

## Growing international research and development partnerships in a post-Brexit world

Date and Location:	18th July 2018 at The British Academy
Chair:	The Lord Rees of Ludlow OM Kt FRS Former President, The Royal Society
Opening statements:	The Rt Hon Norman Lamb MP Chair, House of Commons Select Committee on Science and Technology and MP for North Norfolk  Dr Douglas Terrier, Chief Technologist (Acting) , NASA
Audio Files:	<a href="http://www.foundation.org.uk">www.foundation.org.uk</a>
Hash tag	#fstbrexit
	At the end of this report is a statement tabled by the US National Science Foundation

Following a welcome from the meeting Chair, Lord Rees, opening statements were made by the Rt Hon Norman Lamb MP, Chair of the House of Commons Select Committee on Science and Technology and Dr Douglas Terrier, Acting Chief Technologist at NASA.

**NORMAN LAMB** began by commenting that with the current state of the Brexit negotiation, it was very difficult to predict where we will finish up, however to frame the discussion, he set out what he felt were key points from reports produced by the House of Commons Science and Technology Committee as well recent government papers and speeches by the Prime Minister.

He reminded everyone of the international nature of UK research as set out in the 2016 Royal Society Factsheet about UK Research and Innovation e.g. >50% of research outputs were the result of an international collaboration with the most frequent partner countries being USA (12%), Germany (7%), France (4%) and Italy (4%). The importance of Science and industrial Strategy was also acknowledged by the PM

who in her May 21st speech at Jodrell Bank highlighted that international collaboration is key to high quality research to solve the major challenges facing the world.

He mentioned three specific concerns from the March 2018 House of Commons Science and Technology Committee report (“Brexit, Science and Innovation”<sup>1</sup>). First, the effects on all areas of research of the continued uncertainty and their plea for clarity by November (though he was sceptical that this would happen). He said that although there was cross party support for continued research collaboration and inclusion in EU Research Programmes, the government agreed, but not at any price. Second, we must maintain regulatory alignment with the EU. Third, on the question of people, it was critical that visas and permits must be available at all levels enabling all workers we needed to come together with their families and dependents to the UK. This latter point of immigration is the topic of the latest House of Commons Science and Technology Committee report<sup>1</sup> (“An Immigration System that works for

<sup>1</sup> See the list of URLs on page 6

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Science and Innovation”) which amongst other things highlights the need for such a system to facilitate both short and long term stays in the UK, enable further travel outside the UK for research purposes and have an efficient streamlined and low-cost process of application for employers and employees.

Finally, he noted the continued ambiguity of wording from the government with the recent White Paper talking about seeking a series of science and innovation “accords”, whilst previous papers and speeches have mentioned an “agreement” or “pact”, but none of these have been clearly defined!

**DOUGLAS TERRIER** reflected on the success of the US space programme which over a period of 60 years had a long record of yields in research. From starting as a “space race” it had evolved into an “international space collaboration” culminating in the building of the International Space Station and visits to all planets of the solar system. He argued that the challenging environment of spaceflight pushes the limits of all our sciences and technologies, even unexpected ones, for instance >90% of infant foods contain supplements developed originally for astronauts in microgravity environments.

The focus of future space programmes is collaboration and indeed the recent White House Space Policy Directive #1 calls for NASA to “lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities”.

He noted the increasingly successful commercialisation of Low Earth Orbit, with companies like Blue Origin, Space-X, Bigelow and Virgin Galactic starting independent space operations in the very near future. Whilst major science programmes like the James Webb Telescope and potential missions to Europa or Enceladus will continue to provide new science, the public may feel the impacts of the space program first through developments in technologies like in-situ manufacturing and 3D printing, advanced propulsion and power, quantum computing and potentially the most impactful – Artificial Intelligence which promises to revolutionise almost every aspect of business and culture.

He concluded by noting that all these technological developments will change our lives and jobs (as they have done in the past), but that what we have learned from the last 60 years of the space program is that there is no static model that will ensure success, but

for those who adapt and collaborate, the opportunities are boundless.

## DISCUSSION

Several speakers started by re-iterating the need for UK to continue to be involved with EU research programmes and supporting Norman Lamb’s comment that the uncertainty around the final shape of any agreement is the greatest problem. The point was made that in the field of IT, Europe had lost the lead in search engines and social media and was in danger of doing the same in the AI field where despite considerable research strengths, uncertainty is holding back progress on major collaborations. However, as one speaker pointed out, large scale international collaborations not only need political will and agreement, but also the practicalities of coordinated funding between countries and simple (ideally a single) application and peer review. This often made it difficult for non-EU countries to work with what were seen as complex EU schemes with rigid rules and timings and it was often simpler for them to have a series of bilateral agreements. It was noted that this could potentially be easier for the UK post Brexit. A further difficulty that was noted was the increased focus on commercial involvement in EU programmes which often led to increased problems over IP and a conflict between competition and collaboration.

