative that a High Level political commitment towards a model similar or equal to EFTA is achieved, so that the mobility of researchers, innovators, technicians and their families; regulation of research and research outputs; research funding; research infrastructures and the the commercialization of research outputs is achieved and not hindered by any type of blockage.

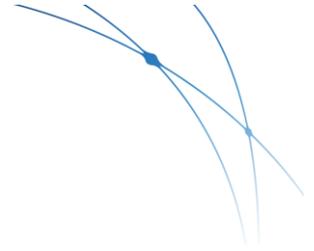
Regarding mobility of researchers it is necessary to create a mechanism or an observatory that assesses properly the several obstacles that stand in the way of a genuine mobile research market and, at the same time guarantee the High Level political commitment to suppress the existing inequities based on legal and administrative barriers (like non-portability of national grants) and deficient human resources/grants policies.

To improve the communication channels between regions in order better advertise the existing opportunities and knowledge on S&T cooperation. For instance, it can be created a new node similar to EURAXESS – North America.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

Research and Innovation all over the world is shifting towards the United Nations Sustainable Development Goals and response to new challenges to tackle like the advent of the ZIKA virus in Brazil. It won't be difficult to implement a common vision on what are the priorities for the two regions, the UK and the EU.

Until now the UK was one of the most prominent countries in what concerns R&I amongst the EU both. Therefore the lines of research and innovation won't be very disparate to what's being done in the European Union. The main factors will be the negotiation over budget to be address and at last, but most important, the question regarding mobility of researchers. Immigration issues will be the most difficult to solve with an economic impact to the research and innovation system when it comes to the regulation of both offer and demand by the two regions.



Submission for Wellcome/Royal Society Future Partnership Project

Executive Summary

This response is written from the perspective of the members of the FENS Kavli Network of Excellence, a pan-European network of principal investigators in neuroscience [1].

- International collaboration is crucial in neuroscience
- The FENS Kavli Network is a successful model for investigator level collaboration

Summary recommendations:

- Continue to support research at the European level via H2020 and its successors
- Investigator networks like ours provide a relatively low cost way to enhance collaboration across Europe
- UK must redouble efforts to engage with the rest of European science
- Maintaining scientific mobility should be a key funding and political aim
- The support of the scientific community remaining in EU will be helpful for this agenda

Specific actions are highlighted in 13 numbered points through the rest of the document.

International Neuroscience

Neuroscience is a very active and highly interdisciplinary field straddling the biological, medical and physical sciences. Understanding the mechanistic basis of brain function is unsurprisingly considered a global basic research priority. In the western world, the rapidly increasing burden of neurodegenerative disease in an aging population and increased appreciation of the social and economic costs of mental health disorders, both clearly argue for increased investment in basic and clinical research.

Given this background, the huge complexity of the brain and the widespread agreement that progress will depend on leveraging a wide range of approaches and talents, it is unsurprising that large scale national and international efforts have been developing [2]. Examples include:

EU Human Brain Project
US BRAIN initiative
UK Dementia Research Institute
Japan Brain/MINDS
International Brain Initiative (early stage coordinating action)
Innovative Medicines Initiative (IMI)

Although these large top down initiatives have a unique role in delivering projects beyond the scope of individual laboratories and setting political and funding priorities, they are not the only levels of activity.

Q1 Elements that underpin successful partnerships

The FENS Kavli Network, a model for investigator led collaboration in Europe

Our organisation, the FENS Kavli Network of Excellence, represents another approach to promoting collaboration and building support for neuroscience. We are a network of 35 junior and mid-career neuroscientists representing most European countries. Established in 2014, through our joint efforts we aim to shape the future of neuroscience by putting young researchers in the driver's seat. We provide collaborative opportunities for young scientists, influence science policy, and facilitate the exchange between science and society. We are sponsored by the Kavli Foundation (key facilitators of some of the international projects mentioned above) and FENS, the Federation of European Neuroscience Societies (representing 24,000 European neuroscientists).

The network highlights in microcosm some of the features of the European research environment that are potentially imperilled by the impact of Brexit : 1) pan-European collaboration 2) the particular strength of UK research 3) the dependence on international mobility for both of these points. For example nine of 35 network members are based in the UK (or twice the 13% of the EU population living in the the UK). However, these 9 researchers come from 5 countries, and while 8 are European, only 3 are British.

Although the Network is only a few years old and not a formal collaborative body, it has provided opportunities for in person interaction and exchange, has led to active collaborations and enriched our science [3]. This model could be useful in other areas of science, particularly in the face of potential decreases in international/European scientific collaboration after Brexit.

Strong support for EU funding among Young Investigators

One of the recent actions of the FENS-Kavli network was a survey of about 300 European life sciences researchers. This underlined the support for European H2020 funding mechanisms and particularly the ERC as well as making specific suggestions for improvements [4]. It is worth emphasizing that pan-European funding mechanisms such as the ERC were very strongly supported by all participants, surpassing in preference national funding bodies and even research charities such as the Wellcome Trust. Highlighted features include the vital role in supplementing national research funding, especially in basic research, pan-European evaluation important for unbiased selection of the very best proposals, and in enabling excellent scientists to further their science in the most appropriate locations. Furthermore in a globally competitive research environment, they provide a highly visible European brand that is attractive to those considering a move to Europe.

The UK has been a net beneficiary of H2020 programmes. UK-based scientists have been consistently successful in ERC competitions. For example in the most recent ERC round (consolidator grant 2017), the UK received the largest number of grants (60/329 = 18%). However 34 of those grants were awarded to non-UK nationals.

Q2 Actions and priorities post Brexit

EU Funding Mechanisms - H2020 and its successors

- 1. The UK should retain membership of H2020 and its successors post-Brexit.**
- 2. If full membership is not possible then associate status (with or without a joint funding pot) would still be valuable for the UK and EU.**
- 3. There may be a place for smaller collaborative actions involving 2-4 investigators with tiered eligibility (more akin to HFSP grants) on a European scale.**

Non-EU Science Funding

Regardless of the success or otherwise of aims to retain a close relationship with H2020 after Brexit, there are other actions that could be taken on the European stage:

- 4. In the life sciences, EMBO is an important supporter of science across EU. Actions should be taken to strengthen EMBO fellowships and other scientific activities.**
- 5. UK should strengthen participation in international initiatives beyond Europe or that it previously participated in via EU institutions.**

Within the UK, positive funding actions could include:

- 6. If the UK fails to retain some form of H2020 membership, then it should reconstitute similar programmes at the national level (e.g. as Switzerland did for some programmes during its suspension).**
Retaining basic funding support like the ERC is critical since new national programmes tend to favour translational/clinical funding in the life sciences.
- 7. Maintaining/enhancing funding for UK-based PhD programmes that provide fees and stipend support students from the EU (and further afield).**
Wellcome programmes do this, but RCUK-funded programmes typically have strict residency requirements that mean most EU students cannot be given stipend support.

This last point is an example where a funding action could both counteract the negative impact of Brexit on mobility and take a positive step to welcome international scientists in training.

Other approaches to maintain EU-UK Engagement

Perception is very important, and it is critical that the UK redoubles its efforts to remain engaged and welcoming at the European level. There are opportunities to maintain engagement outside of standard funding for scientific projects.

Networks like ours provide low-cost, political boundary-free opportunities for scientific and intellectual exchange. The FENS-Kavli has also been active in policy and science/society engagement. Possible actions include:

- 8. Funding pan-European networks like ours in other scientific domains**
- 9. We feel that acting at the the level of junior mid career investigators with in person meetings is particularly effective. However there are many other models, some very inexpensive that can be helpful e.g. online communities based on a shared model organism or technique [5,6].**

Beyond science funding there are other important areas at a more political level:

- 10. Ensuring that the UK and EU maintain mobility for scientists at all levels (students, post-docs, senior scientists) will be critical for European science to flourish.**
- 11. Increasing mobility for non-EU scientists within the UK is one possible Brexit opportunity**

Q3 Factors affecting the ability to implement a shared vision on research and innovation

- 12. In spite of the overwhelming support for Remain among scientists in the 2016 referendum, there is a risk that Brexit may be seen as a self-inflicted wound that is solely for the UK to fix. The fact that the UK has consistently been a net scientific beneficiary may not be helpful in this regard.**
- 13. The rest of the Europe has a role to play. In particular scientific organisations in remaining EU states could lobby for a strong EU-UK scientific relationship post Brexit.**
- 14. It may be worth emphasising that the UK has a distinctive set of international collaborations that are likely to be of value to the whole of European science. For example it the number one European collaborator with the USA and Canada [7].**

Conclusion

The strength of British research is widely acknowledged to depend strongly on international researchers, especially those from the rest of Europe. However while some individual countries may benefit from a migration of talent after Brexit, we strongly submit that European science as a whole will be diminished if the UK and EU fail to take active steps to protect European science.

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Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

Free movement 'of staff and students and cooperation between universities in Britain and in continental Europe, both for long-term employment and shorter-term projects and research visits. The fact that Erasmus and similar programmes fit within existing institutional programmes and are well known at management level as well as to students and researchers.

Q2. What elements must be included in the agreed research and innovation partnership between the UK and the EU to be close and valuable? Please comment on how these would be prioritised.

Funding opportunities open to British and EU projects equally, and encouraging mobility between the UK and the EU. Essential for this to cover all levels of study, from undergraduate and postgraduate to postdoctoral and senior researchers.

Q3a. What practical steps are needed to realise the overall model you describe in Q2?

Formation of research funds to which both the UK and EU contribute, preferably along the model of EU research funding hitherto.

b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

The UK government needs to understand, and should be motivated by, the serious risks to the UK's competitiveness and global ranking in attracting the best researchers and producing world-leading research if it does not continue to forge the closest cooperation with its European neighbours and partners. Put in positive terms, this might be a time of opportunity, as the UK government actively seeks to create valuable international partnerships with the EU as well as further afield.

Fraunhofer UK Research Ltd

Simon Andrews , Executive Director

Fraunhofer UK was established in 2012 following a UK government invitation to Fraunhofer Gesellschaft for closer UK-DE collaboration.

Fraunhofer Gesellschaft is Europe's largest applied R and D organisation. It is not-for-profit, and has research centres in Italy, Sweden, Austria, Portugal, the UK and well beyond Europe in USA, Chile, Singapore. These research centres deliver particular expertise to benefit the local economy through technological development, typically in the Technology Readiness Level 4 to 7 range and through PhD training. (TRL https://www.nasa.gov/pdf/458490main_TRL_Definitions.pdf)

The UK's first Fraunhofer Centre, is the Fraunhofer Centre for Applied Photonics, based at the University of Strathclyde in Glasgow. It specialises in lasers and laser systems for a broad range of industrial sectors including: lifescience, defence, environmental monitoring, renewable energy, space and quantum technologies.

Q1.

Preamble:

Fraunhofer UK is recognised, by UK Government, to be a success https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/642542/Science_and_innovation_paper.pdf

Fraunhofer Gesellschaft is internationally recognised to be a success, for example

<https://catapult.org.uk/wp-content/uploads/2016/04/Hauser-Report-of-Technology-and-Innovation-Centres-in-the-UK-2010.pdf>

Many countries recognise the Fraunhofer model to be part of an innovation landscape in Germany which allows manufacturing to thrive. For example <https://www.asme.org/engineering-topics/articles/manufacturing-processing/how-does-germany-do-it>

Answer:

The key features which make the international aspects of Fraunhofer a success include:

Reliable partnerships are essential. The principle of ongoing governmental support in both countries (not short term, or fixed term, but always with a financial tension which ensures irrelevant centres with no industrial contracts would close.) It is very important that companies, especially those who are not widely or regularly engaged beyond their own supply chain, have recognisable, reliable external applied R and D resource to call upon as and when is the right time for their company. Applied R and D is a strategic investment, not a routine purchase.

Some **complementarity of expertise** gives greatest benefit (such that the total offering internationally is significantly greater than either part alone. There is room for some overlap of expertise in the offering of generic capability and demand for local delivery.)

Expertise is based on highly skilled and experienced individuals, therefore a strong commitment to training and involving early career personnel in projects gaining exposure to that expertise, and the

needs and constraints of many entities from academia to industry to the third sector will give use a strong future knowledge base.

Operation in modern technologies with sufficient complexity that all the expertise cannot be simply sourced from one place demands international collaboration.

Operation in technologies with international supply chains. Modern technological companies rely on a host of international suppliers. One of the many strengths of the international activities and organisations, (Fraunhofer network; work funded by H2020; the innovations and operation of ESA; etc.) is the ability to include many key parts of the supply chain together during the development phase to ensure that every material, component, sub-system and process is improved when considering the final use and user.

In our experience most is to be gained when optimising several key technologies simultaneously towards a challenging goal.

For a familiar example, the smartphone is of such complexity that it is nigh impossible for a single country to manufacture one alone. <https://www.technologyreview.com/s/601491/the-all-american-iphone/>

Finally, but of great importance, a very clear understanding and respect for the principle that in collaboration and indeed in operation, there must be mutual benefit. There will be many occasions when each operates independently and/or locally, but when operating together there must be a focus on mutual benefits. It is essential that mutual benefits are clear in order to drive open and forthright technical discussions which then realise the greatest benefit.

Q2.

An EU-UK partnership Innovation agreement must encourage, stimulate and reward self-selecting partnerships be they business to business, business to RTO, Business to academia or Business-RTO-Academia. Innovation programmes should be business not university led. Research programmes with greater participation from Universities should also be considered.

Collaboration requires scientist/engineers spending significant periods of time together, often at quite short notice and at all stages from project scoping through to field trials. Visa arrangements could kill the momentum of projects, ideally the free movement of scientist/engineers/users from industry/RTO/academia/third sector should be able to spend extended periods in any country without question. All goods required for innovation should be able to traverse borders without cost or delay. For example, a simple lens may be pre-formed in one country, finished in a second, coated in the third, tested in a fourth, assembled in a fifth and deployed in a sixth. If each transit included any significant delay or cost it could make the participation of those with customs difficulties impossible to deal with.

Funding rules should have as much consistency as possible across borders. For example, the Eurostars scheme has country specific funding boundaries within each EU country. The range of possibilities means that UK SME's are effectively exclude from making use of RTO's even if they think it's the best use of the resource; whilst in Germany, Finland and other nations, SME's are able to make great use of their external partners.

Q3a.

Successful implementation would be measured by:

- The continued movement of scientist/engineers in and out of the UK on a regular basis, for a wide range of durations.
- The continued movement of goods required in innovation.
- All elements must be mutually beneficial and equitable.
- The repeated engagement of companies in the international innovation programmes, measured by the nation the company is based in.

Q3b.

There is, of course, a significant risk that the importance of collaboration across academia, RTO's and industry will be overlooked given the plethora of other major issues to be considered during Brexit negotiations.

During this period, there is the insidious risk that EU27 entities will seek out non-UK partners exclusively and at best lose the habit of seeking out partnerships with UK for fear of unknown risks. To this end prompt and clear statements about securing H2020/FP9 participation, with free movement of the persons and good associated with innovation, as a minimum innovation partnership will be required to secure the UK's current excellent position in the innovation landscape of Europe.

Dr Mike Galsworthy

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

Multinational: Specifically with the EU science programme, the unique element is multinational collaboration. We know that international collaboration alone boosts science paper citation by 40%,¹ so adds value for investment. The feature of pooling funding across >30 nations allows huge dream-teams to be assembled that produce large-scale, high-level research. A recent Nature paper evidenced that more networked countries have stronger science and also that the EU has recently overtaken the US for proportion of highly-cited (top decile) output.²

Branding is also vital and often overlooked. A recognised name and philosophy such as that of Horizon 2020, ERC grants, Oxford or Cambridge increases global recognition, identity, familiarity and with it attractiveness. Horizon 2020 was a huge step up from FP7 in terms of visual imagery and well-advertised purpose.

“Excellence” as a driving principle also helped the branding of the EU science programme, especially with the ERC grants. This has been vital to global competitiveness.

Capacity to self-monitor is vital. This is what drove the evolution from FP6 to FP7 to Horizon 2020. The record-keeping concerning FP5&6 funding and outputs was appalling.³ The breakdown across countries and subjects poorly documented.⁴ When those data became more open (and openly-discussed), then the community as a whole could analyse the programme and productively help discussion around future direction.

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

Funding: The largest issue will be investment in R&D capacity development of eastern/southern European Member States. Currently, the UK benefits hugely from the EU science programme and newer member states lose out financially. Built into the EU budget (and general funding philosophy of the Single Market) are the Structural Funds that develop weaker regions. These have been increasingly focused on R&I capacity development. That is how the UK counterbalances for its oversized benefit from the science programme. That is also why the relationship is acceptable to other member states. It is simply not in the interests of those countries to allow the UK to Brexit then play in the science programme, drawing their money and talent, without due reciprocity. Neither is it in the interests of France, Germany, etc to carry the costs of developing the European Research Area (ERA) and buffering this political dynamic whilst the UK profits from the EU science programme free from responsibilities. So packaged into the deal must be some investment in the overall development of the ERA, with focus on struggling countries. As I have written elsewhere, this is most effective if the support is in the form of networking and transfer of skills & know-how.⁵ A specific proposal I have made is that FP9 should be a two-tier programme. Tier 1 being the “excellence” programme; Tier 2 being modelled on

¹ <http://blogs.lse.ac.uk/brexit/2015/12/05/debunking-the-myths-about-british-science-after-an-eu-exit/>

² <https://www.nature.com/news/open-countries-have-strong-science-1.22754>

³ <https://www.ncbi.nlm.nih.gov/pubmed/23804079>

⁴ <https://www.ncbi.nlm.nih.gov/pubmed/23595575>

⁵ <http://www.researchresearch.com/news/article/?articleId=1341729>

the “spreading excellence & widening participation” stream of Horizon 2020, effectively appropriating a sizable proportion of Structural Funds in order to achieve that. I would suggest that direct payments are less effective than competitively-awarded projects for international networking and knowledge transfer. That way, countries outside the EU (eg UK, Switzerland, Norway), would then buy into a holistic programme that demands contributions for both Tier 1 and Tier 2.⁶

Rules: Like Switzerland, the UK should simply acknowledge the role of the European Court of Justice (ECJ) to settle any disputes concerning the projects. Given that the EU is the distributor of funds, any project coordinator needs to be audited by the Commission. The oversight for that is the ECJ. Also internal projects disputes need to be settled by a clear system. Again, the ECJ is the clear final arbiter. With regard to the UK diverging on working standards (data, animal welfare, chemicals, genetic modification, stem cells, clinical trials, etc), there are two approaches that could be considered. Firstly, all funded projects could have to adhere to EU standards. Secondly, there could be an argument for funding projects that obey regulations within their territories. In this case, if the UK diverges on regulations then it could be seen as being at a selective advantage where those rules are looser. On the flip side, this could be regarded as a “sandbox” by the EU, so that the UK bears the risk in regulation experimentation and if the results appear good and safe; then this provides evidence for the wider EU to follow the UK in those standards.

Free Movement: This may be a factor in including the UK as a full partner in any science programme, following the example of Switzerland. However, it is also likely to be the case that any restrictions the UK puts on Free Movement would also be likely to make it less attractive for visiting scientists. Therefore, it is not in the EU’s financial/competitive interest, with regard to science, to make this a strict condition of participation. However, it may wish to ensure basic mobility of scientists for pragmatic reasons and promote Free Movement as a European philosophy of openness around the continent. Further, citing Switzerland, Free Movement could be used as an excuse/rationale to restrict the UK from some of the programme (eg small business grants, coordination of certain projects) where it is seen to be in the interests of the EU27.

Spirit of partnership: A huge opportunity lies in the brand development of “European Science” and the “European Research Area” by the UK and EU jointly – also with Switzerland, Norway, etc. Generating wider awareness of the success of European science as a multinational hub helps to draw investment, partnerships and talent to the continent, benefitting all countries here. With that brand of Europe as a “hub” secured, this then provides a strong base to extend important global partnerships, particularly with China and the US.

Cohesion on research data: In the future, an increasing (and probably soon dominant) share of scientific analysis will be secondary research – ie data re-use / analysis of data collected by others. Central to any new EU-UK partnership should be the long view on data and structures for its collection, publication and reuse. Very importantly, Europe with its democratic tradition, transparency and multinational flavour (with the EU science programme as a multinational and across-all-subjects spine) has the ability to become the world’s main research data hub. A Google for research data. However, Europe cannot simply be a data provider for the rest of the world to plunder. Collectively, there needs to be a plan to provide data re-use grants and develop centralised resources of data cartography – ie the mapping of all the information/ science data available. This, in turn, can rapidly inform policy. That is how Europe trains up the next layer of capacity and ensures its science funding has its finger on the pulse of the data landscape.

Commercialisation: For Europe to be competitive with the US and Asia, the high-quality science must have the capacity to be rapidly translated into IP and market products & services, where appropriate. A common market and common IP is central to that. Additionally, the game-changing success of Horizon 2020 in linking universities and businesses through grants that demand business involvement (especially SME) should be continued and enhanced. The UK should want to retain and develop European Investment Bank (EIB) and any new European Innovation Council (EIC)⁷ involvement where possible.

⁶ <http://www.researchresearch.com/news/article/?articleId=1370792>

⁷ <https://ec.europa.eu/research/eic/index.cfm>

Practical steps to achieve such a partnership

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

Spirit of partnership: There is a substantial opportunity in Brexit to draw attention to the success of European science and reinvigorate the concept of the European Research Area. The Brexit negotiations throw the UK-EU relationship into the spotlight globally and as I have argued before,⁸ this then affords an opportunity for the UK-EU science relationship to become substantially more visible. As this relationship is a clear win-win, it can not only be a white knight in the tone of the negotiations, but also be harnessed as an opportunity for the UK and EU to jointly brand a European future based upon Europe's surge in multinational science leadership. The UK government's "Future Partnership" white paper for science⁹ has something of this flavour, but the joint UK-EU effort should be substantially more public.

Progress so far: In the negotiators' joint report¹⁰ accompanying Theresa May and Jean-Claude Juncker's handshake on 8 December, point 71 states that UK institutions are fully eligible to participate in Horizon 2020 up to the end of all Horizon 2020 projects. The document also makes clear that the UK is holding back from cashing in its assets on the Galileo and Copernicus space programmes, hoping to remain in those frameworks as well. The EU negotiators are evidently open to that option. This agreement means acceptance of Horizon 2020 payments, Structural Funds payments, ERC oversight for science and very probably Free Movement (maybe with some negotiated modifications) up to the end of 2020. Presumably that also means accepting ERC oversight on science projects until their termination. This is all very welcome and pragmatic. The focus then shifts to what the deal will be for FP9, which will operate in a very different context should the UK have completed Brexit at that stage.

FP9: Given the size of the UK, previous models of association with the EU science programme by non-EU countries are not a copy-paste solution, as the Science Commissioner Carlos Moedas has himself indicated.¹¹ Therefore, for a UK-EU science relationship to work after any form of Brexit, there will be complex dynamics around funding the programme, funding complementary support of science in lagging EU countries, negotiations around depth of access, negotiations around policy influence on the EU programme, legal oversight and handling divergence on standards and free movement. The EU would do well to design a new science programme in FP9 designed with a view to how non-EU countries can buy in at both proximal (European) and distal (USA, China, India) levels. The UK can offer useful insights on what looks attractive for outside buy-in.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

Pipeline: There is a substantial risk that the UK Government's Brexit plans have put too much on their plate with too little time. There are substantial issues across Euratom, Customs Union, European Investment Bank, European Aviation Standard Authority, Single Market, European Medicines Agency, Reach regulations, Immigration rules, etc. All of this can risks issues dropping off the plate with insufficient time and resource to agree all necessary parts on time. There is also substantial risk from interaction effects associated with leaving multiple well-developed frameworks in parallel. Constant preoccupation with putting out logistical fires can divert attention needed to craft a stable, deep relationship.

⁸ <http://www.researchresearch.com/news/article/?articleId=1365866>

⁹ <https://www.gov.uk/government/publications/collaboration-on-science-and-innovation-a-future-partnership-paper>

¹⁰ <https://www.gov.uk/government/publications/joint-report-on-progress-during-phase-1-of-negotiations-under-article-50-teu-on-the-uks-orderly-withdrawal-from-the-eu>

¹¹ <http://www.researchresearch.com/news/article/?articleId=1371785>

Goodwill/ hostility: There is a risk that the UK could be cut out of some selected schemes or influence should the EU27 feel that it may be to their advantage. Similarly, there may be drives in the UK to drop or undercut EU standards and practices for reasons of competitiveness. Both of these may be pushed beyond levels of pragmatism should the wider environment become more hostile in tone. It is important that within the science community it is that community itself on both sides of the channel that lead the shape of the framework, supported by politicians, rather than undercut by the rhetoric, whims and misrepresentations of politicians.

Dr Mike Galsworthy,

Co-founder and Director of Scientists for EU

Introduction

At GSK, we are on a mission to help people to do more, feel better, live longer. We research, develop and manufacture innovative pharmaceutical medicines, vaccines and consumer healthcare products and are committed to widening access to our products, so more people can benefit, no matter where they live in the world or what they can afford to pay.

As the UK exits the EU, GSK remains committed to securing the best outcome for life sciences and healthcare in both the EU and UK. In the short term, our focus is on minimising any potential disruption, including to the supply of medicines, which is why we strongly believe that a sufficient transition period to allow business to adjust is necessary.

Early agreement on a pragmatic status quo transition period is critical for public health and the life sciences sector, so that we have time to implement changes at a reasonable pace. These changes are complex, require regulatory approval and cannot be accelerated. In the interest of patient safety, there must be no cliff edge for the regulation and supply of medicines, vaccines and healthcare products for patients and consumers when the UK leaves the EU in March 2019.

Health and patient safety should be prioritised in the negotiations, and the technical issues relating to life sciences addressed at the earliest opportunity, to avoid disruption to the supply of medically critical products. Gaining early agreement on some of these technical issues would avoid duplication of process and delays to patient and consumer access to medicines, vaccines and products, as well as additional cost and complexity. For GSK, our priorities focus on manufacturing, trade and supply of products, regulations, people and R&D. Our position is:

- Mutual recognition agreements should be put in place between the UK and EU to avoid duplication of procedures and processes.
- The current regulatory system works well and the EU and UK should cooperate to the fullest possible extent in its regulatory systems and processes post-Brexit, aligning on regulatory approval and maintenance and release of medicines, vaccines and medical devices.
- We want to continue being able to supply our medicines, vaccines and healthcare products as swiftly as we do today, to ensure our patients and consumers have access to them with zero tariffs on goods, minimal customs procedures, duty and VAT on cross-border trade.
- Securing the ability to move employees with ease across our operations and attracting the best, diverse talent in both the UK and EU is critical. Any new systems put in place need to achieve this aim.
- It is vital that R&D collaboration between the UK and EU continues and that UK scientists are able to play an active role in EU-funded collaborations to tackle the global health and scientific challenges we face.

We welcome the leadership being provided by the Wellcome Trust and Royal Society in co-ordinating the views of the research community to explore what an “ambitious and close partnership for research and innovation” would look like in practice. The following comments describe the importance of UK/EU collaboration and then focus on the consultation questions. We would be happy to provide more information and actively participate and assist in other stages of the ‘Future Partnership Project’ as needed.

UK and EU research and innovation partnership

The most important aspect of scientific research and collaboration is the ability to conduct the best science. That means being able to research in the best places, with the right people, and the right funding and oversight to address the scientific question at hand. Therefore, the purpose of any research framework should be to allow researchers from all sectors, wherever they are, to follow the best science without constraint or boundary to create positive impact.

The nature of life science research, and scientific research generally, is collaborative and open. Scientists from across the EU27 and the UK have worked together to deliver breakthroughs that benefit people throughout Europe and the world. As an international company, we particularly value the ability to work with a range of partners to ensure that we are conducting the best and most relevant research, in a range of areas:

- **Pre-competitive studies:** tackling large scale health issues, or answering broad research questions, is not possible in isolation. It is necessary to be able to draw on relevant scientific expertise and data regardless of which sector or geography it may come from. The current EU Frameworks, enable disparate groups to work together on issues in a pre-competitive manner, to share data and knowledge to progress science in areas which may impact the region but also the rest of the world.
- **Clinical trials:** for the best results, many clinical trials benefit from having large patient populations, or the ability to bring together small groups of patients with rare diseases across multiple settings. Being able to easily collaborate across Europe means clinical trials in multiple countries can be conducted within a common research framework. This helps industry to conduct the most effective research possible to the benefit of patients in Europe and around the world.
- **Developing innovative new treatments:** late-stage development of potential new treatments generally involves 1 or 2 companies collaborating with academic institutions. It is important to find the right complementary partners to work with—the ability to draw on the full European research pool greatly facilitates these projects.
- **Public health and emergency situations:** in cases where public health is threatened, all relevant parties, both public and private, need to be able to work together seamlessly. It is only through collaboration that we effectively address public health issues. Only concerted international effort is capable of mobilizing researchers and industrial manufacturers on to a call to action.

The European Union Research Frameworks facilitate many large scale, collaborative programmes of the types described above and are dependent on galvanising the dedication and commitment of the wider scientific community. The formal funding programmes, such as Horizon 2020, play a particularly critical role in facilitating pre-competitive and public health research by bringing parties from different sectors together, in both European Union member states and other participating countries.

GSK participates in and leads many of these programmes collaborating in a range of areas. Programmes that facilitate international collaboration are of great benefit to us, our research partners and ultimately patients.

1. *Thinking of existing models, agreements, or international partnerships, what features have made them a success?*

There is not a one size fits all for a successful international collaboration. Some of the factors which have driven the success of existing research collaborations include:

- Being able to bring a **wide range of experts** and groups together in multidisciplinary teams, representing scientific excellence, to draw on the most relevant and broadest knowledge and capacity possible.
- Having a **neutral cooperative platform** through which academia, industry and other partners can come with different perspectives and create better understanding and deliver shared goals.
- Putting in place a **clear overarching framework** and shared objective, including strong **governance structures** with emphasis on clear roles and responsibilities, effective communication of decisions, and a commitment to transparency.
- Facilitating novel and **flexible research and funding structures**, suited to the specific area of research, including formal and informal collaboration.
- **Data sharing** where innovation can be accelerated, generating new ideas, or doing something new, quicker or cheaper through open science and making information widely available to the scientific community.

Some examples of successful programmes and their success factors can be found in Annex 1.¹

2. *What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.*

¹ The Pharmaceutical industry participates in the Innovative Medicines Initiative (IMI) to improve health by speeding up the development of, and patient access to, innovative medicines, particularly in areas where there is an unmet medical or social need. This is achieved by facilitating collaboration between the key players involved in healthcare research, including universities, research centres, the pharmaceutical and other industries, small and medium-sized enterprises (SMEs), patient organisations, and medicines regulators. IMI is the world's biggest public-private partnership (PPP) in the life sciences.

Any future European Research Frameworks, including FP9 (Framework Programme 9), should build on past successes, including models of public-private partnerships elsewhere in the world. Science is an international endeavour and it is important that there are mechanisms to bring together expertise from the EU, with scientists globally.

A key aspect of the success of Horizon 2020 has been the ability to draw on a broad scientific community and setting a precedent for the participation of non-member states in European scientific research. During the course of Horizon 2020 Framework, several countries, including Switzerland, Iceland, Norway, Turkey and Israel, were granted Associated Country status. There is also some precedent in incorporating expertise from elsewhere in the world, such as the United States, but this is something that should be further maximised in the future. Building on this, it will be important for the UK to continue to participate fully in and contribute to EU programmes aimed at progressing advances in healthcare and medical science.

To maintain and enhance the existing strengths of international and European research frameworks, the following should be prioritised:

Projects involving a wide range of experts:

- The brightest scientific minds from the EU, UK, and other countries, should continue to contribute to FP9.
- EU scientists currently working in the UK should be able to continue to do so, and vice versa.
- Funding and involvement in EU collaborations should remain accessible to UK academics and industry.
- New mechanisms to support even greater international collaboration should be introduced.

A unique neutral cooperative platform:

- The UK should remain an active partner in future programmes, and participate in decisions on scientific priorities, along with other key partners (Switzerland participation model).

A clear overarching framework and governance structures:

- The interests of patients should continue to be protected by a stable and predictable regulatory and research framework.
- The objectives of the research framework and individual projects should be clearly focused and avoid duplication of efforts in different partnerships or countries.

Flexible research and funding structures:

- There should be flexibility to maximize limited resources (e.g. in areas where low return on investment such as research on Antimicrobial Resistance) or to leverage expertise and funding from outside of the EU.
- Private and public resource will be best applied, to the benefit of society and patients, when the right partners (private and/or public) are able to participate.

Data sharing and open science:

- Mechanisms are needed to encourage and facilitate data sharing in a manner that protects personal information and incentives for innovation.
- In many areas, such as clinical trial data, industry has embedded data sharing to a greater extent than academic counterparts. Therefore, the EU regulatory and research frameworks should provide a mechanism to promote data sharing across all sectors.

Other considerations include the needs of current projects and the regulatory and technological environment in which research is conducted:

- Existing collaborations, such as the EPAD project, which is pioneering a novel, more flexible approach to clinical trials of drugs designed to prevent Alzheimer's dementia, need the current levels of collaboration to be maintained to be a success.² This programme, run through the IMI, has 38 partner organisations, working across 10 study sites in the EU and USA, with over 400 research participants.
- The increased use of data will drive large scale cross border scientific collaboration. Access to large data sets that paint a more comprehensive picture of patients allows patient-relevant outcomes to be measured more accurately.
- The ability to collaborate on clinical trials, within an aligned regulatory framework, will also be essential for future success in life sciences. For example, the UK's alignment with the EU's future Clinical Trial

² <http://ep-ad.org/project-objectives/>

regulation would be greatly beneficial. Limiting the data or patient pools due to regulatory divergence will negatively impact the ability of researchers to follow the best science.

3a. What practical steps are needed to realise the overall model you describe in Question 2?

The EU, UK and other international countries share common public health priorities best served through collaborative partnerships. Issues such as patient safety are international, and it is only through international research collaboration that they can be tackled.

Some practical factors which could contribute to the success of a future framework are:

- Focus on mission oriented research for the solution of a specific problem with clear scientific milestones and deliverables, including a plan for the future use/implementation of outcomes;
- Facilitate multi-sectorial projects, with strong involvement from relevant parties, including academia, government and industry throughout the process;
- Robust and harmonised regulatory, legal, IP, and publication frameworks, which facilitate collaboration and ensure patient safety;
- Governance focused on the delivery of science based outcomes to facilitate implementation of successful outcomes rather than number of publications;
- Dedicated and collaborative project leadership closely aligned with project management that goes beyond administrative support i.e. the right infrastructure to collate and share data; and
- Flexibility and simplicity of operational approach and funding for projects.

Some of the larger infrastructure facilities have already put agreements in place to work together post Brexit. For example, the synchrotrons have an agreement to co-ordinate machine downtime when their respective light beam sources are being upgraded. It is important cooperative agreements such as this are maintained, and where relevant others created.

3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

There is an opportunity, while thinking about the structure of FP9, to remove some of the barriers which have previously been in place such as complex legal frameworks and bureaucracy which make the system hard to navigate. Streamlined decision making, with appropriate agreements that progress science and innovation (including the option of bilateral agreements between partners to protect incentives to develop innovative treatments) would help translate new science into patient benefit.

Factors which might affect the ability to implement a shared vision include:

- Poorly defined framework and project objectives, and duplication of effort across multiple frameworks or research infrastructures;
- Regulatory divergence, making international collaboration (between the UK, EU and other international partners) more difficult, particularly on clinical trials and data;
- Inadequate or poor governance, focused on limited outcomes;
- Limitations on mobility of researchers, or the perception of future limitations, which impact willingness to participate in research projects or proposals;³
- Inflexible IP framework;
- Uncertain or decreasing national or European research budgets; and
- Divergence in UK and EU law affecting participation such as the framework for state aid for research and development and innovation (C(2014)3282, Brussels, 21.5.2014).

³ <https://www.elsevier.com/connect/brexit-resource-centre>

Annex 1: Examples of Successful Scientific partnerships

The European & Developing Countries Clinical Trials Partnership (EDCTP)⁴ aims to accelerate the development of new or improved drugs, vaccines, microbicides and diagnostics against HIV/AIDS, tuberculosis and malaria as well as other poverty-related infectious diseases in sub-Saharan Africa, with a focus on phase II and III clinical trials. The programme is implemented as part of the European Framework Programme for Research and Innovation, Horizon 2020 and governed by the participating African and European countries. GSK is currently working with the EDCTP on a joint call for proposals on co-morbidities of NCDs and poverty-related infectious diseases (PRD), to address the high burden of PRDs and NCD co-morbidities in sub-Saharan Africa. EDCTP has had some considerable successes, such as establishing the [Pan African Clinical Trials Registry \(PACTR\)](#) - the first WHO recognised clinical trials registry in Africa - establishing a unique guidebook for African Research Ethics Committees written almost exclusively by African scientists, clinicians and ethicists, and supporting several key clinical trials in TB diagnosis, and Malaria treatment and prevention.

Key success factors:

- By bringing together the clinical knowledge and experience of the European institutions, and the local insights from the African partners, this programme aims to conduct the best science in the right context. This should provide the most relevant and useful results for patients in Africa.
- The programme has rigorous and collaborative governance provided by the board and scientific advisory committee, including representatives from the UK, Mozambique, France, Germany and the Republic of Congo.

TB Drug Accelerator Program⁵ aims to speed up the discovery and development of novel compounds against tuberculosis (TB). Launched in August 2012, TB Drug Accelerator (TBDA) is a ground-breaking partnership between eight pharmaceutical companies, including GSK, and seven research organizations with support from the Bill & Melinda Gates Foundation. There is no other non-governmental entity in the world that is funding all aspects of TB research in as comprehensive a way as this program. The portfolio is based on analyses of multiple perspectives, including the patient pathway through the health system, the lifecycle of the disease and the basic biology of TB, and since 2013-2014 the program has made impressive progress toward filling knowledge gaps in TB pathogenesis and immune responses.

Key success factors:

- The programme was set up with a strong and involved funding and governance structure, from the Bill & Melinda Gates Foundation, who remain actively involved in the project, not just as funders. The sustained, long-term funding has produced new research tools that have enabled progress in areas such as drug development and understanding transmission, and has led to major breakthroughs.
- The programme is centered on industry collaboration with input from academia, rather than industry being brought in as a partner once the objectives have been set. The success of the academic and industry partnership in the TB Drug Accelerator is a model for collaboration and is attributable to the foundation's convening power and unique role.

ND4BB (New Drugs for Bad Bugs)⁶ represents an unprecedented partnership between industry, academia and biotech organisations to combat antibiotic resistance in Europe by tackling the scientific, regulatory, and business challenges hampering the development of new antibiotics. The programme currently comprises seven projects. GSK has helped to set up and coordinate three of the projects within the ND4BB programme, CombactNet, Enable and Translocation. GSK contributed clinical trial expertise, drug discovery and scientific leadership into the projects respectively. GSK has also contributed or led work packages within the remaining projects of ND4BB.

Key success factors have been:

- The ability to operate on a Europe Wide neutral scientific Platform, with the ability to operate across continents

⁴ <http://www.edctp.org/>

⁵ <http://partnerships.ifpma.org/partnership/tb-drug-accelerator-program>

⁶ <http://www.imi.europa.eu/projects-results/project-factsheets/nd4bb>

- Implementation of new partnerships with existing financial rules, e.g. the ability of managing partners to subcontract CRO activities within a clinical trial network was not anticipated during development of the framework and required some flexibility, and extensive project management and alliance management, through the IMI framework
- Development of IP and financial models for the co-development of antibiotic molecules (ENABLE Project)
- Public/private partnership across borders where patient recruitment and site selection is difficult

PreDiCT-TB⁷ aims to find the most rapid and reliable ways of identifying the most potent combinations of new drugs and hasten their arrival in the clinic. PreDiCT-TB is a consortium of 19 public and private scientific partners from seven EU members' states. GSK coordinated the PreDiCT TB project and was instrumental in providing review and rationalization of new TB experimental models and PK/PD modelling within the project.

Key success factors:

- The ability to operate on a Europe Wide neutral scientific Platform, with the ability to operate across continents (i.e. contribution from US Partners and link with US regulators and consortia)
- Extensive project management and alliance management across multiple partners

ADITEC (Advanced Immunization Technologies)⁸ has developed novel immunisation technologies, adjuvants, vectors and delivery systems, formulations and vaccination methods optimised for different age groups - an EU-funded project that has successfully brought together 42 public and private organisations from 13 European countries and the US. As well as participating as an industry research partner, GSK's Dr. Rino Rappuoli, Chief Scientist at GSK Vaccines, is the Project Coordinator for ADITEC and is on the Steering Committee for the programme.

Key success factors:

- The project was the first to adopt a new model for vaccine research in which the European Commission provided funding for collaboration which specifically included a provision for training courses for researchers;
- The multidisciplinary Systems Biology approach in tackling the challenges of vaccine immunization technologies; and
- The objectives of the project were thought to be very ambitious at the start, but were finally exceeded.

PERISCOPE (Pertussis Correlates of Protection Europe)⁹ aims to accelerate the development and registration of novel pertussis vaccines. The project will focus on a more thorough understanding of the immune response to infection and vaccination, on the identification of biomarkers of protective immunity and on the development of human and pre-clinical models as well as bioassays to predict and evaluate vaccine efficacy. GSK is providing scientific and general expertise in B. pertussis preclinical research, pertussis vaccination and epidemiology to the PERISCOPE project, as well as expertise in licensed pertussis vaccines for prospective clinical studies, clinical development and clinical study conduct. GSK will also conduct several studies, where the results will be made available to the consortium in the course of the project. Although this project is at an early stage, several clinical trials have already been initiated in the UK and the Netherlands.

Key success factors:

- Participation of two major industrial partners with public researchers from academic and public health institutes and SMEs
- Wide range of expertise in clinical trials, vaccinology, immunology, molecular microbiology, (human) challenge models and bioinformatics
- First of the kind combination of funding coming from public and private sector and including funding from a supranational organization (BMGF)

⁷ <http://www.predict-tb.eu/>

⁸ <http://www.aditecproject.eu/>

⁹ <http://periscope-project.eu/>

Miguel Hernandez-Bronchud

BA MA , BM BCH, MRCP, DM, PhD, DGHE

Summary Research CV : https://www.researchgate.net/profile/Miguel_Bronchud2

As a Cambridge Natural Science graduate (Biochemistry part II, BA MA at Gonville and Caius College 1980) and an Oxford graduate (BM BCH, 1983 and DM/later Madrid PhD 1990, Wolfson College) I feel particularly attracted to your proposal.

Having previously gone to school in Italy (Liceo Classico Massimo d'Azeglio, Torino) and now finally back to my native Barcelona as a cancer clinician I might have a few personal conceptual ideas to share and perhaps some suggestions :

1. The UK education system is mainly focused on “critical thinking” as method of learning rather than “memorizing” and then reciting back knowledge(more typical of Continental learning and teaching). Thus in my humble experience in the UK students are encouraged to ask (good questions) while in the Continent traditional Latin and German schools they are taught mainly “to answer” rather than ask questions.
2. UK professional research and teaching positions are very much dependent on a personal network of referees and mentors (not only on CV or published material) and although both are of course related what I found (not a nice experience) is that the former (a good personal network of UK mentors) is or can be pretty useless here in the Continent or even counter productive (envy and jealousy can play a role)...when seeking jobs or promotion.
3. I disagreed on Brexit and the way it came about (too many lies before the referendum and since, besides some “clearly age-related bias against EU”?); but I agree on one aspect: EU current management including in R&D is excessively slow bureaucratic and not enough innovative fast and creative (perhaps as a result of point 1, above)
4. Thus, if we could bring together the best of the two systems in a synergistic manner, by means of some kind of “special relationship” or trust between UK and EU one could probably use both to Science advantages.

For example now I am privately (out of my main pocket or patient donations) sponsoring two R&D programs (did not even bother to ask for EU or Spanish public money):

A. A 2020 Barcelona Regenerative Medicine Clinic under construction in Barcelona which will focus on some specific clinical applications in stem cell and growth factors research (I developed the clinical use of recombinant human G-CSF at the Christie Hospital with Prof. Mike Dexter back in 1986-90 - before he became Director precisely at the Wellcome Research Trust):

1. Sports Medicine (including injuries to professional VIPs sports people, for example Barcelona CF Footballers...);
2. Odontological and teeth implants;
3. Plastic Surgery and esthetic Medicine;
4. Traumatology (Arthroscopic);
5. Immunological new approaches To cancer therapy

Therefore any UK research group or related groups working on these fields from the point of view of Regenerative Medicine will be more than welcome as partners or collaborators. For example groups on Stem Cells/Growth Factors or BioMaterials. We are already in touch with a Glasgow Group led by

fellow Spaniard Prof Manuel Salmeron with exciting pre clinical work on bone regeneration in dogs (recently in BBC news)...

Our Clinic will not be as such an R&D clinic but an applied clinical center. We are planning conducting or participating in some phase 3 or 4 studies (including multi centric prospective and controlled studies) on Quality of Life and Safety issues (which will be posted in webs like Clinical Trial Gov or others) rather than early clinical studies or preclinical.

If Any New device or UK patent enters clinical development we would like to know and if needed we could even try and find some local industry sponsors for the relevant sponsorship of R&D.

B- Placental Immune Editing Switches (PIES) : Following an innovative Paper I published in Dec 2016 in Oncotarget (using a Genomics Nanostring technology) we provide further evidence (this time epigenetic rather than genomic) to the hypothesis that the rather high comparative incidence of aggressive epithelial cancers in most mammals - as opposed to invertebrates and other vertebrates like fish, reptiles or birds (or presumably dinosaurs) - is perhaps related to the evolution of placental derived mechanisms of immune regulation to allow for feto-maternal tolerance in placental mammals (and therefore probably cancer cells escape from immune vigilance). This makes particularly interesting the Oncological study of non placental mammals like Platypus Ornithoryncus and Echidnas in Australia. We are now aiming at some probably X-chromosome related DNA area to elucidate further Epigenomic mechanisms.

See:

2017: ONCOTARGET

[http://www.oncotarget.com/index.php?journal=oncotarget&page=article&op=view&path\[\]=23488&author-preview=i4g](http://www.oncotarget.com/index.php?journal=oncotarget&page=article&op=view&path[]=23488&author-preview=i4g)

2016: ONCOTARGET

[http://www.impactjournals.com/oncotarget/index.php?journal=oncotarget&page=article&op=view&path\[\]=13306&author-preview=a9m](http://www.impactjournals.com/oncotarget/index.php?journal=oncotarget&page=article&op=view&path[]=13306&author-preview=a9m)

On balance, I feel my personal experience as UK trained Cancer Clinician and Researcher with training/education in some of the best learning centers of UK/Italy/Spain might be of help to many and younger others now that we are entering a new political scenario post Brexit.

1. Elements that underpin successful partnerships

International partnerships at Imperial College London benefit from access to long-term, substantial funding from both the UK Government and the EU.¹ Our international engagements build from the UK's reputation as a global science and innovation hub with excellent research institutions.²

1.1 MOBILITY

- **Britain's position as a scientific world leader is dependent on global connections and supportive immigration policy.** Imperial seeks to work with peer institutions all over the world in pursuit of an objective to collaborate with and educate the best globally.³ We believe that great discoveries arise "when cultures collide and collaborate".⁴ As the UK's most international university, our existing and successful international partnerships are underpinned by international exchange and academic mobility programmes which support world-class science, education and innovation ecosystems.⁵ This increases diversity and enriches the intellectual climate of the College.

Examples:

- *The Marie Skłodowska-Curie Actions (MCSA) provide training for researchers at all career stages with a major focus on both international and inter-sectoral mobility. The Individual Fellowships (MSCA IF) and Innovative Training Networks (ITNs) in particular have provided high-quality educational, research and knowledge exchange opportunities that drive scientific breakthroughs.*
- *We have dynamic exchange programmes in place with world-leading universities of science and technology. Our mobility programmes, for example, with Massachusetts Institute of Technology (US), Tsinghua University (China), Technical University of Munich (Germany), Centre National de la Recherche Scientifique (France) and Tokyo Tech (Japan) bring together outstanding researchers working on the application of science and technology to solve global societal challenges.*
- *We engage in exchange programmes as members of the League of European Research Universities (LERU) and Global Tech Alliance: two international networks that provide platforms to bring together technological and research-intensive universities, governments, pioneering industry leaders, SMEs developing the technologies of the future, and impact-driven organisations in the public and third sectors.*

- *Our students come from more than 100 countries. Most international students at Imperial return to their home countries after graduating, forging successful careers and maintaining connections with the UK, heightening our global influence. For example, Chen Jining completed a PhD in Civil Engineering at Imperial before serving as President of Tsinghua University and is now Environment Minister under President Xi Jinping. Marc Garneau completed a PhD in Electrical Engineering at Imperial before becoming the first Canadian in outer space and is now Transport Minister of Canada.*

¹ See [Imperial College London: Annual Report and Accounts 2015-2016](#); and [University funding explained](#), Universities UK (2016). London, UK: Universities UK.

² [The Implications of International Research Collaboration for UK Universities](#), Jonathan Adams & Karen A. Gurney, Digital Science, Feb 2016 ; [From the outside in: G20 views of the UK before and after the EU referendum](#), British Council, June 2017

³ [Imperial College London: Strategy 2015-2020](#)

⁴ [A Magic Pony and America's unicorns: how immigrants spark innovation](#), Alice P. Gast, World Economic Forum Blog, January 2017

⁵ [Times Higher World's Most International Universities 2017](#)

- *Our alumni are powerful ambassadors for British business and innovation. For example, Malav Sanghavi (India) studied International Design Engineering at Imperial and the Royal College of Art and is staying in the UK with an Imperial-sponsored graduate entrepreneur visa to build a UK-Indian start-up selling innovative low-cost baby incubators made of cardboard, and adjustable smart sockets for artificial limbs.⁶ Imperial graduate Zehan Wang (China) worked with his British course friend Rob Bishop to found Magic Pony, a machine-learning visual processing tool. They sold the business to Twitter last year for \$150 million and are helping to build Twitter's global AI research and development centre in London.⁷*

1.2 FUNDING AND INVESTMENT

- International collaboration is increasingly synonymous with excellent research. Working internationally enables academics to increase their impact and nations to pool talent and resources to address global societal challenges and drive economic competitiveness and innovation.⁸ **Successful policy and funding for international partnerships supports flexible collaborations with excellent partners wherever they are located in the world.**⁹ Scientific excellence is advanced by sustained and balanced investment across the whole research spectrum from fundamental discovery to applied research.¹⁰

Examples:

- *Imperial academics have won more than 100 European Research Council (ERC) grants as part of H2020 'Excellent Science'. The ERC gives beneficiaries the independence to pursue bottom-up' groundbreaking research that is high-risk/high-gain and radically advances the state-of-the-art.¹¹*
 - **Professor Zoltán Takáts**, a Hungarian researcher, developed, in collaboration with research colleagues at Imperial, a scalpel that tells surgeons immediately whether the tissue they are cutting is cancerous or not: the iKnife. This research was funded by ERC Starting and Consolidator Grants worth €3.75m.
 - **Professor Michael Schneider** (US national) is a leading authority in the field of cardiac molecular biology. He won an ERC Advanced Grant to identify the mechanisms governing stem cells in the heart that could regenerate when grafted into a heart injured by heart attack. Professor Schneider credits the European research funding mechanisms for supporting international collaborations between groups in different countries as a major reason for his decision to move to the UK from the US.
 - **Professor Esther Rodriguez-Villegas** (Spanish national) has won three European Research Council grants worth nearly €4 million. She developed the AcuPebble, a wearable breathing and cardiac monitoring device that uses innovative engineering to provide automatic assessment of respiratory and cardiac conditions including sleep apnea, COPD, atrial fibrillation and asthma.
 - **Professor Daniel Rueckert** (German national) is the Head of the Department of Computing. His research aims to build the first ever map of brain connectivity in fetuses and newly-born children, allowing researchers to study how brain connectivity is altered in neuropsychological disorders such as autism. Professor Rueckert has received a total of €3,265,196 of funding from the European Research Council to date.

⁶ Malav employs people in R&D and manufacturing in both the UK and India – forging new trade connections – and was recently named in the Forbes 30 under 30 list as one of Europe's most exciting young entrepreneurs.

⁷ [Imperial graduate's startup valued at \\$1 billion](#), Imperial College London, May 2017

⁸ [Collaborations: The fourth age of research](#), Jonathan Adams, Nature, 2013

⁹ [Imperial has UK's greatest research impact, finds REF](#) December 2014

¹⁰ [Now is the time to innovate: the road to three percent](#), CBI, March 2017

¹¹ Over the last decade, the ERC has supported more than 100 grants across all four faculties of the College, investing €160 million, making Imperial one of Europe's top beneficiaries of the ERC's excellence-based funding.

<https://www.imperial.ac.uk/media/imperial-college/about/public/ERC10thAnniversaryEvent.pdf>

- *Horizon 2020 ‘Societal Challenges’ and ‘Industrial Leadership’ pillars are further examples of international collaborative funding that addresses global societal challenges and drive economic competitiveness and innovation.*¹²
 - The ROLINCAP project brings together excellent researchers from UK, Sweden, South Korea, Germany and Greece to advance high-potential post-combustion Co2 capture processes. Preliminary estimates indicate that the envisaged phase-change systems may increase the net generating capacity of a 600MW coal-fired power plant by 8-11.5%. In a 15 year period this increase may result in the avoidance of approximately 130-180 600MW power plants in Europe and approximately 25-40 600MW power plants in South Korea.¹³
 - The European Asthma Research and Innovation Partnership (EARIP) brings together scientists from across Europe, working with the pharmaceutical industry (GSK and Novartis) and patient groups to develop an ambitious roadmap for research, development and innovation. The roadmap aims to transform the lives of more than 300 million people who currently have asthma around the world and reduce asthma-related deaths by 25 per cent within the next 10 years.¹⁴
 - Imperial researchers, with the backing of Volkswagen, Volvo and German university partners, are working on a €6 million project to develop a new clean fuel – PhotoFuel – using Cyanobacteria, which get their energy from sunlight. The aim is to scale up the project to an industrial level, with ‘living refineries’ producing sustainable, low-carbon and cost-effective transportation fuels.¹⁵
 - An international team of doctors is aiming to develop a rapid test to allow medics to quickly identify bacterial infection in children. The £14 million project, which involves French biotech firm bioMérieux and UK-based Micropathology Ltd, aims to reduce the use of unnecessary antibiotics and to quickly identify deadly cases of meningitis, sepsis and other life-threatening bacterial infections.¹⁶
- *Imperial is a partner in the FET Flagships on Graphene and the Human Brain Project. The Future and Emerging Technologies (FET) programme uses Europe’s excellent science base to bring new cutting-edge technologies to maturity with the intention of giving Europe a competitive economic advantage in these areas over the long term.*
 - The EU’s Graphene Flagship is a ten-year, €1bn research and innovation endeavour aiming to take graphene and related layered materials from a state of raw potential to a point where they can revolutionise multiple industries. Imperial is one of around 150 partners spanning academia, research institutes and industries in 23 countries. The funding supports the College’s Mattevi Group to conduct fundamental, discovery-led research into two-dimensional materials with promise for a variety of applications ranging from energy storage to medical diagnostics to consumable electronics.¹⁷
 - Imperial is also a member of the Human Brain Project. The HBP gathers a large consortium of 112 partner organisations, mostly from Europe but also from the USA, Japan, and China and involves world leading experts. It is a multidisciplinary consortium which includes experts in computer science,

¹² Since the current EU Framework for Research and Innovation, Horizon 2020 (H2020) began in 2014, Imperial has won 268 awards worth approximately €164m.