In the discussion over UK participation in future EU programmes, whilst many speakers said it was essential that UK researchers remained involved and that the government supported this, as Norman Lamb had pointed out, this could not be at any price. With potentially more than £1 billion of funding being committed to such programmes, would the government (or UKRI) be content to passively participate in priorities set by others or would it prefer to spend the money on its own priorities and use bilateral agreements where it can influence priorities? Several participants felt this could be a significant consideration for the government and hence a possible outcome in the case of a “no deal” Brexit. One speaker did make the point that the EU was good at very large-scale programmes which can benefit industry, and these cannot be matched by a series of smaller bilateral based activities. To balance this point, it was noted that companies liked the recent UK focus on Industrial Strategy and the Grand Challenge approach to priorities.

The point was made that in many ways the EU has moved on from Brexit, and that the pragmatic

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reality of EU processes was that the degree of involvement depended on how much you spent on buying into the programme (although now without influence) and there was indeed an increased focus on commercialisation and “juste-retour”. In these circumstances, UKRI may decide to spend its money on its own priorities which includes the interests of the wider UK, noting that Brexit means no access to Regional Development funds. One speaker noted that in any negotiation you need to know what the other side wants/needs most, and in the case of the UK, this could very well be the UK financial markets ability to raise funds e.g. the 315 billion euro European Fund for Strategic Investments (EFSI), Brexit could result in a loss of 60-100 billion towards this. We could trade on our continued investment in this for some other investments e.g. in Research & Innovation.

This led to a discussion of the need for the UK to ensure that it remained a confirmed member of other non-EU international organisations, institutions, infrastructure and research programmes, something which had strong support from all participants. It was noted that involvement in these led to high quality science outputs, but also often led to additional bilateral and multilateral activities. The point was made that the USA NSF had approximately 600 active projects with UK partners (making the UK the number one partner, China being second with approximately 400). All of these are bilateral and “bottom up”. A further advantage of such collaborations was that the partners acted as strong advocates for the UK research base and our continued involvement in all programmes.

In all the discussions, the question of “people” was a continuing priority. This ranged from general points around the shortage of STEM trained workers

(at all levels from technician to post-doc), the need to ensure the UK remained open and welcoming to all those whose skills are needed and an efficient and flexible immigration system as recommended in the recent S&T Committee report. It was emphasised that currently the UK has a key advantage in the strength of its education and university sector which together with teaching in the English language is a major attractor. This advantage is however being eroded by the rising standards in many other countries and the move to provide science and technical training in English. Several speakers noted that the UK should now focus much more on the rest of the world rather than just the EU and could still derive considerable benefits from working closer with the Commonwealth countries.

This led to a discussion of the government commitment to increase R&D spend to 2.4% of GDP by 2027 and the potential for new collaborations and programmes that this could lead to. To maximise the benefit from this, it was suggested that UKRI should be mapping what UK R&D has to offer the world (i.e. we needed an R&D Roadmap). Currently UKRI is only mapping research infrastructure. It was suggested that Israel would be a good model to look at.

## CONCLUSION

There was a consensus that international collaborations were the norm and while there were many outstanding process issues - visa restrictions, bureaucracy, etc. through constructive dialogue collaborative research programmes could be made to work. It was suggested the group should meet again once it becomes clearer what the Brexit deal means for science and innovation.

Professor Dave Delpy CBE FRS FREng FMedSci

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### Participants:

Name	Title	Organisation
Professor Guglielmo Aglietti	Surrey Space Centre Director and RAE/SSTL Research Chair in Space Engineering	University of Surrey
Dr Jean Arlat	Counsellor for Science and Technology	French Embassy