¹³ More details on ROLINCAP can be accessed at: http://cordis.europa.eu/project/rcn/205819_en.html

¹⁴ *Asthma could be cured within a generation, say European researchers*, Imperial College London, May 2017

¹⁵ More details on PHOTOFUEL can be accessed at: <http://www.photofuel.eu/project.php>

¹⁶ More details in PERFORM can be accessed at:

http://www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/newsummary/news_19-6-2016-21-53-8

¹⁷ See [Mattevi Group: Two Dimensional Materials](#)

neuroscience, robotics, micro-electronics, and also in innovation and exploitation, ethics, education, programme management and communication.

1.3 MULTI-SECTORAL PARTNERSHIPS

- A key pillar of Imperial College London’s strategy is to continually strengthen international collaboration with business, academia, and non-profit healthcare and government institutions across the globe. **Funding instruments, and an immigration regime that facilitates international multi-sectoral partnerships, help drive our collaboration across boundaries and disciplines.**

Examples

- *International university-industry partnerships support a much richer research ecosystem and knowledge-based economy, with job and wealth creation.¹⁸ In 2015/16 our research income from industry was nearly £54m (over 15% of total research income).¹⁹ We attract new investments into the UK from global corporations and international partners across a range of sectors, such as Petronas, AVIC, Nestle, Novo Nordisk, Johnson and Johnson, Huawei, NEC and Intel. We also help British businesses to reach further; our R&D collaborations with Rolls Royce are driving new opportunities in Singapore and around the world.*
- *The UK Industrial Strategy and Life Sciences and Industrial Strategy can expand international synergy between industry and academia. There is clear evidence that publicly funded R&D creates a strong ‘multiplier effect’ and ‘crowds-in’ private sector, charitable and inward investment, stimulating around 30% more self-investment from industry.²⁰ For example, Ireland has been extremely successful at attracting investment and jobs from the pharmaceutical industry through sustained government investment in research infrastructure. Ireland is now moving up the international knowledge scale and attracting increasing research investment.²¹*
- *Higher education is an incredibly valuable export sector that also attracts inward investment, beyond the billions in fees and expenditure that international students bring. Imperial’s Incubator has attracted £1 billion of investment to UK spin-outs like Blocks – a multinational student and recent graduate-run firm behind the world’s first modular smartwatch – and Cortexica, which is selling its image recognition technology, originally developed in Imperial labs, to some of the top US fashion houses.*
- *Imperial is involved in two-of the European Institute of Technology Knowledge and Innovation Communities (EIT KICs). Our involvement in Climate KIC-and EIT Health provides entrepreneurial experience to our graduate students, but also fosters international collaboration, strengthens links with industry and enhances Imperial’s profile and reputation as a centre for innovation and translation of research into impact.*

2 The shape of an ambitious new partnership

Analysis this year showed that Imperial is the 4th most successful HEI in Europe at winning H2020 funding.²² One third of research collaboration at the College involves European collaborators. Strong European science and innovation networks have been formed over the duration of European funding programmes, and have in turn consolidated or ignited wider global collaborative and interdisciplinary endeavours. The key priority for the UK government should be to secure an agreement on science and innovation which will enable the UK’s full access to future EU research and innovation programmes (and infrastructures) with a focus on excellence.

¹⁸ See [The Dowling Review of Business-University Research Collaborations](#), July 2015

¹⁹ See [Imperial College London: Annual Report and Accounts 2015-2016](#)

²⁰ See The Economic Significance of the UK Science Base, Haskel, Hughes and Bascavusoglu-Moreau, March 2014

²¹ See [Boom time for pharma industry](#), Irish Times, Nov 24 2016

²² See [UK’s participation in Horizon 2020](#), Department for Business, Energy and Industrial Strategy, November 2017

2.1 RESEARCH AND INNOVATION

- The Phase 1 agreement underlines that "the UK states that it may wish to participate in some Union budgetary programmes of the new MFF post-2020 as a non-Member State."²³ **We urge the UK Science Community to play a full part in the consultation process for FP9 in order to send a signal of the UK's commitment to reaching an ambitious science and innovation agreement with the EU.**²⁴
- **We are advocating for an ambitious new arrangement for research collaboration between the EU and the UK which grants full access to FP9 and all subsequent EU research and innovation programmes.** This would also be the best route to preserve our relationships with current EU partners and to develop fruitful research collaborations with new ones.
- **It is not simply the funds provided by EU, but also the opportunities provided by networks and facilities co-developed over 30 years of collaborative joint research programmes that are vital to our academic staff.** Continued participation would retain ease of access to vital networks, data sets, and pan-European research infrastructure projects. For example, hardware or science involvement in a European space mission is inherently building upon pan-European collaborations, relying on expertise and trust developed over years and decades; such networks are invaluable.
- **The Government should continue to forge new global research networks and co-fund more ambitious programmes to support collaboration with leading science powers and emerging economies.** We recognise progress made to date, for example with the Rutherford Fund²⁵, the UK-China Science and Technology deal²⁶ and UK-US Science and Technology Agreement.²⁷ The UK should continue to bolster its world-leading reputation in science by investing in European programmes at current levels *and* investing in new global initiatives. European neighbours such as France and Germany have long invested in European frameworks while at the same time developing bi-lateral funding instruments with other leading science powers such as Japan, Korea, China, US, Brazil, Russia and Switzerland.²⁸ These bi-lateral initiatives complement co-funding agreements the EU have made to open-up framework programmes to the world with Republic of Korea, Mexico, China, Taiwan, Hong Kong, Russia, Brazil, Australia, Japan and Canada.²⁹

2.2 MOBILITY

- There is an urgent need to develop policies that protect academic mobility as part of the UK's new relationship with the EU. **We need the ability to recruit and retain world-class academics, post-doctoral researchers and students if we are to remain internationally competitive.** We have had direct experience that Brexit is now an important consideration for scholars thinking of studying or working in the UK, and we have had a few examples of scholars choosing not to join Imperial citing the Referendum result – and uncertainty around immigration policy- as a factor in their thinking. In addition, European Universities are

²³ [Joint report from the negotiators of the European Union and the United Kingdom Government](#), European Commission, December 2017

²⁴ [Collaboration on science and innovation - a future partnership paper](#), Department for Exiting the European Union, September 2017

²⁵ [£100 million Rutherford Fund to attract best researchers to the UK, Department for Business, Energy and Industrial Strategy](#), Department for Business, Energy and Industrial Strategy, July 2017

²⁶ [Joint UK-China strategy for science, technology and innovation cooperation sets new horizons for closer international collaborations](#), Department for Business, Energy and Industrial Strategy, Dec 2017

²⁷ [First-ever UK-US Science and Technology Agreement paves the way for closer research collaborations](#), Department for Business, Energy and Industrial Strategy, Sept 2017

²⁸ For Germany see [Deutsche Forschungsgemeinschaft \(DFG\) International Agreements](#); for France see [Overview of ANR's international collaborations](#) and [CNRS cooperations around the world](#)

²⁹ [International cooperation "Open to the world"](#), European Commission

actively targeting our staff with recruitment campaigns because of the uncertainty, a situation that will only develop adversely with time. The greatest risk of the continued uncertainty is that existing and potential international staff and students will no longer perceive the UK to be a welcoming environment. A recent survey for Elsevier by Ipsos Mori found that the UK has taken “a major reputational hit” as a place for researchers to work.³⁰

- **One solution would be explicitly to link scientific mobility with research funding.** Any participant in EU-funded research projects, or European-collaborative grants sponsored by UK agencies (e.g., to undertake experiments at CERN through an STFC grant; to build a space instrument on an ESA mission through a UKSA grant), would automatically receive a visa for free movement between Britain and the EU. This would disentangle science from the wider immigration debate and allow researchers to focus on what they do best.
- We are still attracting top talent from Europe but the government needs to give European workers certainty about their future in the UK. 25% of our staff come from Europe. Our immigration system needs to attract the best and brightest students, academics and entrepreneurs. **We are offering policy solutions to improve our immigration system** including expanding graduate entrepreneur visas, expanding the Home Office’s tier 4 pilot scheme for Masters students, and easing the tier 1 visa route to exceptional talent (see section 3.2).

2.3 EDUCATION

- Study abroad brings wide-ranging benefits to UK students, such as enhanced communication and language skills, reinforced adaptability to new environments, and boosted academic performance. In addition, UK students in exchange are ambassadors of UK universities abroad and as such, contribute to enhance the visibility and notoriety of UK universities. **The Government should negotiate continued access to the Erasmus+ programme beyond 2020 as part of a future partnership agreement.**

Quotes of returning Erasmus Imperial College students after their year abroad:

- *“Studying abroad definitely teaches you a lot of transferable skills, which employers value and you gain a wider perspective on research as a whole.”*
 - *“YiE program gave me the perspective of achieving proficiency in two foreign languages and of having an excellent scientific training at the same time.”*
 - *“A challenging but very rewarding experience. I am now much more confident and culturally aware than when I started.”*
- As a member of the EU, the UK economy benefits from the Unions’ rules on the recognition of professional qualifications and work experience, which facilitate the portability of professional qualifications across Europe. **An ambitious new partnership will require a granular focus on the mutual recognition of professional qualifications after the withdrawal date.** This is important for STEM graduates joining international companies and their ability to take on leadership positions and maintain UK influence.

³⁰ [Following Brexit, securing science funding is top goal, researchers tell government and academic institutions](#), Elsevier/Ipsos MORI survey shows, Nov 23 2017

2.4 REGULATION

- **Our interaction with academic, government and corporate partners is being impacted by the uncertainty about whether the UK will continue to participate in European regulatory frameworks.** There are a number of sectors where divergence between UK and EU regulations might make research more complicated – e.g. if it became more difficult to run multi-centre clinical trials across multiple jurisdictions. Loss of EU funding or regulatory obstacles, for example in pharmaceutical and biotechnology sectors, may cause reluctance from companies and institutions around the world to view their UK counterparts as prospective research partners. There may also be an impact on technology transfer which would limit collaborations.

Practical steps to achieve such a partnership

3.1 RESEARCH AND INNOVATION

- **We are advocating for an ambitious new arrangement for research collaboration between the EU and the UK which grants full access to FP9 and all subsequent EU research and innovation programmes.**
- Regarding intergovernmental agencies, such as participation in European Space Agency (ESA) and the European Organisation for Nuclear Research (CERN), beside the mandatory subscription, the UK would have to negotiate a third-party agreement to participate to specific programmes, such as Galileo.
- We note that a possible solution to the ‘model of engagement’ dilemma has been put forward in the recent Lamy report. It recommends that **the EU should “open up the R&I programme to association by the best and participation by all, based on reciprocal co-funding or access to co-funding in the partner country”**.³¹ The UK Government and Science Community should engage with this debate as part of the public consultation process for FP9.

3.2 MOBILITY

- **We advocate a range of visa reforms that are targeted at the best and brightest students, academics and entrepreneurs and should apply across other sectors and industries aligned with the overarching Industrial Strategy**
 - Easing the Tier 1 visa route for workers with exceptional talent such as top researchers.
 - Expanding the Doctorate Extension Scheme for STEM PhD students from one year to three years to match recent US reforms targeted at STEM PhDs.
 - Expanding Tier 1 graduate entrepreneur visas to encourage the brightest foreign students to develop their business ideas and create jobs.
 - Expanding the Tier 4 pilot scheme for Masters students to cover undergraduate and PhD students at highly trusted institutions.
 - Introducing a new post-study work visa for top STEM graduates.

3.3 EDUCATION

- **The European Commission has proposed to boost academic mobility via the creation of a “European Education Area” by 2025.**³² The UK Science Community should monitor this initiative.

³¹ [LAB-FAB-APP: Investing in the European Future we want](#) – Report of the Independent High Level Group on Maximising the Impact of EU Research & Innovation Programmes

³² [Strengthening European Identity through Education and Culture](#), European Commission, Nov 2017; [Future of Europe: Towards a European Education Area by 2025](#), European Commission, Nov 2017.

London School of Hygiene and Tropical Medicine

Given that many examples of successful partnership programmes exist, it would seem sensible to utilise these existing frameworks to develop new partnerships or enhance existing ones in response to Brexit. Within the research funding area, this would include the Newton Fund, Commonwealth schemes, and collaborations between the UK Research Councils and Brazilian FAPs. The Newton Fund model of bilateral research programmes based on areas of importance to the partner country could be expanded to cover other countries. The requirement for matched funding from the partner government could be explored or funding could be provided from charities or other philanthropic donors. The development of novel bilateral or multilateral partnerships using these models should be encouraged. Increased partnerships within the Commonwealth could also be explored, given that these countries have shared education structures, they offer unique opportunities for the development of training networks and research capacity.

Given the London School of Hygiene & Tropical Medicine's focus on global health, these problems, especially those due to infectious diseases, do not recognise national boundaries but frequently extend across countries with different historical and social backgrounds, addressing these issues is best done through partnerships. This also ensures that the UK's contribution to global health is as effective and cost effective as possible. The success of partnerships such as the European & Developing Countries Clinical Trials Partnership (EDCTP) could be expanded upon.

Encouraging the involvement of industry in research partnership should continue to be encouraged, key examples being the EU Innovative Medicines Initiative and GlaxoSmithKline Tres Cantos Open Lab Foundation in Spain, which could also be used as models for the development of new programmes.

Legislation and regulations relating to intellectual property, animal experimentation, new drugs, clinical trials, and data access and sharing are key issues that must be resolved to ensure that delays do not occur to research, clinical trials and getting new drugs to patients.

Finally we would like to reiterate the importance of continued access to EU funding and the free movement of EU scientists and students, would advocating specific action focussing on these issues.

Robert Lucas

GSK Professor of Neuroscience
Faculty of Biology Medicine and Health
University of Manchester

Elements that underpin successful partnerships:

I have experience of international partnership programs run by the Human Frontiers Science Program and the EU. The difference has been stark. While my HFSP funding was easy to apply for, has a low administrative burden, and has brought together scientist from UK, Switzerland and Japan around a topic of genuinely mutual interest and in which there is valuable synergy in terms of resources and expertise, the ratio of administrative burden to research activity supported for EU funding is much worse and partnerships less obviously synergistic. The reason is simple - while the HFSP funding supports simply research excellence, the EU funding generally comes with additional political objectives, of having to involve SMEs and include beneficiaries from numerous member countries. Each stipulation (including especially restricting partners to the EU) placed on a program inevitably reduces the quality of the science it supports. There is a genuine need for funding for international collaborations but it should be available for partnerships in any country and on any topic, guided simply by the need to support scientific excellence.

Professor Malcolm Macleod

University of Edinburgh

Member of UK Animals in Science Committee, MHRA Commission for Human Medicines, EMA Neurology SAG

Cofounder, CAMARADES (Collaborative Approach to MetaAnalysis and Review of Animal Data from Experimental Studies: international collaborative group without core funding)

Co-PI, EuroHYP-1 (FP7 funded RCT for brain cooling in acute stroke)

National Coordinator PRECIOUS (h2020 funded Dutch led RCT of prevention of complications following stroke)

Investigator, MultiPART (H2020 collaboration award developing framework for international multicentre animal studies)

Co-Ordinator, EQIPD (IMI 9 project)

Elements that underpin successful partnerships

- a. Having established one large unfunded international collaborative network (CAMARADES) and participated in several funded projects, it is apparent that the availability of a funding stream is critical in rapidly bringing together research teams with the required expertise. In particular, H2020 and IMI funding allows funders to specify an area in which they would like to see research conducted, and then engender the development of collaborative groups which did not previously exist and which are of the scale required to deliver such projects.
- b. In my experience there is greater transparency in the processes involved in selecting areas to be funded and in the funding decisions than is the case with national (UK) funding schemes, and the accountability and reporting processes built into H2020 improve the timeliness and the quality of the work done. Both of these features give individual investigators greater confidence that the process is “fair”, and encourages them to be more flexible in their approach.
- c. Research consortia which combine participants from different cultural or epistemological backgrounds are often characterised by an early phase of building understanding of different positions, but in my experience the research plans which result are more robust and more rigorous
- d. In preparation for our most recent application we were fortunate to receive support (travel to consortium meetings, writing time) from our institution, which facilitated our taking a leadership role.

The shape of an ambitious new partnership

- e. Many of the collaborative groups with which I have been involved have addressed questions which either could not be answered in one country (eg multicentre trials, where having to apply for national funding in each country would have introduced prohibitive barriers); or we sufficiently unusual or high risk (MultiPART, EQIPD) that the chances of them being funded, in competition with more mainstream projects, would have been very low indeed.
- f. I have had the opportunity to observe the participation of scientists from non EU countries in such projects. Even where arrangements exist (Australia, Switzerland), there is a sense in which involvement of such scientists – often individuals of the highest quality – is diminished because they are operating under different rules. For any new system – be it with the rest of Europe, or other regions – it is essential that all partners are involved on the same basis, so that the

consortium can focus on exploiting their scientific skills, resources and knowledge rather than having to second guess what impact their national status might have now or in the future.

- g. As above, it is critical that in such schemes the UK retains not just eligibility for funding but also full participation in the thematic development of funding calls and in the process for selecting those projects which are to be funded.
2. Practical steps to achieve such a partnership
- a. The UK government should undertake automatically to provide for the full costs of participation of UK researchers. This will be less beneficial to the UK than the current situation for EU funding, but we are where we are. Any scheme where such funding is “usually” or “normally” provided will give UK participants one more thing to worry about, and will reduce their ability to participate fully in consortium building (because even if the main grant is funded there is at least a possibility that the contribution of UK participants will not).
 - b. Current EU funding schemes require that animal work carried out on such projects, even if conducted in non EU countries, meets the ethical requirements established in the EU Directive. This included very precise requirements, for instance around cage size. Therefore, and divergence in UK regulation from the directive will be problematic for such projects; and it would be extremely helpful if there was a common regulatory framework. Indeed, there have been recent discussions about the utility of seeking greater global alignment of such regulations, and this would be beneficial in collaborations going beyond the EU.
 - c. The free movement of the scientific workforce is critical. I currently serve as primary supervisor for 3 PhD students who will spend at least a year of their time in other European countries, and our ability to provide such projects and to attract the best students would be enhanced by much greater clarity around quite how much we welcome them. Arrangements for work permits are at present relatively cumbersome – given tight timelines on a grant and an understandable need not to advertise positions until funding is in place, it is often very difficult to advertise, interview, appoint and for successful applicants to be granted a work permit in the time available. In the last 10 years I have had 2 such occasions with non-EU individuals, and if the same becomes true for EU non UK individuals we will struggle to recruit the best.
 - d. I am concerned that where the need to maintain ones right of residency and employment is dependent on the award of further funding this provides an incentive even more powerful than usual to rush to print, to overstate the importance of research findings, and to engage in what have been called questionable research practices (underpowered studies at high risk of bias, flexibility in data analysis, hypothesising after results are known). Measures to diminish the strength of such perverse incentives – such as guaranteeing rights of residency beyond the period of a grant or contract on which the individual is employed – might be helpful.
 - e. Perhaps the most elegant solution to all of these problems would be for Uk Govt to set out in detail exactly what the future arrangements will be for the UK science base, and for the rest of society, and allow the electorate to confirm that this is truly what we wish to happen.

Peter Mason,

Policy Manager, UUK International

Speech delivered 13th December 2017, on the Future of the EU-UK Partnership in Science and Research.

I want to take a moment at the start to reflect briefly on the UK higher education sector's strong international heritage, the foundation of which is our truly diverse staff and student communities. Our universities have a long history of welcoming great minds from all over the world to fill our lecture theatres with diverse student communities and to contribute to the creation of cutting-edge knowledge.

It's easy to illustrate this story with prize-winners and household names, but this is true at every institution, at every level and across all disciplines. Our recently launched 'Brightest Minds' campaign seeks to do just that, by profiling six EU academics at UK universities who have made life-changing contributions to fields like public health financing, fingerprint technology, renewable energy, sleep science, manufacturing technology and health economics. Together with their UK counterparts, many of whom benefit international mobility opportunities, our international researchers contribute to the UK's reputation for academic excellence through their own global links. Over half of UK research publications are internationally co-authored, which has a strong correlation with higher impact citations.

So, having given some context, it will not surprise you when I say that Universities UK's view on the future relationship between the UK and the EU in higher education and research and innovation is and has been clear since the day after the referendum – we place an extremely high value on our European links and want to maintain the closest possible relationship after we leave the EU.

At a basic level, this means guaranteeing the status of EU citizens who already work at UK institutions, ensuring the lowest possible barriers for the movement of future staff and students between the UK and the EU, and continued participation in the European Research Area and the EU's higher education and research and innovation programmes.

Speaking to you today, I am able to be more positive about this future relationship than a week ago. Although we had the UK Treasury guarantee for EU funding until the point of departure back in August last year and have previously heard positive references to the science and innovation in the Prime Minister's Lancaster House and Florence speeches, universities and researchers have been desperate for more details about arrangements after March 2019.

Thankfully, if the phase one agreement holds up, then the UK will continue to participate in Horizon 2020 and Erasmus+ through to the end of the programming period in 2020. Although still subject to agreement at the European Council this week (especially in light of David Davis' comments this weekend) and to progress with the phase two negotiations, this has provided some much needed clarity to UK and EU researchers. However, the future relationship, by which I refer to what will happen in the next MFF, is still open for discussion.

As we set out to discuss this relationship today, I would like to suggest three key principles to underpin its development.

- Firstly, higher education and research and innovation must be addressed in a joined-up way. Erasmus+ does fantastic job of creating internationally-engaged and outward-looking students, just as Horizon 2020 has an excellent track record in funding world-changing fundamental and applied research. These programmes are mutually reinforcing and both sides would be poorer if the UK were not able to participate in them.

- Secondly, we need politicians to recognise the strong mutual benefit to collaboration in higher education, research and innovation. Although some may try to wrap up these issues in the broader trade deal, the discussion around Horizon 2020 and Erasmus+ needs to be insulated from any disagreements over the broader trade deal and should not be an area where either side seeks to exploit a competitive advantage. This mutual benefit should also be borne in mind in developing the post-departure immigration regime.
- Thirdly, specifically regarding Horizon 2020 and the next FP, we need to protect the 'common pot' approach to research funding whereby academic excellence remains the single guiding principle in the allocation of funding. Indeed, as advocated by Pascal Lamy in his recent report on FP9, we should try to broaden its geographical reach to maximise the gains from collaboration.

On a technical level, existing 'Associated Country' status in Horizon 2020 and 'Programme Country' status in Erasmus+ provide useful models on which to base the UK's future relationships with these programmes in that there is a precedent for non-MS to make a contribution to the overall budget in return for full access. However, there are two clear areas which will require consensus and compromise in the discussions to come : cost and influence.

It is well known that, in the past, the UK has been a net beneficiary of previous FPs, and other MS are understandably wary about subsidising UK researchers if the UK contributes through a similar GDP-based calculation. Inventive solutions as to how the UK contribution could be calculated would be welcomed, but this should not entail a return to a 'juste retour' philosophy whereby countries receive what they put in.

Similarly inventive proposals around the question of influence should also be welcomed. The UK cannot expect any special treatment as far as involvement in the legislative process for the future programmes is concerned. However, the formation of a Schengen-style 'mixed committee' for higher education and research and innovation which would not confer voting rights could be explored. It is crucial that any solution to these issues should not be sought on the basis of UK exceptionalism, but in consultation with all the other Associated Countries as part of broader reform of the FPs.

Collaboration in higher education and research and innovation is a positive sum game. It leads to better scientific outcomes which have a positive impact in resolving societal challenges and stimulating jobs and growth for all involved. It is also primarily driven by researcher choice, so if the future UK-EU framework is not as close as we would like, collaboration at an institution-institution and researcher-researcher level will simply stop. However, there will be fewer funding opportunities, and more barriers, especially through the loss of a common set of rules for collaboration that Horizon 2020 offers. In short, a substantial opportunity cost.

I would like to end by suggesting three clear steps that the science and innovation community can take already to ensure the best possible future relationship for universities and researchers.

- First, we need to continue to communicate to researchers on both sides that the phase one agreement ensures that the UK can play a full role in Horizon 2020 and Erasmus through to the end of the programme, so there no need to view March 2019 as a cliff-edge.
- Second, UK university stakeholders need to be vocal in the policy development process for the next FP while the UK is still a MS to maximise their influence and demonstrate their commitment to EU research and innovation collaboration.
- Finally, stakeholders on both sides need to be vocal about the clear mutual benefit of continued UK-EU collaboration in higher education and research and innovation, so that politicians prioritise this in the phase two negotiations.

Written response from MRC Laboratory for Molecular Cell Biology at UCL
Wellcome/Royal Society Future Partnership project

Opening remarks |

The MRC LMCB is of the unequivocal view that we must retain access to EU science. Scientific research in the UK is world-leading, and is integral to the health and economic stability of the country as well as for its future development and economic growth. In part, this world class position has been achieved by partnership – both financial and collaborative – with the EU. While the UK government has successfully invested in national research, to date this investment has been supplemented by returns that have come from the EU. Loss of access to EU funding will result in a significant diminishment of resources for UK researchers¹, unless the UK government is able to deliver a funding scheme that will compensate for this loss. Moreover, ongoing collaboration between UK and EU science has broken down barriers across disciplines, allowed researchers to network and exchange skills, has given the UK access to the best EU science, and has complemented and enhanced national strengths. All of this is at risk if the UK does not retain its relationship with the EU: Reduced researcher mobility, skills shortages, funding shortages and loss of infrastructure will all be bona fide consequences of the divorce. We thus strongly believe that the UK must maintain its current links to EU science infrastructures (including regulatory agencies and funding bodies) and continue to be involved in the EU's Science Policy decision-making processes.

Q1 | Thinking of existing models, agreements, or international partnerships, what features have made them a success?

- Long-term funding models | Long-term investment supporting ambitious, high-risk technical and scientific goals exist in the UK, EU and in the US. Successful examples include Janelia Farm and HHMI in the US, Wellcome Centres and MRC Institutes and Units in the UK, EMBL in the EU. By allowing very effective international collaboration and stable long-term investment, EMBL, for example, has made the UK and the rest of Europe highly competitive in the areas of cell, molecular and structural biology. It is by no means clear that the current strength of these fields in Europe would have been achieved without EMBL.
- Research consortia | Successful consortia bring together international expertise and allow access to resources that might not otherwise be available within the UK. Successful examples include consortia focusing on rare diseases, e.g. BATCure (that seeks to provide solutions to Batten disease – a complex of rare but fatal neurological conditions), which bring together clinical expertise and patient cohorts that are otherwise limited in the UK.
- Research Fellowships | A key part of research success, fellowships enable researcher mobility and exchange of knowledge at all levels, from junior researchers to group leaders. They allow cross-fertilisation, knowledge exchange and technical training opportunities, and help lay the groundwork for long-term international collaborations, funding and career-defining training. Examples include Rubicon, Erasmus and EMBO short term fellowships as well as Marie Skłodowska-Curie, EMBO and HFSP long-term fellowships.

¹ In 2013-2014, the total research income of UK universities was £7.04 billion; of this, £0.69 billion came directly from the European Union (almost 10%); this does not include support for pan-European research centres (<https://royalsociety.org/~media/policy/projects/eu-uk-funding/uk-membership-of-eu.pdf>)

Q2 | *What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.*

- **Researcher mobility** | The unrestricted mobility of researchers must remain a key priority to enable and support collaboration and knowledge exchange at all levels - academic faculty/group leader, postdoctoral fellows and graduate students. Examples of opportunities which must be supported include: Funding mechanisms for UK researchers to go on sabbaticals, and for international scientist to similarly come to the UK; support and opportunity for ongoing training (which is essential in the climate of current rapid technical advances seen in life sciences research); mobility and training of early career researchers. Such mobility must have simplified, stream-lined bureaucracy, ensuring that opportunities can be accessed within short timeframes. This is key if the UK wants to ensure it has a strong skills base for the future of research.
- **Research funding** | It is essential that the UK retain access to EU funding, including ERC and H2020. These agencies provide a very important part of the total research budget of the UK (for example, see ¹ above, also in the last round of ERC consolidator awards, [60/329 awards were awarded to UK groups](#)), keeping UK research groups productive and internationally competitive. Lack of access to these awards will result in a significant under-funding of UK science, unless the UK government is able to compensate with alternative funding schemes. In addition, EU support can provide an important source of funds to promote mobility of researchers, ensuring knowledge and key technical advances come into UK research, and support for young, newly-independent researchers. Access to long-term funding is also required to support ambitious projects, that frequently cannot be bought to fruition within short 3-5 year funding periods.
- **Regulation** | The UK government must take steps to ensure regulations facilitate and support industrial collaborations with UK laboratories and retain access to clinical trials held in the EU. The UK must also retain access to EU regulatory agencies.
- **Maintain access to key areas of research** | Collaborations with clear scientific objectives must continue to be supported via a number of different mechanisms, including access to H2020 and future programmes, and access to European consortia. This is especially important in areas where the UK has limited resources, e.g. rare disease research, where access to clinical trials and the large numbers of patient cohorts currently available in Europe is essential.
- **Innovative support for key areas of research** | The UK should support and fund innovative areas of research, such as artificial intelligence, personalized medicine, and genome editing. Creation of pan-European agencies (along the lines of EMBL) devoted to these areas of research will ensure the UK (and Europe) remain competitive.

Q3a | *What practical steps are needed to realise the overall model you describe in Question 2?*

- Research funding | Simplification and stream-lining of bureaucracy to enable barrier-free and increasingly ambitious programmes of research. The UK must continue to retain access to EU funding, and be involved in decision-making processes for the allocation of EU research funds.
- Researcher mobility | There must be no visa restrictions on researcher mobility. Mechanisms must be put in place to allow unrestricted mobility of researchers and research groups, allowing them to take advantage of short and long-term opportunities for training and participation in major research initiatives. Researchers in training and collaborative roles should not be included in net immigration counts, as is currently being proposed for students.
- Regulation | There must be no regulatory restrictions hampering access to funding and cross-border research activities, and no impediment to industrial collaborations with UK laboratories or access to EU clinical trials.
- Government | It is of paramount importance that the UK government sets out guidelines regarding how UK science will interact with established EU partners and the new opportunities for international collaboration that may come through Brexit. This could be facilitated by the establishment of a high-level scientific advisory committee consisting of highly recognized experts in science, made up of, for example, the heads of the Wellcome Trust, UKRI and other major funding agencies, senior academics, and other scientific advisors (e.g. the previous Chief Scientific Adviser to the President of the European Commission). This committee can advise government policy on a shared research vision with the EU, on the concerns shared in Q3a, and, critically, on the required levels of investment into UK science to ensure it remains competitive (including new budgets that will go towards compensating for the potential loss of EU funding via the ERC and H2020).

Q3b | Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

- Factors likely to affect the ability to implement a shared vision include the following: Insufficient funding; restrictions of free movement of people, goods and knowledge; not being part of future EU funding decision making process; barriers to collaborations with industry (e.g. by separate regulatory frameworks)

This document is based on contributions from Prof Mark Marsh, Prof Buzz Baum, Prof Sara Mole, Dr Sophie Acton, Dr Robin Ketteler, Dr Ewa Paluch, Dr Chris Stefan, Dr Gautam Dey, Dr Mafalda Lopes da Silva

Newcastle University

Response submitted by: Dajana Dzanovic, EU and International Research Funding Team Manager,

Date: 08 January 2018

Statement: Continuity of collaboration with colleagues and experts from across EU27 (and beyond), mobility of staff and students and access to funds that underpin these remain a key priority for Newcastle University.

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

● *These could be principles or practical features, either directly associated with the partnership, or the wider enabling agreements between involved parties.*

● *Examples might include specific international research programmes and facilities, or broader international agreements such as on trade or the 'deep and comprehensive agreement' between the EU and Ukraine.*

➤ Jointly agreed framework for cooperation

- Support for EU and International research collaboration which is underpinned by the EU Framework Programmes (FP) for Research and Innovation. The EU FP funding enables collaboration between the best researchers across the EU, enables collaboration across sectors (academic and non-academic) and also internationally. This collaboration is intrinsically important in all areas of research but can be critical for some, for example collaboration in rare diseases research unanimously rests on the need to work in a partnership.
- UK-International bilateral/multilateral agreements such as the Newton Fund or the British Council specific funds.

➤ Purpose with clear mutual, joint and global benefits

- Jointly agreed priorities – the FP funding priorities are agreed jointly between the EU Member States. The UK has always had a very strong voice in ensuring that these priorities are aligned with the national priorities.
- EU-USA cooperation agreement supports collaboration between EU and USA (and other countries) in the area of health and is directly facilitated via mutually accessible funds.
- EU cooperation agreements with specific regions and countries (high economies such as Japan, Russia, China, India, Brazil, South Korea, etc. or and/or Low-Middle Income Countries) facilitates jointly agreed research priorities and is underpinned by dedicated funds from both the EU and a given country/countries.
- Specific initiatives such as ITER, ESA, EMBO which all require pooling of expertise and resources to achieve research programmes and outcomes that are of global significance.

➤ Single legislative and long-term programmes

- The EU FPs are multilateral programmes which enable research collaboration between the EU Member States (currently 28) and EU Associated Countries (currently 16), as well as internationally. This is achieved through a single legislative programme with uniform participation rules for all, with funding automatically accessible for participation of organisations from Low-Middle Income Countries (LMIC).
- The duration, budget, legislative rules of a FP are set for a reasonably long time period thus enabling planning for and providing certainty of opportunities and funds.

➤ Kudos

- EU collaborations lead to increased international visibility for UK research organisations and their areas of research excellence which may impact on external recognition such as QS World Rankings.
- Access to European Research Council funds and attracting/retaining best researchers, and enhancing international visibility of institutions.

➤ People

- Career development of researchers including staff mobility and student exchanges.

➤ Pooling of resources

- Networking and collaboration.
- Joint calls for proposals in specific areas of mutual interest (e.g. ERA-NETS, Wellcome Trust and Gates Foundation, etc.)
- Framework for developing new and accessing a wider pool of research infrastructure.

- Legislative framework for data sharing (including protection of), access to patients and similar.

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

- *This could cover the principles behind collaboration, or address specific requirements in areas such as: mobility of researchers, innovators, technicians and their families; regulation of research and research outputs; research funding; research infrastructures (physical and digital); or the commercialisation of research outputs.*
- *Your answer could address novel scientific and research opportunities, or specific objectives, which a new partnership might be able to exploit.*

- Collaboration: open, cooperative, inclusive multilateral partnership between countries and sectors focussing on both fundamental and applied research, and supporting innovation and market uptake.
- Excellence: frontier as well as multi- and inter- disciplinary research awarded to best researchers and consortia to address fundamental research questions and/or contribute to addressing problems of global significance.
- Mobility: cross-border mobility of staff (research, technical, administrative, as well as their families) and students.
- Networking: enhance existing and build new relationships across EU but also globally.
- Pooling of resources: funds for resource intensive initiatives such as research infrastructures, enable collaborative effort in the areas that cannot operate in isolation (e.g. rare diseases), access to data, access to patients, etc.
- International: ensure collaboration in a widest sense possible.
- Kudos: retain access to European Research Council opportunities.
- Funding: long-term source of funding allocated on a competitive basis.
- Operational: single legislative programme that underpins all of the above.
- Influencing: retain a degree of influence to align/help shape the partnership's funding priorities.

There is no simple way to prioritise the above list, we have identified all of the above as important elements that underpin partnerships (Q1) so they all are mutually inclusive and necessary for a successful partnership.

Practical steps to achieve such a partnership

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

- *This could include potential barriers; legal and governance arrangements – including ratification processes and court jurisdiction; risks to either side; and any precedents set.*
- *It could cover how the partnership might develop, for example phased implementation.*
- *You might wish to comment on how a successful implementation could be measured.*
- Single legislative EU-UK framework (rather than numerous bilateral agreements with the individual countries) which has a minimum European Economic Area level agreement that covers access to funding programmes, movement of staff, students, access to data and similar.
- Long-term funding programme that could be updated and refined on a programme cycle basis.
- Favourable staff and student visa regulations to UK and vice-versa.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

- *This could include factors such as economic pressures, or conflicting research priorities*
- Political will to remain part of the programme and the wider economic area.

The United Kingdom has a long history of highly ranked research institutions and excellent researchers who have contributed to significant research discoveries throughout the years. Ensuring that the United Kingdom will remain a strong partner in the European research environment despite the implications of Brexit includes reformulating the research partnership model between the United Kingdom and the EU. The following are important areas to address in this context.

Memo

January 8th 2018
NNFDOC-172650321-3702
Side 1/4

- Collaboration between researchers from different countries and disciplines should be facilitated, and it is of importance to create a vibrant and agile research environment that fosters high quality research and breakthroughs to benefit health and welfare. Some of the most important research discoveries in history have resulted from multinational collaboration. Thus the mobility of researchers between the United Kingdom and the EU countries is important to support research collaboration.
- International research collaboration matters. The statistics on citation impact show that journal articles produced by the recipients of the Novo Nordisk Foundation grants in collaboration with international co-authors have greater citation impact than those with only national co-authors. The citation impact of the reviews and original articles funded by our foundation with co-authors from the United Kingdom is well above the world average. The share of the co-authored reviews and original articles among the world's 10% most frequently cited reviews and original articles is now at 35%, and 8% of all reviews and original articles are among the 1% most frequently cited reviews and original articles (for more information, see the attached paper).
- A future partnership model for supporting international research collaboration could address new funding agreements between the EU and the United Kingdom. Today, several European countries outside the EU, such as Norway, Switzerland and Iceland, are associated countries under the Horizon 2020 agreement, which means that they can participate under the same conditions as the EU countries. This model could be relevant in inspiring the next EU framework programme for research and innovation.

Research collaboration

Co-authorship between the recipients of Foundation grants and the researchers (private or public) based in the United Kingdom

The researchers the Foundation supports are internationally oriented in their research activities. The recipients of Foundation grants publish 53% of their reviews

and journal articles in collaboration with researchers from research institutions in other countries in 2014-15.¹

Publications

Figure 1 shows the number of publications co-authored between the recipients of Foundation grants and researchers based in the United Kingdom from 2000 to 2016. In 2014–2016, 12% of the publications by the recipients of Foundation grants were co-authored with United Kingdom researchers.

Figure 1. Number of publications (all publications) by the recipients of Foundation grants with co-authors in the United Kingdom, 2000–2016

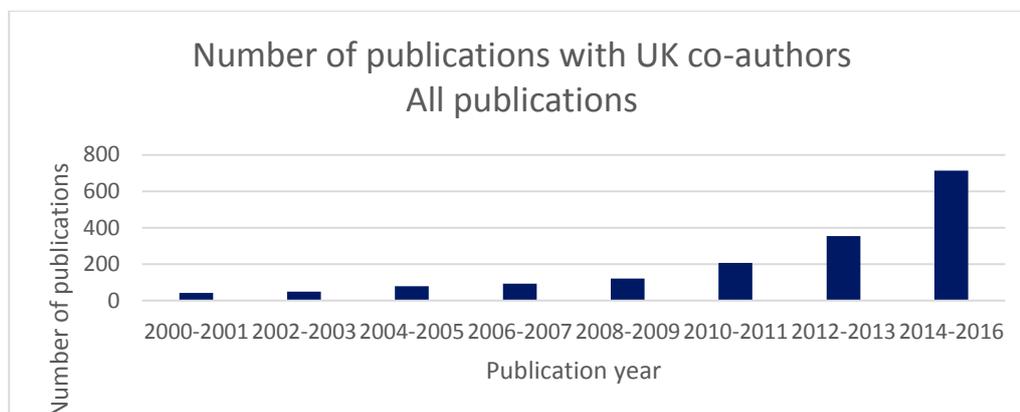
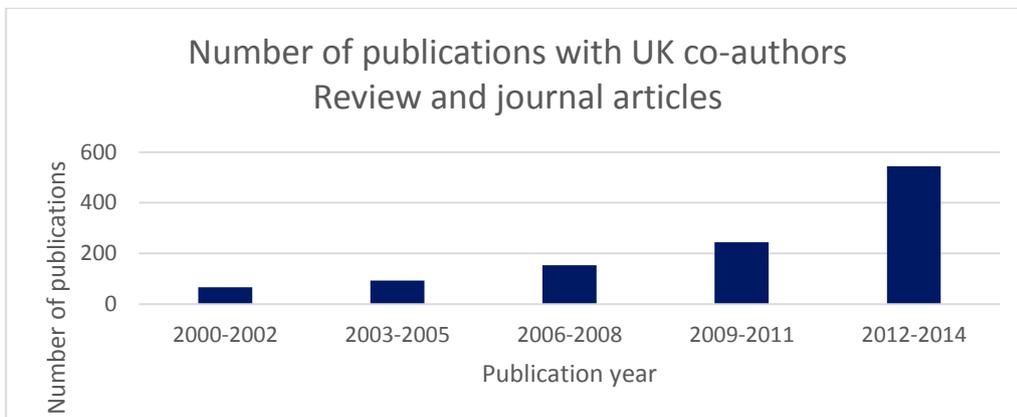


Figure 2 shows the number of review and journal articles co-authored between the recipients of Foundation grants and researchers based in the United Kingdom from 2000 to 2014. The citation impact is based on reviews and journal articles.

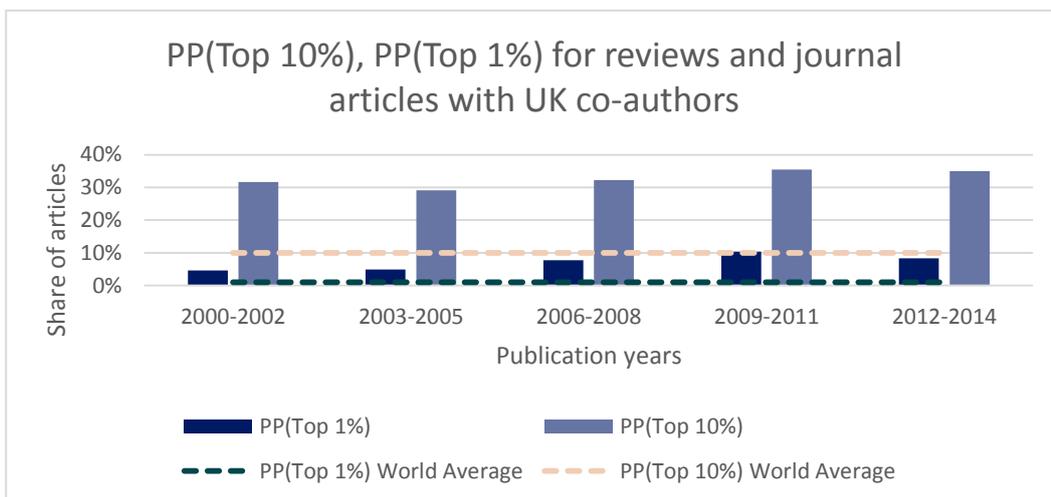
Figure 2. Number of publications (review and journal articles) by the recipients of Foundation grants with co-authors based in the United Kingdom, 2000–2014

¹ http://novonordiskfonden.dk/en/content/impact_assessment_reports



The citation impact of reviews and journal articles with co-authors in the United Kingdom is well above the world average. Starting at a lower level, the share of the UK co-authored reviews and journal articles among the world’s 10% most frequently cited reviews and journal articles (PP(top 10%)) is now at 35%, and 8% of reviews and journal articles are among the 1% most frequently cited reviews and journal articles (PP(top 1%)) (Figure 3).

Figure 3. PP(top 10%) and PP (top 1%) for reviews and journal articles by the recipients of Foundation grants with co-authors in the United Kingdom, 2000–2014

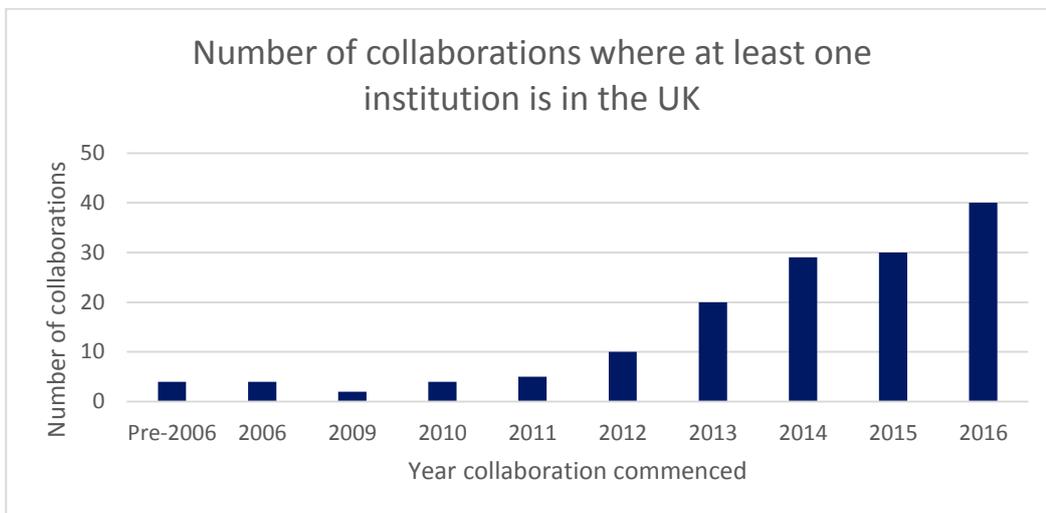


Research-to-research project collaboration and collaborators

Collaboration can be complex, and a single collaboration can involve multiple partners. The number of project collaborations involving the United Kingdom

reported by the recipients of Foundation grants has increased from 20 unique collaborations in 2013 to almost 40 unique collaborations in 2016 (Figure 4).

Figure 4. Number of collaborations by the recipients of Foundation grants in which at least one institution is in the United Kingdom, pre-2006 to 2016



Prof. Arttu Rajantie

I am Professor of Theoretical Physics at Imperial College London. My research area is theoretical particle physics and cosmology. I am originally from Finland, and I have lived and worked in the UK since 1998. Before moving to Imperial College in 2005, I worked as a Research Associate at the Universities of Sussex and Cambridge. I have first-hand experience of mobility within the EU, and I have had many collaborations with other EU countries as well as European PhD students, postdocs and visiting researchers.

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

EU membership, and being part of the European Research Area and EU Research Framework Programmes through it, has been a huge success for UK science. The key features which have made it a success include:

- Lack of barriers on collaboration and mobility
- Supranational funding mechanisms based to scientific excellence, not which country researchers are from
- Pooling of resources

EU membership is the benchmark against which any proposed models should be compared with.

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective?

The agreement must give UK researchers full access to future EU research framework programmes, because it is not possible for a single country to replicate them. The UK has been the major net beneficiary of these programmes, and in many fields they make up a significant fraction of all research funding. Not being able to initiate European collaborations or fully participate in them would also dramatically reduce the UK's leadership in science.

The agreement should not introduce new barriers to collaboration or mobility between the UK and EU countries. The level of national research funding in the UK is lower than in many EU countries, but UK researchers have been able to compensate for this by actively collaborating with researchers in other countries and by hosting visitors funded by other countries. If this becomes more difficult in the future, UK science will suffer.

Irrespective of where their funding is from, EU researchers should be able to:

- come and work in the UK without needing a visa or a work permit
- bring their families with them
- access public services and benefits on the same basis as UK citizens
- remain in the UK even if there are gaps in their funding
- spend extended periods of time abroad without it affecting their immigration status

Because researcher salaries and fellowships are small, it is important that EU researchers do not face additional costs in the UK compared with UK citizens. EU researchers working in the UK must also accrue pensions and be able to take them with them if they move out of the UK.

There should be no visa requirements or other bureaucracy for shorter-term visits, even if they include paid employment such as external PhD examining and lecture fees.

EU students, both undergraduate and postgraduate, should have the same tuition fees as UK citizens, and have access to funding on the same basis.

All of the above should also apply to UK researchers working in the EU.

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

The UK needs to stay in the European Research Area. To allow full researcher mobility, the UK should continue to allow free movement of people. There are three ways in which these can be achieved:

(i) the UK remains a member of the EU

(ii) the UK remains a member of the EEA and an associated country for the EU research programmes (like Norway)

(iii) the UK negotiates a bespoke deal which includes free movement and remains an associated country for the EU research programmes (like Switzerland)

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

Negotiating a Swiss-type bespoke deal would take a long time, and UK science is already starting to suffer because of the uncertainty. The UK government's "red line" on free movement is a serious obstacle to any successful research and innovation partnership.

The Research Council of Norway

RCN serves as the chief advisory body for the government authorities on research policy issues, and distributes roughly NOK nine billion to research and innovation activities each year. The Research Council works to promote international cooperation and increase participation in the EU framework programme on research and innovation. The Research Council creates meeting places and provides a platform for dialogue between researchers, users of research and research funders. More information about RCN on our website:

https://www.forskningsradet.no/en/Home_page/1177315753906

Elements that underpin successful partnerships - the Norwegian case

For the UK, it should be of interest to study the models of partnership between Norway and the EU in the research and innovation field. For Norway, as a non-member of the EU, full participation in the EU Framework Programmes as an associated country is without any doubt our country's most important international partnership within research and innovation.

Norway's partnership with the EU on research and innovation is much broader than the participation in the FPs, but **the association to the FPs is the engine in the partnership**, that opens up for broader cooperation. The status as an associated country not only gives Norwegian researchers, enterprises and other stakeholders the same rights to apply for funding and participate in EU-funded research. **It also gives access as a member state to all kind of partnership activities (article 185, ERA-NET Cofund, JTI, EIT etc), to arenas for policy discussions and policy making, and to the ERA process in a broader sense.**

Norway's participation in the framework programme as an associated country is based in the EEA agreement. The EEA agreement defines the relationship between Norway and the EU in many policy areas, and gives Norway access to the EU internal market. An article in the agreement prescribes the EEA EFTA countries to broaden science, technology and innovation cooperation with the EU. A protocol of the EEA agreement prescribes the implementation of the framework programme. **The fact that the legal basis is found in an overall agreement makes the process of association to a new framework programme easier for us than for countries where a new agreement of association must be negotiated for each new programme.**

The Norwegian Ministry for Education and Research commissioned Tecnopolis Group to conduct a study on Norway's affiliation with the EU Framework Programmes as a preparation to the association of Norway with Horizon 2020. The study presents different models of partnerships and discuss alternative scenarios. The study may be of interest for the UK in the work of future partnership with the EU.

<https://www.regjeringen.no/globalassets/upload/kd/vedlegg/forskning/rapporter/eu-forskningeng.pdf?id=2305819>

Norway has chosen to play an active and positive role in the research and innovation partnership with the EU, not only in the framework programme but also in the ERA process and partnership activities. It is our view that this has given us a position as a constructive and reliable partner for the EU and given us good influence in areas that are important for us. Our hope is that the UK will continue to be a strong partner in European research and innovation cooperation, and that the good and fruitful relationship between Norway and the UK will continue and even be stronger in the future.

Future Partnership Project

Royal Society and Wellcome Trust

Submission from the Royal Academy of Engineering

January 2018



About the Royal Academy of Engineering

As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.

Future Partnership Project

Key messages

- The UK should seek the closest achievable association with future EU research and innovation programmes. A future UK-EU partnership should seek to build on existing strengths, mutual successes, established relationships and shared history. A future partnership should continue to support collaboration and partnership at many different levels, at a range of scales, and across the research and innovation pipeline. The partnership should provide stability and certainty for all partners involved.
- The Academy seeks to ensure that the involvement of UK businesses and the role of innovation, as well as the involvement of universities and the role of research, are recognised and well represented in discussions regarding the UK's future research and innovation relationship with the EU. The whole research and innovation system should continue to be involved in a future UK-EU partnership.

1. Introduction

1.1. The Royal Academy of Engineering welcomes the opportunity to inform the Royal Society and the Wellcome Trust's Future Partnership Project. The Academy is working closely with the engineering profession to provide evidence-based advice to government and ensure that the needs of all sectors that have a dependence on engineering, and the value of existing partnerships and collaborations, are understood and represented in the negotiations. The alliance of the 38 UK professional engineering organisations, known as Engineering the Future, led by the Academy, published the report *Engineering a Future Outside the EU* in October 2016.¹ The Academy is also working closely with its sister national academies to explore how best to support government on issues related to research and innovation.

1.2. The Academy seeks to ensure that the involvement of UK businesses in EU research and innovation programmes, and the role of innovation, as well as research, are recognised and well represented in national discussions regarding the UK's future research and innovation relationship with the EU. While Higher Education Institutions represent the greatest share of UK participations in EU research and innovation programmes, accounting for 58% of UK participations in Horizon 2020, it is also important to recognise the significant involvement of UK businesses, with businesses accounting for 27% of UK participations in Horizon 2020 at September 2017.² Furthermore, compared to other EU member states, UK businesses, particularly SMEs, have been successful at securing EU research and innovation funding. For FP7, the UK was the third most successful country, behind France and Germany, when assessed by the financial contribution to businesses, with UK businesses receiving €1,257 million, and by the number of business participations, at 4544.³

1.3. EU research and innovation programmes are unique in the scale and scope of the support they provide for multinational cooperation. For example, Horizon 2020 programmes are the only international research and innovation programmes of their

¹ [Engineering a future outside the EU](#), Royal Academy of Engineering and EtF, October 2016

² [UK Participations in Horizon 2020](#), Department for Business, Energy and Industrial Strategy, November 2017

³ [Seventh FP7 Monitoring Report 2013](#), European Commission, March 2015

scale anywhere in the world. Other international research and innovation programmes are orders of magnitude smaller and are often thematically based or focused on a narrower geography.⁴ Given the unique nature of EU research and innovation programmes and the UK's extensive and long-term involvement, the Academy's response focusses on the lessons learnt from the UK's participation in EU research and innovation programmes.

2. Elements that underpin successful partnerships

2.1. Underpinning the success of the EU research and innovation programmes is the comprehensive provision of support for international collaboration. There is widespread agreement across the engineering community that international collaboration brings huge benefits to engineering research and innovation in the UK. Collaboration facilitates innovation as new ideas are generated, shared, refined and challenged. Collaboration also gives UK businesses and organisations that specialise in innovation access to a broader range of knowledge, people and facilities than could be obtained in the UK alone. Collaboration is often a requirement of EU research and innovation funding instruments. For example, for Pillar 2, Industrial Leadership, of Horizon 2020, the average number of project partners is just over four, rising to more than 10 for Pillar 3, Societal Challenges.⁵ Such programmes have made collaboration with other EU member states relatively easy, much more so in comparison to collaboration with non-EU countries, where a lack of dedicated funding and frameworks hinder engagement.⁶

2.2. A key element of success of the EU research and innovation programmes is that they enable a diverse range of international research and innovation collaborations at multiple levels, for different purposes. From the Marie Skłodowska-Curie Action grants which enable individual researchers to experience training in different countries, starting at the PhD level; right up to large and complex consortia projects. EU research and innovation programmes can facilitate collaborations between multiple businesses, increasing the ease with which businesses can collaborate, scale-up and work towards shared missions, often for societal benefit. One such example is the Clean Sky aeronautical research programme, which was established in 2008 as a Joint Technology Initiative (JTI), and is now receiving support from Horizon 2020.⁷ It addresses the key societal challenge of developing smart, green and integrated transport. Such initiatives involve very large budget commitments from the EU, as well as other partners, which run into the billions collectively, and dwarf the great majority of national collaborations in the UK or elsewhere.⁸ In addition, the example of the Clean Sky JTI illustrates the importance of being able to coordinate large-scale national initiatives across borders in an industry where supply chains are very internationalised.⁹ Many of the activities facilitated by JTIs, such as creating large-scale demonstrators, are often inherently international activities and may be considered too risky for one country to embark on alone.¹⁰ The amount of funding provided by the EU, and the leverage this achieves, combined with its ability as a neutral convener to bring

⁴ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

⁵ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

⁶ [RAEng submission to House of Lords Science and Technology Committee Leaving the EU: implications and opportunities for science and research inquiry](#), September 2016

⁷ [Appendix: Case studies](#), The role of EU funding in UK research and innovation, Technopolis, May 2017

⁸ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

⁹ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

¹⁰ [Engineering a future outside the EU](#), Royal Academy of Engineering and EtF, October 2016

together industrial competitors to collaborate and work towards common goals is a key element of its success.