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Dr Tim Bestwick	Executive Director, Business and Innovation	Science and Technology Facilities Council
Nick Bridge	Special Representative for Climate Change	Foreign and Commonwealth Office
Judith Carrodeguas	International Relations Specialist, International and Interagency Relations	NASA
Dr Nicholas Chotiros	Associate Director	US Office of Naval Research Global
Professor David Cole-Hamilton FRSE	Chair of RSE Brexit working group on research, innovation and tertiary education	The Royal Society of Edinburgh and University of St Andrews
Professor David Delpy CBE FRS FREng FMedSci	Former Chief Executive, EPSRC	University College London
Rowan Douglas CBE	CEO, Capital, Science & Policy Practice and Chair, Willis Research Network	Willis Towers Watson
Dr Dougal Goodman OBE FREng	Chief Executive	The Foundation for Science and Technology
Dr Hermann Hauser KBE FRS FREng FInstP	Co-Founder	Amadeus Capital Partners
The Lord Hunt of Chesterton CB FRS		House of Lords
Vivienne Hurley	Director Research Funding and Strategy	British Academy
Nicole Jansen	Head of Science, Environmental Policy and Cyber, Department for Economic Affairs, Energy and Global Issues	German Embassy
Sir Emyr Jones Parry GCMG FInstP FLSW	President	The Learned Society of Wales
Dr Rebecca Keiser	Head, Office of International Science and Engineering	US National Science Foundation
The Rt Hon Norman Lamb MP	Chair, Select Committee on Science and Technology and MP for North Norfolk	House of Commons
Philip Lewis	Head of International	The British Academy

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Dr Lucy Mason	Head	Defence and Security Accelerator
Dr Julie Maxton CBE	Executive Director	The Royal Society
James Murphy	Director of Strategy	National Nuclear Laboratory
Jeremy Neathey	Deputy Director of Research and International Strategy	Economic and Social Research Council
Peter Oakley	Associate Director	TWI Ltd
Minister Takashi Okada	Minister Plenipotentiary	Consul-General Embassy of Japan
Chi Onwurah MP	MP for Newcastle Central	House of Commons
The Lord Patel KT	Chair, Select Committee on Science and Technology	House of Lords
Catherine Price	Manager External Research and Innovation	Shell UK
The Lord Rees of Ludlow OM Kt FRS	Former President	The Royal Society
Dr Mike Short CBE FREng FIET	Chief Scientific Adviser	Department for International Trade
Dr Douglas Terrier	Acting Chief Technologist	NASA
Dr Beth Thompson	Head of UK & EU Policy	Wellcome Trust
Henry von Blumenthal	Deputy Dean	European Investment Bank Institute
Professor Karen Vousden CBE FRS FRSE FMedSci	Chief Scientist	Cancer Research UK
Wayne Williams	Head of Policy	UKRI
The Rt Hon the Lord Willetts HonFRS		House of Lords

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## Background Papers

The speech by Sam Gyimah MP, Minister of State for Universities, Science, Research and Innovation on 7th July in Oxford on “Britain’s new unique selling point (USP): the go-to place for science and innovation”  
[www.gov.uk/government/speeches/britains-new-unique-selling-point-usp-the-go-to-place-for-science-and-innovation](http://www.gov.uk/government/speeches/britains-new-unique-selling-point-usp-the-go-to-place-for-science-and-innovation)

The Prime Minister’s speech of 21st May, 2018  
[www.gov.uk/government/speeches/pm-speech-on-science-and-modern-industrial-strategy-21-may-2018](http://www.gov.uk/government/speeches/pm-speech-on-science-and-modern-industrial-strategy-21-may-2018)

Brexit, science and innovation, House of Commons Science and Technology Select Committee, 21st March, 2018  
[www.publications.parliament.uk/pa/cm201719/cmselect/cmsctech/705/705.pdf](http://www.publications.parliament.uk/pa/cm201719/cmselect/cmsctech/705/705.pdf)

Brexit, science and innovation: Government Response to the Committee’s Second Report  
<https://publications.parliament.uk/pa/cm201719/cmselect/cmsctech/1008/1008.pdf>

An immigration system that works for science and innovation  
House of Commons Science and Technology Select Committee  
<https://publications.parliament.uk/pa/cm201719/cmselect/cmsctech/1061/1061.pdf>

Collaboration on science and innovation: a future partnership paper, Department for Exiting the European Union, 6th September, 2017  
[www.gov.uk/government/publications/collaboration-on-science-and-innovation-a-future-partnership-paper](http://www.gov.uk/government/publications/collaboration-on-science-and-innovation-a-future-partnership-paper)

NASA Technology Transfer Programme  
<https://spinoff.nasa.gov/Spinoff2018/index.html>

Universities Aerospace Collaboration  
<https://industrialstrategy.blog.gov.uk/2018/07/20/universities-aerospace-collaboration-takes-off-at-farnborough-international-airshow/>