- 2.3. Although it is clear that substantial benefits can be reaped from collaboration, the benefits are perceived to be maximised when funding is focussed on activities which require collaboration to succeed.¹¹
- 2.4. Stability and certainty are key elements of success for a future partnership. The seven-year funding cycles characterised by the Multiannual Financial Frameworks, such as FP7 and Horizon 2020, provide stable, long-term funding with accompanying long-term strategies. This stability, combined with policy consistency, has enabled UK and EU researchers, institutions and businesses to deliver research and innovation excellence with long-term planning, and can have a positive impact upon leverage as the long-term visibility can give investors confidence.
- 2.5. Ensuring that international research and innovation partnerships complement national funding streams is crucial for success. As a member state of the EU, to date, the UK has had the opportunity to shape the EU research and innovation agenda to maximise alignment with the UK's outlook and priorities. Consequently, EU research and innovation programmes have largely provided support for activities beyond those supported by the UK's research and innovation portfolio. For example, an assessment of the motivations for SME engagement in FP7 concluded that 'access to financial assistance not available nationally or regionally' was rated particularly highly as a motivation for UK SMEs, emphasising the fact that SMEs do not have ready access to support of this nature within the UK.¹² In terms of share of overall SME participation in FP7, SMEs from the UK represented 12%, the second highest proportion behind Germany; the UK's SME participation in Horizon 2020 so far is slightly above its level of engagement in FP7.¹³
- 2.6. People are integral to the success of research, innovation and collaboration. To date, free movement has allowed UK researchers and innovators to achieve more than they would alone and to build lasting relationships with researchers and innovators across the EU, often through participation in EU research and innovation programmes. The recent reassurance on EU citizens' rights in the UK¹⁴ and the agreement on continued participation for the UK in Horizon 2020¹⁵ signals a positive step forward in the first phase of negotiations.

3. The shape of an ambitious new partnership

- 3.1. The elements that have underpinned the UK's successful partnership with the EU to date, as outlined previously, should also underpin an ambitious and close future partnership. The UK should seek the closest achievable association with the EU

¹¹ [RAEng submission to House of Lords Science and Technology Committee Leaving the EU: implications and opportunities for science and research inquiry](#), September 2016

¹² [Performance of SMEs within FP7, An interim Evaluation of FP7 components, Vol 1. Main report](#), May 2014

¹³ [Evaluation of UK involvement with the research framework programme and other European research and innovation programmes](#), March 2017

¹⁴ [Technical note: citizens' rights, administrative procedures in the UK, Government](#), November 2017

¹⁵ [Joint report from the negotiators of the European Union and the United Kingdom government](#), December 2017

research and innovation programmes.¹⁶ A future research and innovation partnership should build on existing strengths, mutual successes, established relationships and shared history.

- 3.2. The whole research and innovation system should continue to be involved in the future partnership. This includes research and technology organisations such as Catapults, and businesses of all sizes, from large corporations to SMEs, innovators and entrepreneurs, as well as researchers and universities. Support should continue to be targeted at collaboration and partnership at many different levels, at a range of scales, and across the research and innovation pipeline.
- 3.3. As a member state of the EU, the UK has had the opportunity to shape the EU research and innovation agenda to maximise alignment with the UK's priorities and strengths. A future partnership should seek to maintain dialogue between EU and UK partners. Ideally, the UK should have the opportunity to shape decisions relevant to the UK's research and innovation landscape, so that the UK's ability to capitalise on its own public research and innovation investments is maintained.
- 3.4. A future partnership with the EU provides an opportunity to evaluate and re-assess priorities of mutual benefit for all partners. With the development of the UK government's Industrial Strategy and the establishment of UK Research and Innovation (UKRI), there is the opportunity to better align priorities and collaborations in areas of strategic importance to the UK, and to ensure efforts continue to complement the UK's research and innovation portfolio.
- 3.5. As a member of the EU, the UK has been involved in the development of regulations; in doing so the UK has had the potential to ensure that regulations do not adversely affect the development and delivery of UK products and services. A new partnership should enable the UK to engage with EU discussions on regulation of new technologies and changes to existing regulatory frameworks, and to seek harmonisation where this is desirable, as well as allowing for input of UK expertise on technical matters.
- 3.6. As acknowledged earlier, people are integral to the success of research, innovation and collaboration. It will be essential that the UK's future immigration system is designed to allow the realisation of the ambitious and close partnership for research and innovation that the UK is seeking with the EU. This should include ensuring that talented researchers and innovators from non-UK EU countries have certainty, both near-term and long-term, about the opportunities to work in the UK and likewise for UK researchers to work in other EU countries.

4. Practical steps to achieve such a partnership

- 4.1. The negotiations relating to a future UK-EU research and innovation partnership are taking place against a backdrop of strong and successful collaboration. The publication of *Collaboration on science and innovation: a future partnership paper* by the UK government in September 2017,¹⁷ laid out the UK's intention to seek to agree, through full and open discussion, a far-reaching science and innovation agreement with the EU

¹⁶ [Engineering a future outside the EU](#), Royal Academy of Engineering and EtF, October 2016; [Higher Education, Research and Innovation: After Triggering Article 50](#), seven national academies, March 2017

¹⁷ [Collaboration on science and innovation: a future partnership paper, UK government](#), September 2017

that established a framework for future collaboration, for the benefit of UK and European prosperity. The Academy welcomed the positive and open tone of the government's science and innovation position paper and encourages the government to continue reaffirming the UK's position as a country with a global aspiration, which is very much welcoming and open for business.¹⁸

¹⁸ [Science and innovation: working with EU partners](#), RAEng News release, September 2017

Future Partnership Project

A response from the Royal Society of Chemistry to the Royal Society and the Wellcome Trust.

The UK government's recognition of science and innovation as a priority in the UK's negotiating objectives for EU exit is vital to realise the government's vision to make research and development (R&D) a key driver for growth in our post-Brexit economy. Maintaining a robust and productive relationship with the European Union will help to deliver this R&D-led growth and can act as an example of how the UK and the EU can continue to work successfully in a close partnership that is beneficial to both parties.

The Royal Society of Chemistry has outlined the following three key objectives for UK government in relation to the UK's exit from the EU:¹

- Maintain access to international research and development funding programmes and research facilities, along with the collaboration opportunities these bring.
- Enable easy movement of the best scientists and innovators to and from the UK.
- Develop a regulatory system that achieves a balance between nurturing innovation, protecting the environment and human health and enables the UK to trade internationally.

Our responses to the questions below regarding the shape of a future partnership are based around these three areas.

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

A number of principles can underpin successful international partnerships across research and innovation – some of these are listed below with examples that demonstrate existing international partnerships. It should be noted that many of these principles are relevant to international cooperation in a much broader sense.

Demonstrable benefits for each participating party

The specific demonstrable benefits that each party desires may vary and will depend upon the strategic priorities of each participant, which in turn will be influenced by overarching organisational, regional or national priorities. Demonstrable benefits can include funding, reduction of investment risks due to shared costs, exchange of knowledge, access to infrastructure or specific expertise and/or relationship building, and access to new markets.

Alignment of vision, goals and/or values

Whilst the tangible benefits for each party do not need to be identical, there must be a shared clarity of the goals for each party. In the case of some existing partnerships, this alignment can be based around a set of values, goals or principles – for example the European Spallation Source, a pan-European partnership to create the world's most powerful neutron source works on core values of excellence, collaboration, openness and sustainability.²

In the case of regulatory alignment, shared goals and values are vital in delivering benefits for research and trade. For example, the Canada – EU comprehensive economic and trade agreement (CETA)³ for trading of goods, agreed in February 2017, has ultimately been successful as both parties '*put people and the environment centre stage*' and follow the '*precautionary principle*', which is an especially important principle to the EU. Both parties agree to place great importance on safety and quality of products and processes in both geographies and aim for equivalent environmental standards. There is a high degree of understanding, trust and cooperation between these partners to make this agreement successful.

Greater impact from pooling resources and sharing risk

The pooling of resources to achieve a greater impact can ensure that all partners achieve improved research outcomes, compared to the level of resource, expertise or finance that they contribute alone. One example of this is shared international infrastructure. The UK has strong capability in some universities and has centres of excellence such as the Diamond Light Source, but it is not possible for any nation to establish and maintain excellent infrastructure across all areas. So for many fields of research and innovation, long-term commitment to and participation in international shared facilities is essential to nurturing particular research and innovation disciplinary strengths.

Another example is research into 'grand challenges' that affect the global population. Pooling of resources not only provides improved outcomes in these cases but also avoids duplication, unnecessary repetition and opportunities to undertake larger-scale programmes. An example is the international partnership that determined the human genome. In some cases, the challenge itself can only be tackled through concerted international efforts due to the span of expertise required to address it and the potential trans-national impacts of the challenge (e.g. antimicrobial resistance).

Creating synergies and links between existing national and/or international programmes

Individual nations or groups of nations will develop and set their own priorities and mechanisms to enable international collaboration. Linking existing mechanisms to create efficiencies across national and international programmes can bring benefits. For example, Eureka is an intergovernmental network of over 40 countries, consisting of both EU members and non-member countries. It *'concentrates the existing potential of experts, of knowledge, research facilities and financial resources in a more efficient way'*, helping to create collaborations by leveraging the strengths in existing programmes and schemes.⁴

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

As outlined in the introduction, the Royal Society of Chemistry has identified three main objectives for the UK government in relation to our exit from and future relationship with the EU:

- Maintain access to international research and development funding programmes and research facilities, along with the collaboration opportunities these bring
- Enable easy movement of the best scientists and innovators to and from the UK.
- Develop a regulatory system that achieves a balance between nurturing innovation, protecting the environment and human health and enables the UK to trade internationally.

Funding

The principles outlined in our response to question one can help to frame a future partnership on research funding. Working together where greater value can be achieved through joint programmes, pooled resources and sharing of knowledge can form the foundation of the UK's future relationship with the EU.

Particular attention should be paid to areas or schemes where EU and UK principles regarding research and innovation align. Some examples of this include the principle of funding excellent research, undertaking collaborative research to tackle grand challenges and supporting the role of small and medium enterprises (SMEs) in the translation of research into products and services.

Mobility

People are vital to science – the ability of people to be able to move with ease between countries is essential in creating an effective future research and innovation partnership between the UK and the EU.

In order to do the best science, researchers travel to and from the UK to collaborate with leaders in their field, to access cutting-edge research facilities and to present their work to audiences globally. To remain globally competitive, universities and businesses must be able hire the best people to deliver world-class research, innovation and teaching.

Regulation

A new partnership between the UK and the EU will be most successful where we have common problems to solve or a shared ambition to achieve. In terms of regulations to be included in any partnership agreement, there are different considerations relating to

- a) the performance of research and the generation of research outputs, and;
- b) the commercialisation of processes and products from research outputs.

In some cases, it may be necessary to agree on regulatory alignment, in other cases there may be opportunities for the UK in divergence. The UK and EU need to discuss regulations on a case-by-case basis. Partners need to prioritise the regulatory elements of a new UK-EU partnership by identifying where there are common goals and where there are different goals.

Developing a future UK immigration system that allows easy movement of scientists to and from the UK is of strong importance to the research community. The results of a recent survey of researchers working across the world, published by Elsevier, and Ipsos MORI found that those surveyed strongly supported the UK government taking action to simplify visa and citizenship applications for EU research staff and to maintain current free movement for EU researchers who wish to work in the UK.⁵ These actions came ahead of other options for action by UK government around funding and collaboration.

Whilst people are central to carrying out research and innovation, a failure to address the other elements could jeopardise a successful future relationship that benefits both parties due to the deeply interconnected nature of these different areas. For example, changes to the availability of diverse international funding routes may make the UK a less desirable location to carry out research, impacting the UK's ability to attract talent. Similarly, changes to the regulatory regime may make cooperative international research between the UK and other countries challenging and/or affect companies that trade the products of innovation and carry out research of their own in the UK.

Practical steps to achieve such a partnership

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

A key practical consideration will be determining the shape of the UK's future immigration regime. Within research and innovation, mobility for different lengths of time during a researcher's career is important to acquire skills, build networks, develop collaborations and deliver specific projects. The nature of this mobility depends on many factors, both professional and personal, but can range from mobility for a few weeks and months, through to a post that is fixed for a number of years or even longer-term. The UK's future immigration system must recognise the need for different kinds of mobility to support effective international science and innovation partnerships.

Continued participation in EU funding framework programmes will require the UK to contribute financially, as is acknowledged in the UK government's discussion paper on a future partnership for science and innovation.⁶ However, other areas of wider negotiation, including the UK's future immigration system and parity of regulations could affect negotiations on the level of UK participation in future EU funding framework programmes.

To underpin regulatory decision making there is a need for a common platform for data sharing and for harmonised discussions on data interpretation by UK and EU experts. Regulatory alignment between partners relies on the sharing of the same data and coming to an agreed conclusion on what the data means. However, regulatory divergence is also most effective when based on the same data and evidence. The UK may take different decisions based on local needs for different outcomes. All parties can then understand in a transparent way the basis of the divergence and may reach mutual acceptance of any divergences.

About us

With over 50,000 members and a knowledge business that spans the globe, the Royal Society of Chemistry is the UK's professional body for chemical scientists, supporting and representing our members and bringing together chemical scientists from all over the world.

Our members include those working in large multinational companies and small to medium enterprises, researchers and students in universities, teachers and regulators.

¹ - [UK Science and Innovation after the UK Exits the EU](#), Royal Society of Chemistry, March 2017

² - [European Spallation Source – Vision, Mission & Values](#)

³ - [Standards and values in CETA](#), A progressive agreement for sustainable development, CETA factsheet 5, European Commission, September 2017.

⁴ - <http://www.eurekanetwork.org/about-eureka>

⁵ - [BREXIT: Global researchers' views on opportunities and challenges](#), Elsevier/ Ipsos MORI, November 2017

⁶ - [Collaboration on science and innovation, A Future Partnership Paper](#), HM Government, September 2017



*The Royal Society
of Edinburgh*

KNOWLEDGE MADE USEFUL

**Advice Paper 18-01
January 2018**

Developing a Shared Vision for a Future Partnership in Research and Innovation Between the UK and EU: A response from the RSE to the Wellcome Trust and Royal Society Joint Project

Summary

The UK must be able to continue to attract and retain talented individuals at all levels of our higher education and research and innovation system. The UK should adopt flexible migration policies that facilitate mobility of researchers and students to and from the UK after Brexit. There remains a pressing need to provide certainty on this issue. Otherwise, the UK risks damaging its leading position and international competitiveness.

Direct participation in EU research funding programmes must be a continuing priority for the UK. Aside from EU membership, under current EU rules, agreeing associated status is currently the only means of securing this participation, and this must be a priority for Phase 2 of the Brexit negotiations. Agreement will need to be reached on the financial contribution that the UK would be expected to make to enable it to participate in EU research and innovation programmes.

Based on precedent, associated status is unlikely to afford the UK the ability to shape the strategic direction of EU research and innovation policy. There would, therefore, be great merit in establishing a joint UK-EU strategic committee that would enable the parties to strategically align their programmes and capital investments in higher education, research and innovation. This would help to secure the collective benefits of international collaboration in Europe.

Introduction

1. The Royal Society of Edinburgh (RSE) welcomes the opportunity to respond to the joint project from the Wellcome Trust and the Royal Society that is seeking to develop a shared vision for a future research partnership between the UK and the EU. The RSE and the RSE Young Academy of Scotland have been exploring the implications of Brexit on key areas of policy, including that relating to research, innovation and tertiary education.¹ The RSE would be pleased to contribute further to the joint project, particularly as options for a research partnership are advanced.

¹ The papers prepared by the RSE's EU Strategy Group are available from:

<https://www.rse.org.uk/rse-publishes-advice-brexite-challenges-opportunities/>

The RSE Young Academy's Brexit Impact Report and Case Studies are available from:

<https://www.youngacademyofscotland.org.uk/news/brexit-observatory-assessing-the-impact-of-the-brexit-vote.html>

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

2. In responding to this question, we concentrate on the UK's current partnership with the EU because reliable data is available concerning Horizon 2020 and related programmes.
3. The EU Framework Programmes for Research & Innovation, including the European Research Council (ERC) and Erasmus+, together with the ease of movement for students and researchers under these schemes, have been extremely important in strengthening the UK's research base. The competitive nature of these programmes and the way they allow the UK to easily draw in talented individuals at postgraduate, early career researcher and academic levels has been crucial to UK research success and must be preserved. The complementarity of the UK national research funding system and the European research funding system has made the UK an excellent place to have a research career.
4. Access to overall funding of €79 bn (Horizon 2020) allows the creation of imaginative proposals and collaborations at all technology readiness levels. The UK on its own cannot replicate the scale and opportunities offered by EU programmes like Horizon 2020.

People

5. The internationally leading standing and competitiveness of the UK's research base is in large part reliant on its ability to attract and retain the highest quality staff from across the globe. Notably, 29% of academic staff in the UK are non-UK nationals (17% EU and 12% non-EU), and Scotland employs proportionally more EU (18.3%) and non-EU (13.4%) academic staff compared to the UK.² Indeed, 27% of research-only contracted staff within Scottish higher education comprise EU nationals.³ In addition, approximately half of all full-time doctoral students in the UK are foreign nationals.
6. It is instructive to consider the recipients of ERC Starter Grants based in the UK. Between 2009-2015, 35% of UK awardees were UK nationals, 39% were other EU nationals based in the UK, and 19% were non-EU nationals based in the UK. Additionally, 7% of recipients had moved specifically to the UK for the grant, meaning that foreign-born nationals comprised 65% of the total awardees in the UK. By comparison, foreign nationals made up 31% and 36% of grant recipients in France and Germany, respectively.⁴
7. These points highlight the importance of the UK continuing to be able to recruit internationally mobile researchers and academic staff and students from what is a global talent pool. It is equally important that those based in the UK continue to have opportunities to experience work and study abroad.

Collaboration

² HESA Statistics 2015/16

³ The Scottish Government's response to the Migration Advisory Committee call for evidence on the role of EEA workers in the UK labour market; November 2017 <http://www.gov.scot/Resource/0052/00527237.pdf>

⁴ UK Research and the European Union; The role of the EU in international research collaboration and researcher mobility, Royal Society, 2016 <https://royalsociety.org/~media/policy/projects/eu-uk-funding/phase-2/EU-role-in-international-research-collaboration-and-researcher-mobility.pdf>

8. Researchers and innovators want and need to work with the best in their field, irrespective of where they are located, or with which institution they are affiliated. International collaboration is demonstrated by co-authored publications, which are in turn stimulated through opportunities for direct collaborative research funding. Nearly 50% of the UK's scientific publications have non-UK authors and the impact of these papers is significantly higher than the average impact of UK papers.⁵ Almost 60% of these international collaborations are with European partners.⁶
9. Notably, 37% of the Horizon 2020 funding has been directed to research aimed at addressing 'Societal Challenges', which would include health, demographic change and wellbeing; food and energy security; and action on climate change.⁷ These challenges cannot be addressed by researchers working in isolation. They are reliant upon collaborations among interdisciplinary teams of researchers spread throughout the EU. It is therefore crucial that UK-based researchers and innovators can continue to participate in these collaborations.
10. Collaborative activity often extends beyond the completion of the specific project upon which it was founded. This can enhance the research effort by enabling UK-based researchers to maintain valuable links with research networks.
11. Notwithstanding UK Government reassurances that funding for UK research will not suffer as a result of Brexit, this cannot compensate for the potential loss of the added value gained from full UK participation in EU programmes, especially the benefits accrued through collaborative activity, where the critical mass for research provided by the EU is crucial.
12. Mechanisms need to be put in place to maintain the collaborative nature of UK research.

Quality

13. The fundamentals of UK performance internationally lie in the excellence of our universities, our attractiveness to international talent, and the national research funding available through quality-related research (QR) and that emanating from the UK Research Councils, which provide the basic funding and competitive environment needed to thrive.
14. In the past the UK, in common with Europe more broadly, has suffered from a "brain drain" of academics to the US. Two key factors have helped to stem this:

⁵ Elsevier for the UK's Department of Business, Innovation and Skills; International Comparative Performance of the UK Research Base; 2013

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263729/bis-13-1297-international-comparative-performance-of-the-uk-research-base-2013.pdf

⁶ UK Research and the European Union; The role of the EU in international research collaboration and researcher mobility; The Royal Society; 2016

<https://royalsociety.org/~media/policy/projects/eu-uk-funding/phase-2/EU-role-in-international-research-collaboration-and-researcher-mobility.pdf>

⁷ Horizon 2020: Participation by Thematic Pillar and Excellent Science Participation; BEIS; September 2017
<https://www.gov.uk/government/statistics/uks-participation-in-horizon-2020-september-2017>

- I. The increased inflow of talent to the UK from the EU countries at all levels (student, postgraduate, post-doctoral, academic), which has balanced the outflow of highly trained UK nationals (primarily to US, Canada, Australia)⁸.
 - II. The European Research Council, which was designed by the EU to retain talent in Europe, and has become one of the world's leading funders of fundamental research. The level of competition for ERC grants has driven-up standards and the ERC is one of the most highly regarded funding schemes in the world. Although equivalent grants could be funded through the UK Research Councils, the international quality driver would be missing and the prestige of such grants would be diminished relative to those of the ERC. This loss of international prestige would be expected to reduce the attractiveness for the best international researchers to locate in the UK.
15. In relation to new developments, the EU is piloting the European Innovation Council (EIC), with funding of €2.7bn over three years, to improve the rate and quality of research commercialisation and exploitation. The UK would benefit greatly from being part of the EIC and under any circumstance must be able to align its Industrial Strategy with the corresponding European strategy.
 16. The key features underpinning the success of the existing relationship between the UK and the EU for research and innovation can be summarised as follows:
 - Multi-centred research collaborations and networks underpinned by the interchange of researchers and students between the EU and the UK.
 - Critical mass and strategic coordination of research endeavor, particularly in terms of funding and access to shared research infrastructure and facilities that could not otherwise be provided by a country working alone. This has increased efficiency and reduced unnecessary duplication.
 - The range of research programmes and funding available, supporting: disciplinary and interdisciplinary research, including that aimed at addressing major societal challenges; fundamental research and innovative developments; and researchers at different stages of their careers.
 - Competition and a focus on excellence has driven-up research quality.

Q2. What elements must be included in the agreed research and innovation partnership between the UK and the EU to be close and valuable? Please comment on how these would be prioritised.

17. The objectives of this partnership must be to ensure that:
 - The UK can continue to attract, recruit and retain talented people (wherever they may be located) to work and study in our academic and industrial organisations with the minimum of bureaucracy and uncertainty.
 - UK researchers and innovators can work and study abroad for at least part of their career.

⁸ A study conducted in 2011 and published in Nature looked at global talent flows. It showed the UK broadly in balance, with the largest inflows from Italy and Greece and the largest outflows to the US, Canada and Australia. See Table 1, <https://www.nature.com/articles/nbt.2449/tables/1>

- Immigration regulations at undergraduate and postgraduate level sustain and expand levels of student participation from all countries, and are not detrimental to our ability to recruit talented individuals for postgraduate study. Post-study work visas should be reinstated.
- The UK has the ability to lead and fully participate in multi-centred collaborations between academia, industry and civic society to tackle major problems and remain in the forefront of international research and innovation.
- The UK maximises its ability to influence the European research and innovation agenda.
- UK researchers remain competitive in the world's largest research programme.
- The UK retains its role in governance of, access to, and right to host, major European international facilities for research and innovation.
- Where possible the UK retains influence over regulations relating to the EU Knowledge programmes. UK regulations concerning research and innovation remain closely aligned with those of the EU.

Priorities

18. Although we believe all of these requirements to be of fundamental importance, we would prioritise them in the following order:

- Multi-partner collaborations involving academic and industrial centres.
- The mutual ability for the UK and the EU to recruit and retain excellent people at all levels (PhD to Professor and industrial manager) from one another's talent pools.
- The ability for the UK to influence the long-term direction of programmes in which the EU and the UK collaborate.
- Access to funding schemes that drive-up the quality of research and innovation in the UK and the EU.
- Significant alignment of regulatory systems related to research and innovation.

Q3a. What practical steps are needed to realise the overall model you describe in Q2?

European Education Area (EEA) and European Research Area (ERA)

19. It is vital that the UK remains a full partner of the EEA and the ERA – something that does not depend on membership of the EU, and is distinct from having direct participation in the EU Knowledge funding programmes (Erasmus+, Horizon 2020, Euratom and ITER etc).

Direct participation in EU knowledge funding programmes

20. The Phase 1 agreement between the UK and the EU guarantees the UK direct participation until the end of the multi-year EU budget. However, direct participation must be a continuing priority for the UK.

21. Importantly, it is also clear that EU scientists are anxious that collaboration with the UK should be retained.⁹

⁹ See for example the position paper signed by 23 Presidents of European Chemical Societies, *Research and Education Without Borders After Brexit*; September 2017 <http://www.euchems.eu/policy-and-communication/policy-positions/research-education-without-borders-brexit-position-paper/>

22. There are three main ways in which the UK can continue to be involved in EU research and innovation programmes.

- Continued EU membership.
- Associated status, which under current EU rules, is the only means of securing UK direct participation in EU research funding programmes following the UK's withdrawal from the EU. Agreeing associated status for the UK should be a priority for Phase 2 of the Brexit negotiations. Associated countries have the same level of access to Horizon 2020 as EU member states. They do not, however, have formal decision-making powers over the work programme.
- 'Industrialised third country' participation. Compared with associated status, third country participation would mean that the UK needs a national back-up scheme to fund the indirect participation of its researchers in multi-beneficiary grants. The further disadvantages are:
 - a. UK-based researchers would be excluded from all sole beneficiary grants (notably ERC).
 - b. Investigator-led grants held by non-UK based researchers (notably ERC) cannot be transferred to our institutions so that the UK would need a national transfer scheme to convince ERC grantees to stay or to come to the UK and give their ERC grant back to the EC.
 - c. Increased levels of administrative bureaucracy for government, universities and researchers, including the need to administer the operation of the UK back-up scheme.
 - d. The UK would lose all access to the decision-making processes of the EU funding programmes.
 - e. The UK would lose participation in all bodies linked to Framework Programme association. This would include bodies related to the European Research and Innovation Area Committee, such as the European Strategy Forum on Research Infrastructures (ESFRI), which is charged with developing the long-term strategy for European level co-invested research infrastructure. Exclusion from this body would make it difficult for the UK to influence, participate in, and host co-invested large-scale research infrastructure.
 - f. It is in the UK's strategic interests that new EU programmes related to research and innovation are fully aligned with the UK's national priorities, but this will not be possible as a third country.
 - g. The UK will not be able to benefit easily from the creation of synergies between its Industrial Strategy and the corresponding developing European innovation programmes.

Free circulation of knowledge

23. Whatever broader agreements are made between the UK and the EU about movement of people, a position must be reached that enables the UK to continue to attract and retain talented individuals at all levels of our higher education system. Otherwise, the UK risks damaging its leading position and international competitiveness in this area.

The role of bilateral agreements

24. An increased number of bilateral schemes (that is, schemes between UK Research and Innovation (UKRI) and its equivalents in other countries) would be valuable. These cannot, however, replicate the benefits of associated status, for two reasons:
- I. The UK structure for research and innovation support differs from that in many countries which will make comprehensive structures difficult to create.
 - II. A multi-country scheme that offers researchers the opportunity to simultaneously collaborate with multiple international academics will be more attractive and efficient than schemes that allow only for single collaborations. And, so, a multi-country scheme will always – other things being equal – provide better value for money.

Regulatory environment

25. Harmonisation of regulations and standards across the EU has helped to provide a level playing field and regulatory consistency, which is important for researchers, businesses and investors. Very large numbers of EU regulations, supported by standards and guidelines, currently ensure the safety, quality and efficacy of innovations arising from basic research. There are, for example, more than 100 EU regulations and directives that cover the chemical sector alone.¹⁰ To continue trading in EU markets post-Brexit, it will be in the interests of the UK for regulations to be closely aligned with EU regulatory requirements so that UK participation in European funded projects is still possible. Although it is difficult to foresee circumstances in which the UK would be allowed to participate in EU research programmes without adherence to EU regulations being a condition of participation, there may be scope for some modifications based on full risk-benefit analysis. It is important that regulation does not become a barrier to collaborative research and development.
26. The debate at EU level around the adoption of an Innovation Principle is recognition that regulatory systems need to be adaptive to the needs of innovative technologies and proportionate to their risks and benefits.
27. In summary, the UK should seek associated status in the EU Knowledge Programmes within Phase 2 of the Brexit negotiations. In parallel, and to avoid the danger of a brain drain and long-term decline of the UK's research standing, the UK should adopt flexible migration policies that facilitate mobility of researchers and students. This is entirely to the UK's own benefit to ensure it remains internationally competitive, notwithstanding the desire on the part of the EU for such a policy. The reintroduction of post-study work visas for students from all higher education institutions is an important first step.

3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

28. The most significant factors relate to:

¹⁰ Royal Society of Chemistry response to House of Commons Select Committee on Science and Technology Inquiry, *Leaving the EU: implications and opportunities for science and research*; July 2016
<http://www.rsc.org/globalassets/04-campaigning-outreach/policy/research-innovation/leaving-the-eu-implications-and-opportunities-for-science-and-research-royal-society-of-chemistry.pdf>

- Reaching agreement on the financial contribution that the UK would be expected to make to enable it to participate in EU research and innovation funding programmes, including Horizon 2020 and its successors.
 - Providing certainty on the mobility of researchers, innovators and students to and from the UK.
 - The extent to which the UK is able to influence on-going and future EU research programmes.
 - Ensuring any changes in UK regulations do not provide a barrier to EU-UK collaboration.
29. It is important that the UK Government does not reduce the funding available for Research and Innovation through the national support routes (primarily QR and UKRI), as this would damage the competitiveness of the UK as a whole.
30. The UK Government's commitment to increasing investment in R&D from the current 1.7 % of GDP (0.6 % from public sources) to 2.4 % by 2027 and 3 % in the longer term makes it perfectly feasible to retain sufficient national funding and participate as an associated country in the EU Knowledge Programmes.
31. Precedent (e.g. non-EU countries including Norway and Switzerland) indicates that associated status is unlikely to afford the UK the ability to shape the strategic direction of EU research and innovation policy. In this context, there would be great merit in establishing a joint UK-EU strategic committee that would enable the parties to strategically align their programmes and capital investments in higher education, research and innovation. The creation of such a mechanism would help to secure the collective benefits of international collaboration in Europe.
32. As outlined above, it will be important that UK research and innovation remains sufficiently aligned with the EU regulatory landscape to ensure that the UK is able to maximise its participation in EU frameworks and programmes

Further considerations

33. As the negotiations between the UK and the EU continue, it will be necessary to be agile in offering advice to the negotiators. The RSE has undertaken some initial scenario planning and would be pleased to be involved in helping the Royal Society and the Wellcome Trust respond to this changing landscape.
34. Currently the Research Councils are United Kingdom bodies but QR is administered by the individual devolved administrations. Care must be taken to ensure that any arrangements between the UK and the EU take into account the needs and particular circumstances of the devolved jurisdictions of the UK.

Additional Information

This Advice Paper has been signed off by the Convener of the RSE's EU Strategy Group and the General Secretary of the RSE.

Any enquiries about this Advice Paper should be addressed to Mr William Hardie (email: whardie@theRSE.org.uk)

Responses are published on the RSE website (<https://www.rse.org.uk/>)

The Royal Society of Edinburgh, Scotland's National Academy, is Scottish Charity No. SC000470

Advice Paper (Royal Society of Edinburgh) ISSN 2040-269

Royal Swedish Academy of Sciences

Prof. Christina Moberg

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

International collaboration and free mobility of scientists are crucial for research. EU programmes, including ERC and Marie Skłodowska-Curie actions, have been instrumental in this respect since they have enabled collaboration between scientists in Europe – this is in fact a major reason for the success of the EU programmes.

The EU programmes have facilitated for scientists at all levels to settle outside their home country. Funding is essential, but rules that allow and facilitate mobility are in fact even more important.

UK and Sweden share common views regarding the balance between basic and applied sciences; both countries strive for excellence rather than broad programs. Brexit may lead to a shift of the balance between basic and applied research; from a Swedish perspective it is important that UK in the future will be able to contribute to, and ideally also influence, the programmes.

Another factor that has been important is international competition in that this favours excellence.

Joint research infrastructure is also crucial since no single country is able to finance. This is particularly important in areas in which Europe has established itself as a leader, such as particle physics, and also EMBL. It would be a huge setback for European science and innovation, and particularly for that of the UK, if the UK were to withdraw from these programmes.

The establishment of successful research environments in less favoured countries is another important element of the European research programmes.

Finally, it is important that decisions regarding the future role of UK be taken rapidly since European scientists already seem to hesitate to include UK partners in EU projects.

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective?

Ideally UK will be an associate member, or at least remain as much as possible as a partner in the scientific partnership within Europe.

It will be of crucial importance that UK not only compensates British science for the loss of EU grants but also continues its contributions to European programmes including infrastructure (e.g. SUNET/CEANT, structural biology etc).

Practical steps to achieve such a partnership

Several questions need political decisions within UK.

Some comments from a Swedish perspective:

The Swedish government has asked the Swedish Research Council and Sweden's Innovation Agency to analyse the consequences of Brexit for future international and UK-Sweden research and innovation collaboration. A preliminary report has appeared. The report concludes that both Sweden and UK have the ambition to favour excellence in EU programmes against a broader participation at the expense of excellence; support for this position will be weaker in case UK will not be associated to the framework programmes. This is one of the reasons that an association and future role as observer for UK would be desirable from a Swedish perspective. UK is, after Germany, the most important collaboration partner for Sweden. Decreased mobility between the two countries and thus less collaboration, is identified as another risk. This would be highly disadvantageous e.g. within the life sciences. Problems connected to collaboration regarding infrastructure are considered to be less serious.

The consequences of Brexit for research will, however, be more serious for UK than for other countries, including Sweden. Whether Sweden will take an active role in working for an association of UK seems still to be an open question.

Christina Moberg
President of the Royal Swedish Academy of Sciences

Russell Group input to the Future Partnership Project

1. Introduction

- 1.1 The purpose of The Russell Group is to provide strategic direction, policy development and communications for 24 major research-intensive universities in the UK. We aim to ensure that policy development in a wide range of issues relating to higher education is underpinned by a robust evidence base and a commitment to civic responsibility, improving life chances, raising aspirations and contributing to economic prosperity and innovation.
- 1.2 Research and innovation are global pursuits and are most effective when ideas and people are mobile across borders. The free movement of talent, the networks, collaborations, critical mass of research activity and funding we have gained from EU membership has contributed to the competitiveness of our leading universities and the UK economy as a whole. EU funding is increasingly valuable for supporting ground-breaking, collaborative and interdisciplinary research.
- 1.3 We support the Government's ambition as set out in its Future Partnership Paper to explore a far-reaching science and innovation agreement with the EU, noting that "there are a range of existing precedents for collaboration that the UK and the EU can build on, but our uniquely close relationship means there may be merit in designing a more ambitious agreement". The size and quality of the UK's leading research base, the influence we have been able to have in promoting scientific excellence across the EU, and our long history of collaboration ought to be taken into account.
- 1.4 We have offered our support to ministers in developing an outline for what such an ambitious agreement could entail, and welcome the opportunity to contribute to this project.

2. Elements that underpin successful research collaborations

- 2.1 Russell Group universities' research collaboration with EU partners is undertaken extensively through the EU research and innovation Framework Programmes. The UK made over 150,000 collaborative links with EU partners over the course of FP7, including just under 26,000 with partners in Germany, 17,500 in France and nearly 16,000 in Italy, in addition to 13,700 links internally within the UK. The UK received a total of €7 billion in FP7 funding, and over €4 billion under Horizon 2020 so far.
- 2.2 EU Framework Programmes also bring significant added value far beyond the initial research income, resulting in key collaborations, creating networks, and driving excellent research which brings enormous benefits to the UK and enables the UK to remain a globally competitive research leader.
- 2.3 It is our view that EU Research and Innovation Framework Programmes should:
 - Drive, and focus on, excellence through maximising competition, funding the very highest quality research proposals from a wide talent pool
 - Facilitate multi-lateral cross-border collaboration to enable as near frictionless collaboration as possible with the best partners
 - Tackle global challenges and other issues on a large scale, allowing participants to show global leadership on projects which could not feasibly take place on a national level (or where national level action would be sub-optimal)

- Promote researcher mobility to facilitate academic exchange of ideas and ways of working and allow researchers to gain international experience by working overseas
- Provide a mechanism through which UK researchers can create relationships, networks and partnerships
- Support research careers
- Invest in and allow access to key large-scale research infrastructures

2.4 It is encouraging that the UK-EU joint report following phase one of the Brexit negotiations notes that the UK may wish to participate in some future programmes as a non-Member State and the Prime Minister has identified programmes that “promote science, education and culture” as “greatly to the UK and the EU’s joint advantage”. Provided that the next EU Research and Innovation Framework Programme (FP9) adheres to the key principles outlined above, we would urge the Government to be ambitious in securing the best possible association agreement reflecting a balance of access, influence and return on investment.

3. The shape of an ambitious new partnership

3.1 In the next phase of the negotiations the UK Government should secure an overarching umbrella agreement with the EU on research and innovation that builds on our existing links and opens the door to UK participation in future European programmes.

3.2 Having looked at several existing science and technology agreements between the EU and third countries, and taking into account the UK’s unique relationship with the EU, we would suggest that the agreement should contain the following elements:

- It should be based on the principle of mutual benefit. A high-level statement should be included which recognises the mutual value of EU-UK cooperation in science and research, the importance of research excellence, and a commitment to ongoing cooperation
- Cooperation should include the option for the UK to associate to future research and innovation Framework Programmes, subject to negotiation with the EU
- Other forms of cooperation could include: coordinated/joint research projects; participation in meetings and other events; participation in scientific advice; training of scientists, technical personnel and others working in R&D; exchange or sharing of equipment/infrastructure and materials; visits or exchanges of scientists, engineers and other appropriate personnel; exchange of information on activities, policies, practices, laws and regulations concerning R&D etc.
- Although it may be helpful to identify some priority areas for research collaboration, cooperation should not necessarily be limited to these areas alone. Given the UK’s long history of cooperation with the EU on research and innovation, the UK has been involved in virtually every area of research covered by EU programmes.
- Consideration should be given to intellectual property rights and data and information sharing, along with other matters considered essential to collaboration.
- Many science and technology agreements between the EU and third countries include an opt-out clause which allows either party to terminate the agreement by giving between six and twelve months’ notice (this does not affect the validity or duration of any

arrangements made under the agreements). Including a similar clause for the UK's partnership could be considered.

- 3.3 We understand that free movement of people will not continue as it does currently after Brexit. However, a science and technology agreement/future partnership agreement between the UK and the EU could include a commitment to promote mobility within the relevant immigration rules of each party. For example, the Association Agreement for the Faroe Islands includes the following text:

The Parties will make every effort, within the framework of their applicable legislation, to facilitate the free movement and residence of research workers participating in the activities covered by this Agreement and to facilitate cross-border movement of goods intended for use in such activities

- 3.4 Consideration also needs to be given to the mobility of the families of research workers.
- 3.5 The Future Partnership Project should take the opportunity to highlight to the Government in its output document how mobility of students, academics and other research workers is integral to continued excellent research collaboration.

4. Practical steps to achieve such a partnership

- 4.1 A high-level joint EU-UK science and innovation committee could be established to oversee the implementation of the partnership agreement and provide a clear mechanism to raise concerns, share information and discuss general issues of cooperation. This committee could develop to include a remit to discuss strategic priorities of EU programmes.
- 4.2 Currently under article 7 in the Horizon 2020 regulation¹ associated country status is open to countries that are members of the European Free Trade Association (EFTA), EU enlargement countries and countries covered by the European Neighbourhood policy. Whilst the joint agreement on phase one of the Brexit negotiations secures UK participation in Horizon 2020 until the end of the programme, the rules of the next framework programme will need to be different for the UK to have the option to negotiate association to the programme with the EU.
- 4.3 One of the key recommendations of the report of the independent High Level Group chaired by Pascal Lamy on maximising the impact of EU Research & Innovation Programmes was that future programmes should be open to association by the best and participation by all.² It states that:

A step-change would be to open the EU R&I programme to association by trading partners of a similar level of excellence, such as Canada or Australia. Association of non-EU countries to future EU R&I programmes should be governed by excellence in R&I, not confined to a particular part of the world.

- 4.4 We strongly support this recommendation and would urge the European Commission to open up the rules for association for FP9 to involve a wider range of countries, which would include the UK.

¹ http://ec.europa.eu/research/participants/data/ref/h2020/legal_basis/fp/h2020-eu-establact_en.pdf

² http://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/hlg_2017_report.pdf

Annex: Data on EU research and innovation programmes

Framework Programme 7³

- The UK received a total of **€7.0 billion in FP7** funding (15.5%), second only to Germany (€7.2 billion – 15.8%). France, the next closest country, received €5.2 billion (11.5%).⁴
- The UK **submitted over 48,000 proposals** to FP7, the highest number of any country, of which 22.7% were successful (higher than the EU average of 20.5%). The UK has the second highest number of participants after Germany.
- The UK **participated in 10,344 signed grant agreements** involving a total of **85,834 participants** – around 17,500 of these (20%) were from the UK
- The UK made over **150,000 collaborative links** with EU partners over the course of FP7, including just under 26,000 with partners in Germany, 17,500 in France, nearly 16,000 in Italy and almost 14,000 internally within the UK.

Horizon 2020⁵

4.5 European Commission data from September 2017 shows that in Horizon 2020:

- The UK ranks 2nd in terms of number of total participations (8,056), accounting for 12.6% of all participations in Horizon 2020.
- Overall the UK has won **€4 billion** (14.9% of the total funding awarded), second only to Germany.
- The UK ranks 1st in terms of participations from Higher Education institutes (4,674), accounting for 22% of participations from all HEIs in Horizon 2020.
- **€2.6 billion** has been awarded to UK HEIs under Horizon 2020 so far, accounting for **a quarter** (24.9%) of all funding awarded to HEIs.
- Overall, 65% of the funding for UK organisations has been won by universities, 20% by private-sector organisations, 9% by research organisations and 3% by public bodies
- Russell Group universities have secured over **€1.9 billion** from the programme so far, just under half of all the funding secured in the UK, or 7% of the total H2020 funding allocated.
- **Three quarters** (74%) of the funding allocated to UK universities has been to Russell Group universities.

Russell Group EU research income⁶

³ Taken from FP7 Seventh Monitoring Report unless otherwise stated.

⁴ http://ec.europa.eu/research/fp7/pdf/fp7_evaluation/5_fp7_fundingbyeu.pdf

⁵ <https://www.gov.uk/government/statistics/uks-participation-in-horizon-2020-september-2017>

- In 2015/16 Russell Group universities secured over **£526 million** in research grants and contracts from EU government, an **increase of 4%** compared to the previous year.
- EU government research income represents **12% of the collective research grant income to Russell Group universities (RGUs)** in 2015/16, up from 7% in 2007/08 (the start of FP7).
- Russell Group universities won over **half a billion pounds** (£600 million) in research grants and contracts in 2015/16 from all EU sources combined, which is an **increase of 4%** compared to 2014/15 and represents **3% of total Russell Group university income** [all income sources, not limited to research income].
- Total research income from all EU sources accounted for **13%** of collective research grant income to RGUs in 2015/16, up from 8% in 2007/08.

⁶ The following bullet points all draw on calculations using HESA 2015/16 finance statistics. 'All EU sources' includes research grants and contracts from EU government; EU industry, commerce & public corporations; EU-based charities (open competitive process); and other EU sources.

Science Foundation Ireland

Science Foundation Ireland is Ireland's national foundation for Research. It is the government's largest competitive funder of scientific and engineering research in Ireland. The agency supports outstanding research in the areas of science, technology, engineering and mathematics (STEM), which promote and assist the development and competitiveness of industry, enterprise and employment in Ireland.

Science Foundation Ireland makes competitive grants/awards based upon merit review for excellence and impact by international distinguished scientists, and this results in the agency administering research projects of global scale and international excellence, with a high potential to deliver impact for the Irish economy and society. Science Foundation Ireland-supported research projects often take place in partnership with industry, charities and other research funders both national and international – several of those being in the U.K.

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

- These could be principles or practical features, either directly associated with the partnership, or the wider enabling agreements between involved parties.
- Examples might include specific international research programmes and facilities, or broader international agreements such as on trade or the 'deep and comprehensive agreement' between the EU and Ukraine.

Lead Agency Procedure

Science Foundation Ireland has developed a number of international, co-funded partnership programmes with several international funding partners. The agency's governing principle on entering such partnerships is that the Lead Agency Procedure (LAP) is used as the mechanism to deliver the programmes.

Science Foundation Ireland is seeing tangible benefits from these interactions. The US Ireland R&D Partnerships Programme (see below) which has its origins in the Good Friday Agreement to strengthen research collaboration between the north and south of Ireland and the USA has, to date, supported:

~120 Refereed Original Articles

~10 Review Articles

~17 Refereed Conference Proceedings

~ 75 presentations at international conferences; 15 invited speaker presentations;

~70 team members

The above includes publications in high impact journals such as Nature. The awards also facilitate leveraged funding from international programmes, including H2020. Spin out companies are also being formed as a result of the collaborative research. One such example is Roughan O'Donovan Innovative

Solution, a specialist consulting engineering company formed to commercialise the research outputs of a US Ireland R&D Partnership Programme award.

The main benefits associated with applying the LAP include:

- increased administrative efficiency and removal of “double jeopardy” whereby the outcome of a review process in one country may differ to the outcome in a partner country;
- compatibility with a bottom-up approach. A bottom-up approach provides research institutions in each jurisdiction with an opportunity to realise their own strategic objectives with support from the RFO programmes;
- at the same time, the model allows for collaboration between RFOs supporting different types of research, e.g. research in specific fields or theme-driven research calls. Science Foundation Ireland has successfully taken this approach under the US Ireland R&D Partnership programme, for example;
- the potential for mutually beneficial sharing or combining of good practices through the support of cross-border collaboration, e.g., data management plans and open access.

It is recommended that the LAP be the standard operating procedure for cross-border partnerships, in so far as possible.

Science Foundation Ireland currently has six main bilateral and trilateral international partnerships in place operating under the LAP. These are listed below. The agency is also involved in smaller international partnerships such as the NSF GROW Programme and NSF I-CORPS.

[US Ireland R&D Partnership Programme](#)

This is a tri-jurisdictional programme across the United States of America, the Republic of Ireland and Northern Ireland. The NSF and the NIH in the US take the lead agency role. The partner agencies in the Republic of Ireland are Science Foundation Ireland (SFI) and the Health Research Board (HRB), who are only involved in the Health theme. In Northern Ireland, the Health & Social Care R&D Division (HSC R&D) supports health-related projects, while the Department for the Economy (DfE), and Invest Northern Ireland (InvestNI) support projects related to Sensors & Sensor Networks, Nanoscale Science & Engineering, Telecommunications, and Energy & Sustainability. InvestNI and DfE support health-related projects in the area of Sensors & Sensor Networks and Nanoscale Science & Engineering.

Proposals submitted under an Agriculture pilot theme are submitted to the National Institute of Food and Agriculture [NIFA (US)]. The Department of Agriculture, Food and the Marine (DAFM) is the partner agency in the ROI and the Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland.

[Science Foundation Ireland/National Natural Science Foundation of China Partnership](#)

A new partnership funding collaborative research between Ireland and China which has just completed its first funding round. Science Foundation Ireland is the lead agency, however, 50% of the international review panel is appointed by the NSFC. This shared responsibility is unique amongst our LAP programmes and whilst it counters the goals of a non-bureaucratic approach it is important for the wider science diplomacy efforts. This also brings a periphery benefit of increased awareness of the Irish research landscape to senior researchers in China, thus, supporting further collaboration potential.

[EPSRC-SFI Joint Funding Partnership](#)

This new partnership supports collaborative research between researchers in the UK and Ireland under all areas of EPSRC's remit. The EPSRC is the lead agency.

[BBSRC-SFI Joint Funding Partnership](#)

The partnership with the BBSRC also supports collaborative research between researchers in the UK and Ireland under all areas of the BBSRC legal remit. The BBSRC is the lead agency.

In addition to the above programmes, which facilitate cross boarder collaboration, Science Foundation Ireland has entered into the below programmes with partners in the UK which facilitate researchers in Ireland accessing prestigious UK programmes.

[Royal Society Science Foundation Ireland University Research Fellowship](#)

Facilitating researchers in Ireland in the early stages of their research career to apply for funding under the Royal Society University Research Fellowship. The Royal Society is responsible for the administration of applications and awards.

[The SFI-HRB-Wellcome Biomedical Research Partnership](#)

Under this partnership, Science Foundation Ireland and the Health Research Board (both in the ROI) co-fund successful biomedical and clinical science applications by researchers based in Ireland under a number of Wellcome funding schemes. Wellcome is responsible for the administration of the applications and awards.

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

- This could cover the principles behind collaboration, or address specific requirements in areas such as: mobility of researchers, innovators, technicians and their families; regulation of research and research outputs; research funding; research infrastructures (physical and digital); or the commercialisation of research outputs.
- Your answer could address novel scientific and research opportunities, or specific objectives, which a new partnership might be able to exploit.

[International Peer Review](#)

All awards funded by Science Foundation Ireland are done so following international peer review – as is essential for a small country. It is recommended that international peer review is utilised for funding partnerships to ensure that research funded maintains a standard of global excellence.

[Addressing global challenges](#)

It is recommended that budgets are identified for specific funding programmes to address global challenges, as well as those areas identified under the Sustainable Development Goals. An example of

such activity is the African Union-European Union partnership. A joint declaration outlining common priorities for the EU-Africa partnership was signed at the most recent (5th) AU-EU Summit which took place in November 2017.

The Irish Government, through the national strategy for research and development, science and technology (Innovation 2020) has committed to adopting a challenge-centric approach to funding by focusing on research that has the potential to address national and global challenges. Such moves by individual member states and the UK should be leveraged and feed into larger scale collaborative efforts.

Independent Research Prioritisation

Non-governmental/non-exchequer Research Funding Organisations (RFOs) are critical players in the fabric of research funding systems. Many of those RFOs set funding priorities independently, based on the remit or mission of their organisation. Such priority setting by large scale funders can catalyse activity and their leadership role should be enabled and encouraged through multinational agreements. It is important that collaborative relationships with such organisations are established to facilitate research funding that may fall outside the domestic government priority areas. Wellcome is one example of such a RFO.

Domestic R&I Budgets

Achieving the optimum rate of 3% of GDP being invested in R&I at EU and MS state level is critical to ensuring a stable and growing innovation economy in Europe and with partner states. The priority to reach this target should be a prominent feature of EU and national strategy development. More opportunities to increase co-fund mechanisms with industry at national and international level should be explored and implemented. The Irish Government, through the national strategy for research and development, science and technology (Innovation 2020) has committed to increase investment in research in Ireland to 2.5% of GNP by 2020.

Rationalising the EU Funding Landscape

The LAB-FAB-APP report of the High-Level Group on maximising the impact of EU Research and Innovation Programmes, recommends rationalising the EU funding and achieving synergy with structural funds. Applying this and related recommendations within the LAB-FAB-APP report, in Europe would support more impactful, streamlined programmes which would provide clear collaboration and engagement routes for partners in the UK.

Mobility

Mobility of researchers is paramount to the success of cross-border collaboration. Any agreement between the UK and the EU must enable movement of researchers to support knowledge transfer, cross-border industry collaboration and education of PhD students who may be involved in collaborative research projects.

Practical steps to achieve such a partnership

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

- This could include potential barriers; legal and governance arrangements – including ratification processes and court jurisdiction; risks to either side; and any precedents set.

- It could cover how the partnership might develop, for example phased implementation.
- You might wish to comment on how a successful implementation could be measured.
 - Efficient and transparent procedures are of crucial importance, especially for international activities. The objectives are to make administrative procedures as compatible with national procedures as possible, to minimise organisational effort, to keep procedures as simple as possible and to avoid redundant efforts (very much the principals of LAP). In order to carry out smooth programme practices it is essential to ensure that all aspects of programme assessment procedures are clearly articulated, agreed and enshrined in MoUs, Cooperation Agreements and any other preliminary guidelines in advance of commencing any international partnership programme. The impact of cultural and language barriers should not be underestimated in this context.
 - In order to verify the effectiveness and impact of the funding measures, international expert evaluation needs to be performed regularly. The results of these evaluations are taken into account in the ongoing development of funding instruments and ensure the programmes' compliance with international standards as a key prerequisite for the international competitiveness of bilateral and multilateral partnerships;
 - Creating a bilateral model that has the flexibility to expand to a multilateral arrangement should new partners wish to join.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

- This could include factors such as economic pressures, or conflicting research priorities

With the advent of the European Innovation Council, the planned Global Challenges and Missions initiatives the structure of the European funding environment is likely to shift to a more dynamic and innovative one.

Brexit Consultation by the Wellcome Trust/Royal Society: The Guild Submission

I. Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

- *These could be principles or practical features, either directly associated with the partnership, or the wider enabling agreements between involved parties.*
- *Examples might include specific international research programmes and facilities, or broader international agreements such as on trade or the 'deep and comprehensive agreement' between the EU and Ukraine.*

Trust, mutual recognition, long-term reliability and dependability, and simplicity of governance are essential for any new partnership:

Mutual Recognition:

- Of each other's degrees and qualifications (for students and researchers)
- Of what constitutes research quality
- Of what constitutes a good research proposal
- Of norms and standards (health and safety, ethics, drugs testing, etc.)
- Of legal standards and jurisdictions (what happens if a project goes wrong or violates a grant agreement?)

Mutual recognition is far from perfect at the moment, and there are still unacceptable differences and variations in practice in each of these categories; but this makes it all the more important for any new partnership not to aggravate these imperfections.

Long-term reliability and dependability

Given the greater degree of complexity involved in international research projects, it is important that the lead time for funding calls is much greater, and that funding periods are longer, especially with new schemes. This is critical so that researchers have time to develop sustainable international partnerships. It is also critical that funding periods are extensive (10 years plus) to foster relationships that involve not only academic researchers, but also seek to establish cross-cutting links with industry, engage with or create start-ups, and generate impact.

Simplicity and independence of governance

It is essential that a good partnership is governed by transparent mechanisms belonging to bodies that command the respect of researchers as well as of public authorities. While it may be inevitable that the funding priorities of governments will need to be taken into account, it is critical that research collaborations focus on generating new knowledge in the most effective way, and in that sense, withstand political short-termism.