Spaceport Announcement  
[www.gov.uk/government/news/one-giant-leap-vertical-launch-spaceport-to-bring-uk-into-new-space-age](http://www.gov.uk/government/news/one-giant-leap-vertical-launch-spaceport-to-bring-uk-into-new-space-age)

House of Commons Science Select Committee Report on Brexit , Science and Innovation  
<https://publications.parliament.uk/pa/cm201719/cmselect/cmsctech/705/705.pdf>

## Useful URLs

Aerospace at Cranfield University  
[www.cranfield.ac.uk/themes/aerospace](http://www.cranfield.ac.uk/themes/aerospace)

Association of Innovation, Research and Technology Organisations (AIRTO)  
[www.airto.co.uk](http://www.airto.co.uk)

European Investment Bank Institute  
<https://institute.eib.org>

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European Research Council

<https://erc.europa.eu>

French Embassy Science Section in London

<https://uk.ambafrance.org/-Science-Tech->

German Embassy in London

<https://uk.diplo.de/uk-en>

Japanese Embassy in London

[www.uk.emb-japan.go.jp/itprtop\\_en/index.html](http://www.uk.emb-japan.go.jp/itprtop_en/index.html)

Mullard Laboratory, UCL

[www.ucl.ac.uk/mssl](http://www.ucl.ac.uk/mssl)

NASA

[www.nasa.org](http://www.nasa.org)

National Physical Laboratory (NPL)

[www.npl.co.uk](http://www.npl.co.uk)

National Space Centre, Leicester

<https://spacecentre.co.uk/>

Office of Naval Research

[www.onr.navy.mil/Science-Technology/ONR-Global.aspx](http://www.onr.navy.mil/Science-Technology/ONR-Global.aspx)

Space Applications Catapult, Harwell

<https://sa.catapult.org.uk/>

Surrey Satellite Technology

[www.sstl.co.uk](http://www.sstl.co.uk)

UK Space Agency

[www.gov.uk/government/organisations/uk-space-agency](http://www.gov.uk/government/organisations/uk-space-agency)

UK Research and Innovation

[www.ukri.org](http://www.ukri.org)

Arts and Humanities Research Council

[www.ahrc.ukri.org](http://www.ahrc.ukri.org)

Biotechnology and Biological Sciences Research Council

[www.bbsrc.ukri.org](http://www.bbsrc.ukri.org)

Engineering and Physical Sciences Research Council

[www.epsrc.ukri.org](http://www.epsrc.ukri.org)

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Economic and Social Research Council  
[www.esrc.ukri.org](http://www.esrc.ukri.org)

Innovate UK  
[www.gov.uk/government/organisations/innovate-uk](http://www.gov.uk/government/organisations/innovate-uk)

Medical Research Council  
[www.mrc.ukri.org](http://www.mrc.ukri.org)

Natural Environment Research Council  
[www.nerc.ukri.org](http://www.nerc.ukri.org)

Research England  
[www.re.ukri.org](http://www.re.ukri.org)

Science and Technology Facilities Council  
[www.stfc.ukri.org](http://www.stfc.ukri.org)

Nesta  
[www.nesta.org.uk](http://www.nesta.org.uk)

Royal Academy of Engineering  
[www.raeng.org.uk](http://www.raeng.org.uk)

The Royal Society  
[www.royalsociety.org](http://www.royalsociety.org)

The Royal Society of Edinburgh  
[www.rse.org.uk](http://www.rse.org.uk)

Russell Group  
[www.russellgroup.ac.uk](http://www.russellgroup.ac.uk)

Universities UK  
For a full list of UK universities go to:  
[www.universitiesuk.ac.uk](http://www.universitiesuk.ac.uk)

US National Science Foundation  
[www.nsf.gov](http://www.nsf.gov)

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## U.S. National Science Foundation Statement

Input to the Foundation for Science and Technology round table discussion on  
“Growing international research and development partnerships in a post-Brexit world”

Dr. Rebecca L. Keiser  
Head, Office of International Science and Engineering

July 18, 2018

### Introduction

We live in an increasingly globalized world. Challenges do not stop at national borders. A multipolar environment for S&E continues to emerge in which discoveries in one country can benefit others, and collaboration among countries spurs transformative discovery and innovation. The state of S&E in the U.S. and elsewhere is not only a function of a given nation's policies and investments. Creativity and scientific discovery produce broad economic and social benefits through an interrelated system of invention, knowledge transfer, and innovation. Government, businesses, universities, non-profits, and individuals all play a role. At a time when global societal challenges help frame the worldwide research agenda, the UK and the U.S. have an opportunity to lead in developing multinational research collaborations to address these challenges.