Trust

This is essential for the effective delivery of the points mentioned above. It is worth mentioning explicitly because different national research systems will pursue different agendas for their own reasons. While the EU currently offers a space for these to be discussed, contested and aligned, outside the EU, a way of sharing confidences, pressures, experiences and concerns must be found – both structurally (this relates to governance) but also informally (amongst leaders of funding organisations, research institutions, etc.).

Q2. The shape of an ambitious new partnership. Please comment on how these would be prioritised.

- *This could cover the principles behind collaboration, or address specific requirements in areas such as: mobility of researchers, innovators, technicians and their families; regulation of research and research outputs; research funding; research infrastructures (physical and digital); or the commercialisation of research outputs.*
- *Your answer could address novel scientific and research opportunities, or specific objectives, which a new partnership might be able to exploit.*

Our strong preference is to secure the continued, and full participation of the UK in the framework programmes. If, and only if, that is not possible, we would emphasise the following priorities for collaboration:

1. Mobility for Researchers. It is essential that this is dealt with comprehensively, and includes:

- Visits for researchers of all ages, including students. It is conceivable that especially doctoral researchers (for instance) might face obstacles to movement as they may not be able to satisfy income requirements that may be imposed to obtain a visa.
- There must be no barriers to long-term visits or academic hires, and this includes the right of researchers to move with their families.
- The mutual recognition of degrees, modules and other qualifications.
- Developing and sustaining short-term as well as long-term mobility. Facilitating the former (as in lab internships for instance) could help prepare and strengthen the latter, which would be particularly valuable for younger researchers.

2. Research Funding. The ability of the best minds to collaborate on a research project is a huge value-add of the current Framework Programme, and (in practice) impossible to replicate through bilateral agreements.

3. We need to continue to push for a European Research Area that includes the UK (this very much underpins the other points in this section).
4. We need to ensure common access to research facilities and promote joint research infrastructures. This includes a shared commitment to Open Science with its broad implications for how we create, share and use new knowledge.
5. We might need to focus on PhD funding, and whether the UK model of student fees needs to change. Although this is a specific issue for the UK, it does affect the mobility of researchers at the beginning of their careers: if they have to pay international fees it could jeopardise the sustainability of particular subject areas in the UK.

New Opportunities

It is essential that the UK will participate in FP9 through full association to the programme, and not just through agreements covering specific parts of it. .

In terms of a vision to underpin joint research funding, it may be worth aligning future research collaborations closely to the industrial strategies that both the UK and the EU have outlined and wish to prioritise, and which would be impossible to achieve without UK/EU collaboration in research and innovation.

Europe would also benefit from alignment between the thematic priorities for challenge-driven research, between national UK funding and the framework programmes. Health research, the digital economy, and challenges around environmental sustainability (for instance) reflect shared concerns, and are areas that could underpin any new partnership. It is important that we join forces rather than stimulate competition in critical research areas, and that the opportunities for collaboration throughout Europe are preserved.

It might also be worth thinking about where the UK and the EU could work together to enhance the framework programmes. One example could be widening participation and spreading excellence; the Norway/EEA grants scheme is pioneering new initiatives to make a substantive change about how research excellence is fostered between Norway/EEA researchers and researchers from lower-performing regions. The UK might identify its own priorities in supporting excellence in lower performing regions, e.g. by focusing on supporting sustainable beacons of excellence in lower-performing regions through institutional partnerships.

Another area where the EU has not been as successful as it had hoped is in its 'Openness to the World'. One option could be to foster mutual engagement with researchers from other countries, using UK experience, for instance through the Global Challenges Research Fund? How could EU and UK researchers collaborate with colleagues in third countries, including Africa and Asia, on a sustainable basis?

Finally, any vision must strengthen the visibility and effectiveness of collaborative research output, and that will need to include a strong component of collaborative bottom-up research, including European Research Council (ERC) and Marie Skłodowska-Curie Actions (MSCA) funding.

Q3. Practical steps to achieve such a partnership.

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

- *This could include potential barriers; legal and governance arrangements – including ratification processes and court jurisdiction; risks to either side; and any precedents set.*
- *It could cover how the partnership might develop, for example phased implementation.*
- *You might wish to comment on how a successful implementation could be measured.*

We would favour full UK participation in FP9 to maximise opportunities for collaboration. We would also favour simple arrangements for the recognition of jurisdictions. We would favour the continued application of ECJ jurisdiction, as this is most efficient. It would be possible to have a system where the jurisdiction of the principal applicant (Belgian law for EU PIs, or UK law for UK PIs) applies.

Success could be measured by using 2015 as a baseline for UK/EU collaboration and measuring changes against that baseline in terms of:

- Number of applications
- Success rates
- Citation rates

It might be important politically to ascertain the economic/social/cultural value created, but this would be impossible because there is no clear 2015 baseline for this, nor is there (or is there likely to be) an agreement on how to measure impact between the UK and other parts of the EU.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

Good research policy needs to be directed and implemented by funding bodies that keep a close link with the research community. Scientists have busy agendas for their research: institutions that are too remote will be considered as hurdles. The biggest threat to this is politics – within any national context, as well as within the difficult political context of the UK/EU Brexit negotiations.

The most effective response to this is the articulation of a vision that builds on UK and EU funding priorities (in their alignment to the sustainability goals, their industrial strategies, and the ways in which the UK influenced the EU's framework programmes to date). But in terms of vision, it would be important to start by looking at the global challenges we face, and the need for Europe to contribute to address these by partnering with other Europeans and with scientists in other parts of the world.

If we navel-gaze and focus on our own divisions we will be left behind by other research systems, and this compromises our ability to innovate, and create high value-add jobs. So, the vision that we articulate must be framed as a joint contribution to global knowledge and discovery, but also towards tackling social division and alienation – this affects us all, and has very common causes. If we just focus on one (i.e. scientific discovery) while ignoring the other, we risk deepening social inequalities and anxieties. Hence, we must articulate a vision that stresses the need for all areas of human knowledge to be developed as effectively as possible, through cross-border collaboration and partnerships.

Q4. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective?

- *This could include factors such as economic pressures, or conflicting research priorities.*

In addition to what we have written above, we would hope that UK researchers, funding bodies and research organisations can continue to participate fully in the EU's framework programmes. For example, in contributing fully to the articulation of the EU's Open Science agenda, its joint research infrastructures, and the scientific governance of the ERC, the UK ensures that it influences norms, standards and frameworks that support excellent and collaborative science across Europe. Meanwhile, the EU ensures its effectiveness as a unique agenda-setter towards a global research area. And this, in turn, gives the UK an ability to punch above its national weight. UK input into EU research and innovation has been hugely valuable up to now. We must continue to include the UK not just in research collaboration, but in governance, as far as possible (just as Norway and Switzerland have become highly influential in their own ways).

Office of the Vice-Provost (Research), University College London

Introduction

UCL is pleased to submit a response to part 2 of the consultation of the Future Partnership Project, further to our previous response to part 1 of the consultation.

UCL is London's leading multi-faculty university, with more than 11,000 staff and 38,000 students from 150 different countries. UCL takes a global outlook, seeking to engage internationally to advance research and address global problems. As our previous response noted, UCL is one of the leading European recipients of Horizon 2020 funding, in particular ERC grants. We see a continued, strong relationship between the UK and EU as essential to the future success and impact of research in the UK, EU and internationally.

The EU framework for research collaboration has evolved over many years and, whilst imperfect, provides a highly effective environment in which a large, diverse population of researchers can form new collaborations under an administrative protocol that is already agreed. Funding to lubricate collaborations and support collaborative projects that span national borders within the EU is a further advantage.

These characteristics provide important efficiency gains, both by reducing barriers to new collaborations and by reducing the administrative burden of maintaining an established collaboration. (Indeed, the efficiency of EU collaborations is so great that an unintended consequence may have been limited attention to pursuing important, but less accessible, opportunities in other parts of the world.)

The UK has made major investments of expertise and political capital in the creation of an EU research framework that is aligned with UK interests. Those investments already bear fruit for the UK science and research community. The UK can continue to harvest the benefits of this framework if we continue to participate in an influential role. Both challenges and opportunities arise in turning the changes in the UK's relationship with the EU into net benefits for the UK.

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

UCL researchers who have held Horizon 2020 grants particularly value the **quality and transparency of the review process**; the relative transparency regarding the provision of costs to research participants; and **openness to cross-disciplinarity and collaboration**. We would strongly support these as key aspects for any future partnership agreement.

Researchers also emphasise the strong relationships that are built during the research process, which required regular planning and discussing of research over a longer-term (3 year) timescale. They value the opportunities to go to Brussels to meet other grant-holders and developing understanding of the funding system, building networks, and support to understand how to run large-scale, multiple-partner projects. We would strongly recommend therefore ensuring appropriate **support and capacity for building networking** between grant-holders as well as providing support on managing projects.

Participation in EU funding programmes, which support research in those states which invest little in research or which are not EU members, enables **widespread international collaboration with a wide diversity of partners** whilst minimising bureaucracy.

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

UCL values above all the current access to a multi-national funding scheme within a common regulatory framework which incentivises collaboration between world-leading researchers to address global problems. Key elements for a future research and innovation partnership agreement include:

- **Funding awarded on basis of excellence and conferring prestige.** Researchers highly value the prestige associated with H2020 funding, and ERC grants in particular, and any new agreement must seek to replicate this prestige
- **Supporting all disciplines:** EU funding is valued in particular by research communities who do not currently feel there are many opportunities for support from UK research funding
- **Supporting collaboration with key partners and world-leading researchers:** Six of the UK's top 10 partners for international research (France, Germany, Italy, the Netherlands, Spain and Switzerland) are EU countries. There are also opportunities to complement UK research in areas where we may not have the same concentration of excellence and to consider how other key global research partners could be engaged.
- **Enabling UK research expertise to continue to contribute to solving global societal problems** by supporting multilateral research projects addressing global challenges
- **Ensuring parity between UK and EU partners:** it is crucial that UK partners continue to have the opportunity to lead research across Europe and are not seen as second-tier partners.
- **Minimising bureaucracy and avoiding double jeopardy in international research collaboration:** One of our academics described H200 as providing a 'ready-made platform' for collaboration and any future agreement should seek to replicate this. The single programme of governance and requirements was highly valued.
- **Building confidence in the future of UK-EU research collaboration** (particularly in the context of growing uncertainty amongst European partners about working with UK researchers)
- **Transparency** in both the review process and funding decisions (including provision of costs)
- **Supporting flexible and rapid-response funding** to enable researcher to respond to emerging opportunities and changing situations
- **Ensure a balanced portfolio to support different sizes of research projects:** avoid an over-emphasis on very large proposals (in which applicants have a very low success rate) and ensure a healthy proportion of small and medium sized projects involving small teams with higher success rates.
- **Sustaining scope for innovation, creativity and flexibility in research funding** – including through a diversity of funding opportunities and a diverse pool of reviewers.

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

We propose a number of practical steps but these are not exhaustive:

- **Ensuring a diverse and sustainable peer review college** to support a breadth and diversity of projects and quality of assessment
- **Ensuring that any agreement enables UK partners to take leading roles in projects**, so that UK institutions can lead bids and contact partners to participate in joint ventures
- **Providing funding opportunities to provide support for participating in and organising international workshops and expert meetings to sustain and develop new relationships and networks.** This should include in particular targeted support for early career researchers who may have less developed networks (but be at the forefront of their field). This is in recognition of the importance of building relationships and trust for successful collaborations, and would help to sustain current and build new relationships
- **Ensuring appropriate salary support for senior researchers** to develop and participate in European research collaborations
- **Providing more opportunities for involving doctoral students** in research projects, through integration with doctoral projects and joint PhDs linked to international projects.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

UCL believes that the area of **science and research offers an opportunity for a harmonious agreement between the UK and EU**, building on a consistently successful relationship. There is a clear win-win outcome given the continued appetite for collaboration amongst researchers across the EU and the strength of the UK research base.

However, we are concerned that **restrictions on freedom of movement would significantly impede the ability of researchers to travel for research collaborations**, as well as the international meetings and conferences that are so crucial to successful relationships.

Ongoing uncertainty amongst the research community in the UK and wider EU – around the status of EU and UK nationals and around the future of UK-EU research collaboration – could also undermine relationships and impede future collaboration.

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The Joint Report between the EU and the UK published on 8th December states that the UK will continue to participate in Union programmes financed by the MFF 2014-2020 until their closure, which is welcome. This provisional agreement is of course subject to the caveat that nothing is agreed until everything is agreed. There is also a great deal of uncertainty around UK post-H2020 (FP9) participation. With this in mind we would like to make the following points.

H2020 is unique in the world in terms of budget, duration, budgetary stability and scope. The funding available to undertake large scale, multinational research and collaborate across nations and sectors on large multidisciplinary research projects is not available through any other programme. The opportunity to form large, lasting international collaborations is only available through H2020.

Therefore, any future partnership agreement should include an Association Agreement to H2020 which gives us full access to the funding programmes we currently participate in and allows us to participate in the same way e.g. leading and participating in collaborations, hosting ERC grants and Marie Curie fellowships etc. The Association Agreement should assure UK involvement in the conception and design of the funding programmes and schemes, and in the decision-making process both at a political level and in advisory and programme committees. Any alternative to an Association Agreement to H2020 could not match the scale, scope and long-term stability of H2020 access. Failure to obtain an Association Agreement would mean loss of a crucial source of research funding; loss of access to a mechanism which allows us to form multidisciplinary international collaborations and recruit research staff from across the world; loss of access to the ERC, which funds cutting edge, risky research free from political priorities; and a loss of staff and students due to the diminished research environment created by the factors mentioned in the previous points.

While a provisional agreement has been reached regarding H2020, uncertainty around FP9 participation continues and therefore a push for an agreement which includes provision for full access to FP9 should be prioritised in the next phases of the negotiations.

Helen Jordan
Research Development Manager (International)
Research and Enterprise Development
University of Bristol

University of St Andrews

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

- *These could be principles or practical features, either directly associated with the partnership, or the wider enabling agreements between involved parties.*
- *Examples might include specific international research programmes and facilities, or broader international agreements such as on trade or the 'deep and comprehensive agreement' between the EU and Ukraine.*

Partnerships in international research are of value when they encourage joint working among talented people to solve shared problems through undertaking high quality work; achieving a broad set of outcomes by matching skills and other capabilities lying with each of the partners and which would be less successful at achieving the desired outcomes if they were to operate independently. Partnerships involving infrastructure which cannot be afforded by the UK alone (e.g. CERN, ITER) are a clear example.

Additional/specific points are mentioned below.

- **Good leadership, novel themes, reliable teams, new research outcomes, and impact are all key elements that underpin successful partnerships. In addition to blue skies research, successful partnerships can also provide important frameworks for joint academic/industrial research.**
- **UK HEI leadership in European projects should be able to continue, based on our long experience and high standards in Legal, Financial, Data Management, Ethics, and Copyright components of successful projects, as well as our underpinning research excellence and innovation.**
- **Access to large-scale funding for Humanities and Social Sciences opens up the possibility for international collaboration and increased global understanding in the realm of culture. Appreciation of the role culture in healthy societies is gaining agency internationally, e.g. in the Sustainable Development Goals.**
- **The European Research Council also provides opportunities for larger-scale and more ambitious personal research programmes than can usually be funded by UK sources.**
- **The Horizon 2020 (e.g. ICT LEIT) programme is particularly important, providing good research and good opportunities to demonstrate impact.**
- **H2020 has a budget allocation of 77 billion euros. The Global Challenges Research fund also has a large allocation, and may have diverted some UK-based researchers' attention. However, EU funding rhetoric appears more attractive internationally (due to its less obvious link to trade).**
- **Collaboration – learning from researchers in other countries brings novel ideas and stronger outcomes.**
- **Focus on impact is high on the agenda for both the EU and the UK. There is evidence that EU-funded collaborative work has greater impact than research funded from other sources <https://royalsociety.org/topics-policy/projects/uk-research-and-european-union/role-of-eu-researcher-collaboration-and-mobility/>.**

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

- *This could cover the principles behind collaboration, or address specific requirements in areas such as: mobility of researchers, innovators, technicians and their families; regulation of research and research outputs; research funding; research infrastructures (physical and digital); or the commercialisation of research outputs.*

- *Your answer could address novel scientific and research opportunities, or specific objectives, which a new partnership might be able to exploit.*

Ambitious new partnerships would ideally be characterised by well-resourced groupings of the best researchers that are competently led due to the management skills required being built in to their structure. The UK should look beyond the EU as well as with the EU to secure a comprehensive and complementary suite of partnerships; the UK is a sufficient power in the field of primary research to be able to lead this agenda rather than be led.

Additional/specific points are made below.

- **Upholding the UK pledge to underwrite current H2020 recipients (Article 10.9, White Paper)**
- **Access to competitive funding.**
- **Clear guidelines on the UK's involvement in European programmes in coming years, communicated to HEIs and researchers.**
- **A partnership conscious of variance in the political situation across the UK.**
- **Designing new UK legislation and policies compatible with EU legislation towards common goals.**
- **Continued freedom of movement of researchers (staff and students) to/from UK/Europe will stop our universities from shrivelling. This is primarily short-term mobility at present, but needs to extend to long-term mobility.**
- **Programmes the UK would welcome discussion with the EU on are in particular:**
 - **The Research and Innovation (R&I) Framework Programmes;**
 - **The Space programmes;**
 - **Nuclear R&D and**
 - **Defence R&D.**
- **Joint and equal research frameworks. The Swiss/Israeli model (UK pays for its own research in companies and universities) rather than the Norwegian model (UK contributes to a general pot that is disbursed by the EU). The UK is able to exploit its own research results. There is cooperation on research and exploitation between UK and EU partners.**
- **Freedom of exploitation. No artificial barriers on intellectual property, for example.**
- **Openness of research results. Partners and others should benefit from scientific results, where this is not inconsistent with e.g. commercial exploitation.**
- **Make the emphasis in new partnerships on excellent research & innovation, ensuring that this is not undermined by a focus on Technology Readiness Levels in assessment. Make it more obvious that AHSS are welcome participants in projects and ensure that processes are conducive to interdisciplinary and transformative research.**
- **Extend efforts towards gaining gender balance in, for example, decision making bodies and in research teams. Address work-life balance issues by providing for flexible working and additional funding to cover replacement costs for periods of parental leave.**

Practical steps to achieve such a partnership

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

- *This could include potential barriers; legal and governance arrangements – including ratification processes and court jurisdiction; risks to either side; and any precedents set.*
- *It could cover how the partnership might develop, for example phased implementation.*

- *You might wish to comment on how a successful implementation could be measured.*

Three overarching steps need to be considered, in which the UK must define: (1) what it wants to achieve from partnerships, how much of its research budget it wants to devote to this form of research funding and how best to make these investments to achieve its objectives; (2) whom are the UK-based potential members and beneficiaries of these partnerships (including not only HEIs but also public sector custodians of national-level research capability, some of which are already responsible for running global-scale research initiatives); and (3) whom to work with on a global scale, basing its decisions primarily on merit, which it should define broadly and in terms of objectives (e.g. could include benefits of research-based diplomacy).

More specific suggestions are made below.

- **HEI representation in high-level stakeholder negotiation groups should be ensured**
- **A clear and practical UK HEI list of recommendations for the EU's 9th Framework Programme (post H2020) should be written, reflecting on the success of burgeoning research in key strategic areas for the UK and Europe. The UK needs to ratify and agree to fund key elements of the Framework 9 programme, including ICT LEIT, ERC and others.**
- **Research collaboration with emerging economies should be encouraged, while providing them with adequate support to collaborate.**
- **Funding additional new programmes as with e.g. South America, former Soviet republics etc. should be considered.**
- **Participation should be ensured in events such as the annual ICT Proposers conference and with scientific steering committees**
- **UK involvement in EU research programmes should be actively promoted**
- **Additional rewards for participation in EU projects (e.g. through providing tax benefits to companies) should be provided, as in France.**
- **The major recommendation to open up the R&I programme to association by trading partners of a similar level of excellence contained in the LAB-FAB-APP: investing in the European Future We Want report, should be welcomed(https://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/hlg_2017_report.pdf).**

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

☒ *This could include factors such as economic pressures, or conflicting research priorities*

- **Borders, lack of inclusion, weak UK leadership**
- **Although the UK may have different economic and strategic priorities to the EU, participation in EU programmes is important: for building collaboration, for establishing presence, for maintaining contact with customers and research partners, and for maintaining the UK's scientific and technical status.**
- **Although it may not be necessary for the UK to engage with all EU research activities (e.g. it might opt out of EU-Brazil collaboration in favour of specific UK-South American programmes), it is important that we engage with the broad majority of these activities.**

The University of Strathclyde

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

The success of such models, agreements and partnerships for the UK should be assessed in three key areas – the production of excellent research, the creation of excellent research facilities and infrastructure, and finally the (medium to long term) ability of the UK system to attract highly talented researchers.

The fundamentals of UK performance internationally lie in the excellence of our universities, our attractiveness to international talent, and the national research funding available through QR and RCUK funding, which provides the basic funding and competitive environment needed to thrive. International research programmes enable the UK to maintain its international competitiveness and to leverage funding from other countries to support excellent research programmes and research infrastructure.

Both international bilateral and multilateral research and research infrastructure programmes exist and are very valuable. However, the multilateral programmes provide both the highest degrees of financial leverage for infrastructure and the greatest opportunities to assemble leading international teams which in turn produce world leading research.

The European knowledge programmes - such as the EU Framework Programmes for Research & Innovation, including the ERC, and Erasmus+, together with the ease of movement for students and researchers under these schemes have been extremely important in strengthening UK research. The competitive nature of these programmes and way they allow the UK to easily draw in the best talent at postgraduate, early career researcher and academic levels has been extremely important and must be preserved. The complementarity of the UK national research funding system and the European research funding system has made the UK an excellent place to have a research career, and therefore has enabled the UK system to attract highly talented researchers from across Europe.

There are further reasons for the success of the EU multilateral R&I programmes which include:

- Length of programme, allowing for advance planning
The EU Framework Programmes have been 5 years and 7 years in duration, with some types of calls having annual deadlines for the duration of the programme, and other parts of the programme now publishing specific call topics for 2 and 3 year periods at a time – both of which result in the possibility for our researchers to have some degree of certainty over upcoming opportunities for a number of years in advance, and to plan and prepare accordingly. This compares very favourably against other types of international opportunities (such as GCRF or the Newton Fund), where there is not such a clear forward plan of upcoming opportunities, and many calls come out with very short deadlines in order to be able to put together the type of international consortium / detailed research programme required to be successful.
Another advantage of the type of annual calls which feature in Horizon 2020 (particularly in Pillar One) is these allows for resubmission of near misses, thus lowering the opportunity cost of preparing and submitting an application.

- One review process
In the EU Framework Programmes, the consortium submits one joint proposal, which is evaluated in a single review process, and is either successful or unsuccessful. Many of our colleagues have been keen to stress how important it is to avoid the “double jeopardy” situation evident in some other international funding programmes, where two (or more) separate proposals are required to be submitted to two (or more) funding bodies, each with their own review process, but where both proposals are required to be independently successful in order for either proposal to receive funding.
- One set of administrative procedures / funding rules / participation rules / etc
The EU Framework Programmes have one set of procedures / rules etc for all participants in the project. This compares (negatively) with, for example, the complexity of the Newton Fund, where a specific funding scheme might have a different set of rules for each of the 17 countries involved.
If there was such a situation in the future, where UK participants were to receive funding for participation in EU funding programmes from a UK source, instead of directly from the EU, it would be important to avoid a situation where the UK participants had an added administrative burden from having to follow two different sets of rules – to satisfy both participation in the EU rules, and any specific rules required by the UK funder (as this would create artificial barriers to participation).
- Breadth of programme, with multiple disciplines and multiple types of opportunities
One of the specific features of the EU framework programmes which makes it attractive is the overall scale of the whole programme. This allows for a programme which covers the full range of disciplines, across all countries, and across a broad range of different funding schemes ranging from PhD training, to individual fellowships, to multi-million, multi-partner multidisciplinary research projects.
- International competition, with a focus on excellence, leading to associated prestige
The European Research Council in particular, is a competition at the highest international level, which of itself lends a high degree of prestige to the award.
While a UK version of this could be created, it would not automatically carry the same level of prestige.
- Access to opportunities not otherwise available
International partnerships (such as the H2020 agreement with the NIH in the US – which allows US researchers to receive funding from H2020 and EU researchers to access NIH funding schemes) which allow access to opportunities to which our researchers would not otherwise be able to access, are very attractive, as they open up potential new avenues for funding.

In the past the UK, and Europe more broadly, has suffered from a “brain drain” of academics to the US. There will always be a proportion of UK nationals who are attracted to work abroad because of particular facilities, research groups, and funding mechanisms. However, the UK remains competitive because of its ability to be a *net* attractor of top international talent. Alongside the health of our national system, two key factors have helped to stem the problem:

- a. The increase in talent from the EU countries at all levels (student, postgraduate, post-doctoral, academic), which has balanced the outflow of highly trained UK nationals

(primarily to US, Canada, Australia)¹. This has been facilitated by schemes such as the Erasmus+ and Marie Curie Sklodowska schemes for which the UK has been the most popular destination within Europe.

- b. The European Research Council (discussed above), which was designed to retain talent in Europe and is considered to be one of the most prestigious funding bodies in the world.

International collaboration is demonstrated by co-authored publications, which are in turn stimulated through opportunities for direct collaborative research funding. UK co-publication with authors in European Research Area nations are higher than those to the US, Canada and Australia put together (see Table 1 <http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2017/international-collaboration-uk-post-exit.pdf>)

UK influence on the strategic development of the European knowledge programmes has been highly significant – for example in terms of the focus on excellence, the development of open access and much more. While the UK will have less direct influence as a non-EU member, it will continue to be a very important trend-setter and can continue to have significant influence to ensure a strong and mutually beneficial alignment. For example, the EU is developing a European Innovation Council (EIC)² to improve the rate and quality of commercialisation and exploitation. The UK would benefit greatly from being part of this EIC and under any circumstance, we must ensure a mutually beneficial strategic alignment of the UK industrial strategy with the corresponding European strategy.

Q2. What elements must be included in the agreed research and innovation partnership between the UK and the EU to be close and valuable? Please comment on how these would be prioritised.

It is of the utmost importance that the UK continues to attract international – and in particular European - research talent, benefits from participation in high quality multilateral research programmes, benefits from the use of internationally funded research infrastructures, and strategically influences future European programmes and investments in research and innovation.

Student fee structures (mainly at postgraduate level) and ease of movement are very important. However, more broadly the ability of the UK to derive the benefits listed above will depend on the type of agreement made with the EU – do we participate directly or as a third country?

European Education Area (EEA) and European Research Area (ERA)

It is vital that the UK remains a full partner of the EEA and the ERA – something that does not depend on membership of the EU and is distinct from having direct participation in the EU Knowledge funding programmes (Erasmus+, Horizon 2020, Euratom and ITER etc).

Direct participation in EU knowledge funding programmes

The Phase 1 agreement between the UK and the EU guarantees the UK direct participation until the end of the multi-year EU budget. However, direct participation (associated status as opposed to industrialised third country status) must be a continuing priority for the UK.

¹ A study conducted in 2011 and published in Nature looked at global talent flows. It showed the UK broadly in balance, with the largest inflows from Italy and Greece and the largest outflows to the US, Canada and Australia. See Table 1, <https://www.nature.com/articles/nbt.2449/tables/1>

² <https://ec.europa.eu/research/eic/index.cfm>

'Industrialised third country' participation would mean that the UK needs a national backup scheme to fund the indirect participation of our researchers in multi-beneficiary grants. The further disadvantages are:

- UK-based researchers are excluded from ERC.
- Investigator-led grants held by non-UK based researchers (notably ERC) cannot be transferred to our institutions so that the UK would need a national transfer scheme to convince ERC grantees to stay or to come to the UK and give their ERC grant back to the EC.
- UK government and Universities would have to deal with a double layer of administration, as the researchers have to deal with all regular EU administration, but would also have to deal with the administration of the UK back-up scheme.
- The UK would lose all access to the decision making processes of the EU funding programmes.
- The UK would lose participation in all bodies linked to FP association, including bodies related to the European Research and Innovation Area Committee, such as the European Strategy Forum on Research Infrastructures (ESFRI) which is the body developing the long term strategy for European level co-invested research infrastructure. Exclusion from this body would make it difficult for the UK to influence, participate in, and host co-invested large scale research infrastructure.
- It is in the UK's strategic interests that new programmes such as a possible Space and Defence Programme are fully aligned with the UK's national priorities, but this will not be possible as a third country.
- The UK will not be able to easily benefit from the creation of synergies between own its Industrial Strategy and the corresponding developing European Innovation programmes. This is important because of the number of European multinational companies who are vital to the success of the UK Industrial Strategy. We must therefore seek a sophisticated alignment.

Movement of researchers

Whatever broader agreements are made between the UK and the EU about movement of people, a special position for researchers and students must be found that allows the UK to benefit from the attraction of talented individuals. While recognising the broader issues around free movement, this is not controversial amongst staff and students of the HE sector, and if necessary special arrangements such as knowledge migrant status (and corresponding efficient procedures) should be introduced. If the UK cannot attract the best talent at all levels in our HE system then we shall surely lose out in the global race to attract the most talented individuals.

The role of bilateral agreements

An increased number of bilateral schemes (that is, schemes between UKRI and its equivalents in other countries) within Europe would be valuable and should be developed. These cannot replicate the benefits of associated status, for two reasons:

- a. The UK structure for R&I support differs from that in many countries which will make comprehensive structures difficult to create.
- b. A multi-country scheme that offers top researchers the opportunity to simultaneously collaborate with multiple top international academics will always be more attractive than schemes that only allow for single collaborations. Hence a multi-country scheme will always – other things being equal – provide better value for money.

Q3a. What practical steps are needed to realise the overall model you describe in Q2?

The UK should seek associated status in the EU Knowledge Programmes within Phase 2 of the Brexit negotiations. The current legal dispute resolution mechanisms (involving ECJ) do not have significant impacts on future UK legal sovereignty.

In parallel, and to avoid the danger of a brain drain and long term decline, the UK should adopt migration policies that specifically allow the easy movement of students and researchers. This is entirely to the UK's own benefit, notwithstanding the desire on the EU side for such a policy.

b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

The two largest factors are budget and some version of free movement for researchers and students (which has been discussed above).

It is important that the UK Government does not lower the funding available for Research and Innovation through the national support routes (primarily QR and UKRI), as this would damage the competitiveness of the UK as a whole.

The UK Government's commitment to increasing investment in R&D from the current 1.7 % of GDP (0.6 % from public sources)³ to 2.4 % by 2026 and 3 % in the longer term⁴ makes it perfectly feasible to retain sufficient national funding and participate as an associated country in the EU Knowledge Programmes.

Note also that the regulatory landscape for UK Research and Innovation must remain sufficiently aligned with that of the EU to enable the UK to achieve as many of the benefits of participation as possible. The UK has traditionally been a thought leader in this area (research integrity, open access, etc etc), and can continue to be a trend setter.

The "new, deep and special partnership" between the UK and EU can be given clear form through the future collaboration around Research and Innovation, and indeed this would provide the best platform for an enduring and mutually beneficial partnership. This implies that

- the UK should continue its partnership through associated status of the EU Knowledge Programmes.
- Given the longstanding excellence and size of the UK system a joint EU-UK collaboration mechanism should be established that allows the parties to strategically align their programmes and capital investments in education, research and innovation. This will guarantee the collective benefits of international collaboration in Europe and make it easier for the UK to strengthen its partnerships outside the EU.

³<https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/ukgovernmentexpenditureonscienceengineeringandtechnology/2015>

⁴ <https://www.nature.com/news/uk-political-parties-promise-science-funding-boost-1.22020>

University of Surrey

Prof Vince Emery, Senior Vice President (Global Strategy and Engagement)

Q1. Thinking of existing models, agreements or international partnerships, what features have made them a success?

The University of Surrey has a range of different partnerships across the World and one of the things that distinguishes a successful partnership is where we have developed multiple strands of activities and where these have deepened relatively quickly, so that the partnership is sustainable in the medium to long term. A good example would be our University Global Partnership Network, formed in 2011 and now incorporating the University of Surrey, the University of Sao Paulo, North Carolina State University and the University of Wollongong. The success of this partnership at producing joint publications and also enhancing our brand in country has been through the successful publication of joint outputs together with leveraging funds for research, which has been pump primed by the partnership each year through an annual corpus research collaboration fund of US\$240,000. Our very successful engagement with FP7 and H2020 programmes has been driven by Surrey being a valued partner with expertise in specific areas and its willingness to be part of consortia led by other EU member organisations i.e. a flexible approach to being the lead organisation or a partner.

Another factor which is important for a successful partnership is the combination of top down and bottom up approaches. Our most successful strategic partnerships have been facilitated by these multi-level interactions plus the identification of academic champions who can lead forward the particular programme of interaction.

At a regulatory level, the abilities to foster open collaborations between partner countries is key, removing unnecessary barriers for interaction and the mobility of staff and students. Multi-disciplinary research networks, especially across and between continents, need a framework which facilitates mobility of researchers, and so barriers that inhibit this can be a negative influence on the success of a partnership.

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

As stated above, one of the core principles in a research and innovation partnership between the UK and EU is to allow free movement of researchers, innovators and technicians to enable the partnership to be successful. Regulation should be relatively light touch, especially as the codes of practice adopted across the EU and in the UK are broadly speaking synonymous with respect to publication rights, intellectual property rights, etc. Commercialisation of research outputs is essential if the research is to have appropriate impact and this feeds into both SME and larger enterprises to exploit intellectual property generated through interactions in the partnerships. Any barriers that would restrict this exploitation or inhibit the exploitation of research IP generated in the UK by other European SMEs would be a significant issue for a successful new partnership. The increasing requirement to involve industry in recent framework grants is unlikely to decrease; therefore, some form of free trade across the EU partners with the UK would be required to enable these types of interactions to be successful and contribute to the economic wealth of the UK and the rest of Europe.

Q3a. What practical steps are needed to realise the overall model you describe in Q2?

Barriers should be kept to a minimum within the context of legal and governance frameworks. The issue of which legal system would be used to defend any infringements, eg IPR, would need to be worked through and would need to be seen to be effective in minimising risks to all partners whilst facilitating productive partnerships. Looking forward, assuming that the UK is able to access successors to Horizon 2020, it would be important to have a partnership agreement in place well before the inauguration of new funding opportunities. With respect to the successful implementation of any such agreement, feedback from individual researchers regarding the proposed agreement and, following any implementation of the agreement, feedback as to the ease of use and modifications required would form an important part of the evolution of such an agreement to facilitate ongoing and future partnerships.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

Two areas are noteworthy:

- 1) Freedom of movement of researchers and trade barriers would be areas which may prove challenging with respect to the negotiating environment. Having said this, I do not envisage any major issues with creating a shared vision for research and innovation since this is consistent across most western hemisphere countries.
- 2) In the light of 1) above, there will inevitably be divergence between the desires of national policy versus trans-European policy. This is also being seen in the UK with the launch of the Global Challenge Research Fund and the industrial strategy which, whilst overlapping with the calls under Horizon 2020, provides an alternative source of funding in specific areas and in ODA countries, which does not always align with EU funding priorities and initiatives.

University of Warwick

Please see below the response from a sub-set of the University of Warwick's academic community; this includes views from one Science department and our Faculties of Social Sciences and Arts & Humanities.

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

COST actions were effective and useful ways of facilitating 'low-level' collaborations by funding student exchanges, travel, research network meetings and other activities. The sums of money were modest but the benefit was substantial. COST actions have been successful because they are community driven - with groups of collaborators from different countries getting together to form networks - and inclusive. Having partners from less-favoured parts of the EU was always approved of; unlike most 'large' grants these are not primarily about giving large sums of money to a small number of research superstars, but about distributing modest amounts of money as widely as possible. 'Small' groups could make collaborations with big ones and have the cash to send students on visits. Partnerships and mobility were always the main driving forces; a successful network had to be highly collaborative with every partner being from a different country, which made people strike up partnerships that otherwise might not have happened.

Another example is the British Academy-funded Research Institutes (British School at Rome; British School at Athens; British School at Ankara), which play a key role in linking up researchers in the UK with counterparts internationally. British School at Rome (BSR), for instance, offers a way in to collaboration not just with Italians, but via the network of foreign schools in Rome (American Academy, Netherlands, Danish Institutes, German Archaeological Institute). BSR is also distinctive in its interdisciplinarity, joining up ancient historians, medievalists, modernists, architects, & artists.

In general, partnerships with other international bodies or Higher Education Institutes work best where there is an alignment of research interests, or at least the research interests are complementary; essentially partnerships should be mutually beneficial (and both parties must be engaged and interested in pursuing the partnership from the very earliest stages). Funding is key; the earlier this is in place, the higher the likelihood of generating a fruitful partnership. Having an individual leading the partnership, that has prior experience of building similar relationships and partnerships, usually leads to a notably higher success rate. Effective coordination is vital, as is trust and reliability among partners; this can be achieved by building new partnerships from previous personal contacts, pre-existing relationships and networks.

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

The following elements should be considered:

- Mobility of researchers at all levels (from undergraduate - postgraduate - postdoctoral - early career - established scholars) along with funding streams to support this (including short-term). Related to this, the visa process must be simple without significant financial or administrative hurdles that could lead to significant delays.
- Research funding opportunities and a guarantee of funding – in the case of research and innovation partnerships continuous funding streams/sources are often a necessity.

- Regulation of research funding.
- Flexibility in funding schemes to permit collaboration across borders (e.g. PI/CI residence).
- Considerations of the social, economic, emotional and relational consequences of change for people and their identities.
- Clarity on status of the UK remaining part of the European Higher Education Area (EHEA). This is important if for e.g. the proposed 2 year degree is not covered by the Bologna Declaration. The Bologna Declaration, in which most EU countries adapted their degrees to the UK model of BA and MA, was hard to realise, and many countries will not want to adapt to further changes coming from the UK. Higher Education in other countries is not heavily marketed, so existing differences will remain and should be noted.
- Extension of existing contracts with EU partners post Brexit for continued access to confidential data held by EU partners for research projects.

We have not considered how these should be prioritised.

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

- It will be necessary to build long term partnerships to take advantages of opportunities.
- Financial support is required including access to Erasmus funding and sustained funding by the Government of the British Academy foreign research institutes.
- Continuation of exchange programmes for students and staff, and of support for international colleagues to work in the UK.
- Maintaining the large pool of researchers from other European countries in the UK higher education sector.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

It is vital that the UK remains involved with Framework 9 (FP9) and therefore access is crucial; to be excluded from FP9 would be extremely detrimental to research in general in the UK. It is also vital that researchers remain in close contact with existing networks during the Brexit negotiations – such relationships must not lapse during this period.

Dr Florian Urmetzer

Senior Research Associate
Cambridge Service Alliance, University of Cambridge

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

Here I can only speak about exchange agreements (I have not personally been involved, but know the mechanisms) and research studies.

Exchange mechanisms:

- As a researcher it is very important to get time away from the location and normal influences. This increases quality of research and teaching alike. This includes as well to get the opportunity to gain money to travel as well as spend time with people on research, but then as well money to buy out of teaching. The latter as well has the side effect that young researchers get the opportunity to do teaching as a network effect.
- This as well of course is the other way around, where people need to be enabled to participate and travel freely to visit and stay here in the university. The university is an attractive place for researchers to visit and we indeed hope that this will be staying as it is at present. Hence we need as well support mechanisms where we enable and allow researchers to visit and to be influencing our environment.

Research studies:

- To gain money for research not only is important for the aspect to execute research studies and gain publications. This money is as well used to grow the future generation of researchers and lecturers as well as influences teaching and future teaching within the university. One could say that money for research not only influences the quality of the research being done, but as well the quality of teaching being done.
- The ease of access to such fund is important. At present many positions in the university are working hard to access these funds. But while the tax payer demands transparency and competition about this money, the ease of access is important. Hence in some areas of EU funding the access to the funds is so complex that external consultancies now offer their help and support in the area. Hence the upfront investment in time and effort is very high to such funds and should be seen as an expenditure towards the fund.

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

- The opportunities must be clearly communicated. I have now been excluded in research studies from consortia within the EU because of the fear that the project may be marked down on the basis of a UK partner. This has of course only got word of mouth problems rather than structural, but is important to consider.
- The funding for research partners within the UK has to be 100%. There is more and more investments done in research studies where the university has to give additional funds, which always creates problems and extra effort.
- There should be a clear link to the wider community within the research done. Hence I am in management research and the research should be including partners from the UK and the EU to expose the real world to the findings (EG SMEs and large firms).

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

- First a model like it is adopted by Switzerland is seen as advantageous. (guaranteed funding if there is money spoken by the commission for projects). As soon as there is unclarity of the security of funds, there will be exclusion happening. As well it may be seen as a positive point by the EU partners to have UK partners who are "not influencing or destroying" the budget.

- This needs to of course be clear in both systems. Hence there needs to be travel opportunities without great crossing efforts between countries.

Key Messages

1. The UK is a global leader in genomics and the life sciences but does not work in isolation. Sustaining and nurturing formal and informal networks of science, is critical to maintaining the UK's position.
2. A partnership model should be based on diplomatic principles rather than trade.
3. Any future partnership arrangement must seek to support the entire research and innovation network.
4. Regulation must be proportionate and joined up in order to provide adequate protection whilst avoiding driving risk averse behaviour.
5. Legal and regulatory issues, including intellectual property rights, should be identified and resolved before the commencement of any partnership.
6. ELIXIR and EMBL are examples of different types of international partnerships.

The Wellcome Sanger Institute

7. The Wellcome Sanger Institute is a genomics institute specialising in large scale projects, often beyond the capability or capacity of one organisation or even one country. The institute is at the heart of a network of global collaborations with research organisations, universities, hospitals and commercial partners.
8. 32% of the staff at the Sanger Institute come from outside the UK. Of those, 32% are classified as highly skilled, 38% medium skilled and 7% are low skilled (as defined by the Home Office). Medium and low skilled staff frequently have domain specific knowledge which can be difficult to recruit and requires invest of time and resource to train, for examples animal technicians, sequencing service staff and administrators.
9. International staff at the Institute are vital. They bring unique skills that sometimes can only be learnt in a few places in the world. They also, importantly, bring different practices and different ways of thinking, which drive new findings and development of ideas and research.
10. The Institute is core funded by Wellcome, but around 20% of its research funding comes from third party grants. These grants often strategically support global collaboration, large scale science and training networks, e.g. FP7: BLUEPRINT¹ and the Cancer Research UK Grand Challenge: Mutographs of Cancer.²

Elements that underpin successful partnerships for the Sanger Institute

11. Defining what makes a large partnership successful is challenging, and even these elements are met there is no guarantee of success. However, in our experience certain features are significant:
 - Shared values and goals which are defined and agreed up-front
 - Expert scientific leadership
 - Ability of partners to access the same funds and resources and a shared regulatory framework.
 - Movement of people between projects and project sites – learning, training and capacity building are significantly easier where there is physical proximity.
12. Initiation of projects before addressing regulatory and legal issues invariably leads to delays, additional cost and can result in project failure. The most common issues are failure to obtain

¹ <http://www.blueprint-epigenome.eu/>

² <http://www.sanger.ac.uk/science/collaboration/mutographs-cancer-cruk-grand-challenge-project>

appropriate ethical approvals, put collaboration and material transfer agreements in place, and agree intellectual property rights.

13. Any partnership model should look to diplomacy rather than trade for precedent. Historically, science has maintained dialogue between countries where formal diplomatic arrangements have failed and strengthened ties between more friendly countries. Partnerships should be built on the principles of friendship and shared values, rather than on the principle of market regulation and should reflect this spirit by being as open and flexible as possible. This will encourage new collaborations from new partners. Although the purpose of this consultation is not to consider the impact of Brexit, it is worth considering the role of collaborative science in strengthening the relationships between the UK, the EU and globally, particularly at a time when isolationist rhetoric risks damaging relationships with allies and harming UK science.
14. Regulators are a key stakeholder in any large-scale partnership and should be engaged early in the process in order to develop clear guidance and a framework of expected behaviours, in order to avoid over interpretation of regulation or drive risk averse behaviour.

The shape of a new partnership

15. Any new research partnership should aim to support the entire research and innovation system, through funding mechanisms which encourage:
 - Discovery and translational research
 - Public engagement on new science and technology
 - Regulatory science to develop proportionate and joined up regulation
 - Skills development to create the next generation of researchers and entrepreneurs
 - Collaboration and co-localisation to tackle challenging problems
16. Mechanisms to broker partnerships between different sectors and public and private organisations would support and ease translation of research, and expose researchers to entrepreneurship and industry and vice versa, helping to bridge the cultural divide that acts as a barrier to research translation.
17. Over the last decade, open access publishing and data sharing have become the academic norm. Industry are rapidly adopting many of the underlying principles, and open innovation is increasingly common. There is increasing interest in non-commercial models of translation and responsible innovation practices. New forms of collaboration between industry and academia have generated new ways of working and new routes for innovation, for example Open Targets, an open, pre-competitive collaboration between the Sanger Institute, EMBL-EBI, GSK, Biogen and Takeda.³ A new partnership framework should seek to embed these practices and cultures.
18. Partnerships must be supported by immigration policies that allow movement of scientists, for short periods as well as for longer-term posts.

Practical Steps

19. Organisations such as ELIXIR or EMBL can offer two models for international science co-operation. ELIXIR in particular offers a model with multiple country membership which, although EU-centric, is not limited to EU member states.⁴

³ <https://www.opentargets.org/>

⁴ <https://www.elixir-europe.org/about-us/who-we-are/nodes>

Prof. Andy Wilson

Professor of Organic Chemistry and Deputy Director Astbury Centre for Structural Molecular Biology, University of Leeds

Andy Wilson (AJW), is a recognised leader in Supramolecular Chemical Biology. He joined The University of Leeds in 2004 and was promoted to Professor in 2012. His research is supported by a career grant portfolio of ~£9M from EPSRC, BBSRC, The Wellcome Trust, The Leverhulme Trust, ERC, AZ the EU and from Feb 2016 a £3.4M EPSRC Programme Grant (PoPPI). AJW was recognized by the European Federation for Medicinal Chemistry Young Academic Scheme (2012) the RSC Bob Hay Lectureship (2012) and the RSC Norman Heatley Award (2016). His group delivered generic approaches for inhibition of α -helix mediated protein-protein interactions and, identified dual hDM2 and MCL-1 inhibition as a potential anticancer strategy. AJW also developed photocrosslinking methods for studies of peptide self-assembly, protein surface mimetics and novel H-bonding motifs for self-sorting and polymer assembly. AJW leads "PPI-net", an RCUK-funded academic/industry network that defined an integrated PPI research agenda for the UK.

Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

- *These could be principles or practical features, either directly associated with the partnership, or the wider enabling agreements between involved parties.*
- *Examples might include specific international research programmes and facilities, or broader international agreements such as on trade or the 'deep and comprehensive agreement' between the EU and Ukraine.*

EU COST is an excellent mechanisms for promoting collaborative activity. Whilst it provides only limited support for actual research, by becoming involved participants can expand their network, send researchers in your team to other labs to gain expertise, knowledge or access to instrumentation and initiate bilateral collaboration. They can provide a focal point for a new or developing community of researchers to build something bigger e.g. ITN applications. My personal experience of this was a a member of the COST foldamers network – I became a management group members and working group leader. The benefits have been considerable both in terms of my individual profile and career development but also in setting the vision for a global effort in this area i.e. the network extended naturally beyond Europe

Marie Curie actions are excellent mechanisms to support collaborative research activity. These schemes provide direct additional and considerable resource for research and there is no similar national mechanism dedicated to the objectives of the schemes. Individual fellowships serve to provide the host PI with a mechanism to bring a talented individual to his/her laboratory e.g. to achieve critical mass on a project or spin something new out. The mobility aspect serves to diversify the culture in the host lab enriching its activities and approaches to research. The visiting fellow receives advanced training and holds a prestigious award to further their career. At the conclusion of the fellowship a lasting link survives as the fellow moves to a different lab in another (or their home) country, leading to a lasting link. For the ITNs these provide cohort training in a similar manner to the individual fellowships promoting mobility and excellence but for early stage researchers e.g. PhD candidates on a common research project/ theme – networking opportunities are similar to those available in COST. Although the collaborative nature of the projects can be unwieldy or function poorly, the networking and mobility aspects are universally beneficial. I have been involved in both ITN and Individual fellowship schemes both of which have been beneficial resulting in high quality publishable results, researchers from Hungary, India and Croatia joining my lab and new projects being started where I can offer/exploit my expertise collaboratively but which would not otherwise have taken place.

ERC does not directly support collaboration at an international level, but it does promote mobility, allow international researchers to join ERC funded teams and give EU/ international visibility to leading researchers. I previously held an ERC starting grant.

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

- *This could cover the principles behind collaboration, or address specific requirements in areas such as: mobility of researchers, innovators, technicians and their families; regulation of research and research outputs; research funding; research infrastructures (physical and digital); or the commercialisation of research outputs.*
- *Your answer could address novel scientific and research opportunities, or specific objectives, which a new partnership might be able to exploit.*

The key objective for me is to have barrier-less mobility to allow researchers from all over the world to come to the UK and enrich what we do. We tend to shoot ourselves in the foot a little bit with a prohibitively large fee for international students to pursue PhD studies in the UK and this would be disastrous if implemented for EU students – a policy in the other direction would be useful.

I have always indicated that the funding mechanisms and potential loss of funding from EU schemes is not the key negative impact of Brexit, but rather the loss of access to expertise and mobility opportunities. That said, collaboration with international groups are frequently prohibited by the absence of direct and substantial resource to pursue projects. Small pots of money e.g. RS international grants can get a project going, but it tends to be necessary to support international collaboration through ad hoc funding mechanisms e.g. PIs in different countries are reliant on simultaneously having a grant on the same project or funding the project from unrestricted funds. More opportunities to secure support to allow UK applicants to work with “the best” team to delivery the project regardless of borders would be beneficial.

Practical steps to achieve such a partnership

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

- *This could include potential barriers; legal and governance arrangements – including ratification processes and court jurisdiction; risks to either side; and any precedents set.*
- *It could cover how the partnership might develop, for example phased implementation.*
- *You might wish to comment on how a successful implementation could be measured.*

Government barriers included restrictive and burdensome immigration policies. Funding agency barriers are likely to centre around drawing-up bilateral agreements with individual government funders. Large charities may play a significant role here as they may be less tied to “the national interest”

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

- ☒ *This could include factors such as economic pressures, or conflicting research priorities*

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Elements that underpin successful partnerships

Q1. Thinking of existing models, agreements, or international partnerships, what features have made them a success?

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- Examples

○ The Joint Programming Initiatives and the Belmont Forum

- The **Joint Programming Initiatives (JPIs)** are led by research funding organisations, research councils and ministries, from participating European countries. Together they initiate cross border research through shared calls and other research actions based on Strategic Research and Innovation Agendas (SRIA) designed to address specific societal challenges and to inform policy.
- **The Belmont Forum** is a partnership of funding organizations, international science councils, and regional consortia committed to the advancement of interdisciplinary and transdisciplinary science. Forum operations are guided by the [Belmont Challenge](#), a vision document that encourages: *International transdisciplinary research providing knowledge for understanding, mitigating and adapting to global environmental change*. Forum members and partner organizations work collaboratively to meet this Challenge by issuing international calls for proposals, committing to best practices for open data access, and providing transdisciplinary training.
- Both the JPI model and the Belmont Forum work based on:
 - The principle of variable geometry or fit for purpose, which means that funding agencies can decide for each international activity if they are willing and able to participate.
 - A virtual common pot system, which means that each funding agency only pays for those applicants in the research proposal selected for funding that fulfill the funding regulations of that agency. In practise this means often that only researchers from the country of the funding agency can be funded – together with other criteria, although some funding agencies do support cross boarder funding.
 - A fee to contribute to the costs of the secretariat.

○ European Research Infrastructure Consortium (ERIC)

- The community legal framework for a European Research Infrastructure Consortium (ERIC) is a specific legal form to facilitate the establishment and operation of research infrastructures with European interest. The principal task of ERIC is to establish and operate new or existing research infrastructures on a non-economic basis. **The ERIC legal framework provides** amongst others a European joint-venture (also allows the participation of non-European countries), a legal capacity recognised in all EU Member States and a faster process than creating an international organisation.

- Principles of practical features that underpin their success

○ Flexibility

- Partnerships focus on a shared vision and strategy around a certain theme or topic; but the implementation is based on variable geometry.
- Virtual common pot system allows funding agencies to establish a 'regular' contract with the researchers that receive funding.
- **Simplicity**
 - No binding legal documents but partnerships based on agreements, high level political support and mutual trust.
 - Virtual common pot system for the funding activities.
 - Fee and/or in kind contribution for the governance/ secretariat of the partnership.

Background information: The EC funded BILAT USA 4.0 project aims to enhance the development of S&T partnerships between the EU and the USA. One of the activities of this project was a consultation amongst the USA state funding agencies around push and pull factors in relation to collaboration/ partnerships with the EU. The findings were that H2020 is impossible for almost all state funding agencies due to the legal and contractual issues. For the USA state agencies however it is clear that there is no decline of financial support from the EC – this might be different for the UK. The partnership model based on the virtual common pot and variable geometry method and no contractual requirements is a model that has been deemed interesting by the USA state agencies. More information: <http://www.euussciencetechnology.eu/documents/34/european-and-multinational-initiatives-opening-towards-usa-survey-results>

The shape of an ambitious new partnership

Q2. What elements must be included in a research and innovation partnership agreement between the UK and the EU to ensure it is close, valuable and effective? Please comment on how these would be prioritised.

- *This could cover the principles behind collaboration, or address specific requirements in areas such as: mobility of researchers, innovators, technicians and their families; regulation of research and research outputs; research funding; research infrastructures (physical and digital); or the commercialisation of research outputs.*
- *Your answer could address novel scientific and research opportunities, or specific objectives, which a new partnership might be able to exploit.*

- Focussed on a shared challenge/ topic.
- FAIR data principle
- The (non infrastructure specific) criteria of ERIC could be a good basis in case a legal entity is considered - amongst others member state driven partnerships, financial support, a clear and transparent regulation for countries to join and leave the partnership etc.

Practical steps to achieve such a partnership

Q3a. What practical steps are needed to realise the overall model you describe in Question 2?

- *This could include potential barriers; legal and governance arrangements – including ratification processes and court jurisdiction; risks to either side; and any precedents set.*
- *It could cover how the partnership might develop, for example phased implementation.*
- *You might wish to comment on how a successful implementation could be measured.*

- The beauty of the Joint Programming Initiatives as well as the Belmont Forum is that these partnerships are free of any complex legal and governance arrangement. It is important however that the partnership is recognised by the governance and that high level support is provided and maintained to allow both the establishment of the partnership as well as the implementation on the national and international level. This high level support should – amongst others – result in available resources for participation in the partnership as well as the recognition of the developed vision/ agenda as an important base for any national R&I strategy.

- In case a legal framework is considered the ERIC model might be interesting to explore as a basis for a relatively easy legal entity to establish; in this case it should be explored which part of the ERIC model can be converted into a non research infrastructure partnership and which steps are needed to establish an ERIC procedure for non research infrastructure partnerships.

Q3b. Thinking about the wider negotiating environment, what factors are likely to affect the ability to implement a shared vision on research and innovation?

- The availability of sufficient public resources for Research and Innovation, allowing the means (including human resources) for international consultation and the implementation of the output/outcomes of this consultation.
- The overall support for international collaboration – both in general as well as in relation to R&I policy.