The National Science Foundation (NSF) pursues international collaboration due to the global nature of science. The UK is one of our largest partners. We look to continue and enhance our science relationship in the UK and see great opportunities given the new, consolidated UK Research and Innovation (UKRI) structure.

### Current Collaborations

NSF enjoys an extremely close working relationship with the Councils under UKRI. We currently support over 600 active projects in which U.S. researchers collaborate with partners based in the UK. This number makes the UK one of the leading destinations for international collaboration for U.S. researchers. Across the spectrum of scientific fields, U.S. and British scientists continue to make significant intellectual contributions. Together, we build on the innovations inherited from the great scientists and engineers who preceded us and continue to push forward the frontiers of science. This cooperation enables us to pursue broad, programmatic research collaborations, in addition to individual researcher-to-researcher connections.

In the past 3 years, multiple components of NSF have established agreements with counterpart Councils in the areas of engineering, geosciences, biological sciences, and social, behavioral and economic sciences. As evidence of the fruitful opportunities these agreements foster, collaboration in engineering was recently expanded to include two additional NSF Divisions. Through these agreements, the Councils have invested \$34M toward collaborative UK-US research, with NSF contributing nearly \$40M. These agreements demonstrate the strong synergy between the UK and U.S. research communities.

Areas of current collaboration include (but are not limited to):

- Novel synthetic biology approaches to explore fundamental rules of life.
- Technologies to advance crop breeding.
- Nanomaterials and nanomanufacturing.
- Convergence research related to the Future of Work at the Human-Technology Frontier.
- Ecological and evolution of infectious diseases.
- Future of Thwaites Glacier and its contribution to sea level rise.
- Application of data science to museums and cultural heritage organizations.

In addition to these active areas of collaboration, discussions are ongoing regarding potential new collaborations in computer and information sciences and engineering.

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In September 2017, the U.S. and the UK signed a government-to-government Science and Technology Agreement. NSF currently is working with the UKRI USA Office to renew the agency-to-agency Memorandum of Understanding. With these overarching agreements in place, NSF and UKRI may explore even more areas of potential cooperation.

### **Potential Future Collaborations – NSF Big Ideas**

In 2016, NSF unveiled a set of bold ideas for the future called the “10 Big Ideas for Future NSF Investments.” The Big Ideas identify and seek to catalyze research in areas that will impact science and society. Six Big Ideas define cutting-edge research agendas foster breakthroughs, taking advantage of decades of technological revolutions and new discoveries. Four Big Ideas implement processes to enable more and better research by embracing new practices and approaches.

Since unveiling the Big Ideas in 2016, NSF has pushed this bold research agenda forward. For example, and of mutual interest to the UK and U.S., NSF is bringing together researchers to examine the Big Idea on the future of work and how constantly evolving technologies like artificial intelligence are shaping the workforce. NSF is also boosting investment in quantum research to push this field to the next level. Many key country partners are also making significant investments in quantum centers and research. Another Big Idea, Windows on the Universe: The Era of Multi-messenger Astrophysics, has just yielded the discovery of the first source of high-energy cosmic rays: an immense galaxy is identified as a source of neutrinos detected on and around Earth using the Ice Cube facility at the South Pole together with gamma-rays in the Fermi Large Area Telescope. The team who made this discovery is international, and the telescopes that confirmed the discovery span the globe.

### **Potential Future Collaborations – MULTIPLIER Missions**

NSF values and is committed to its large and increasing number of international partnerships. In the context of an evolving global science enterprise, NSF has transitioned its international engagement to a new model that allows us to expand our outreach and cooperation around the globe. Called “MULTIPLIER” (MULTIplying Impact Leveraging International Expertise in Research) Missions, this new approach deploys NSF experts on strategic, short-term expeditions to select areas to explore opportunities for content-specific collaboration. Clear goals and a follow-up toolkit for each mission will yield evidence-based outcomes toward realizing new collaborative approaches. Last month NSF completed its first MULTIPLIER, which explored Synthetic Biology. With a purpose to deepen programmatic linkages between NSF and related European funding institutes, this mission included a visit to the Rosser Laboratory in Edinburgh, Scotland. NSF is interested in exploring future MULTIPLIER Missions to the UK.

### **In Closing**

As the UK commits to increase its investment in R&D in the immediate and long term and expand its international research cooperation, the U.S. should remain a leading choice to build future partnerships. NSF looks forward to exploring additional areas where the UK and the U.S. can expand on the very productive collaborations we have enjoyed for generations.