

# **IOP** Institute of Physics

## **Submission to the House of Commons Science and Technology Committee on the risks and opportunities for UK science, research and innovation after Brexit**

**13 February 2018**

The Institute of Physics welcomes the opportunity to submit evidence to the Science and Technology committee's call for written evidence on mitigating the risks and exploiting opportunities to UK science after Brexit.

### **Summary**

- **The UK must retain its position as a destination of choice for qualified international students, and academic, technical and research talent to encourage scientists to continue to come to the UK.**
- **A new immigration system must be favourable towards scientists and students coming to the UK from EU and non-EU countries.**
- **The strong history of collaboration with European partners is a distinguishing feature of UK science and the UK should participate in Framework Programme 9 (FP9) and other European research programmes. There is also an opportunity to strengthen ties with other research intensive nations.**
- **The commitment to raise gross domestic expenditure on R&D as a proportion of GDP to 2.4% by 2027 provides an opportunity for physics-based industries in the UK, particularly for research in new innovative technologies.**
- **The mechanisms to spend new money must be aligned with other funding sources to support the whole research base, and based on the principles of growing and supporting excellence. Fundamental research must continue to be supported as it forms the basis of future innovation and development.**
- **The increased funding from Government must be genuinely additional to EU sources rather than substitutional.**
- **The UK must prioritise arranging access to shared EU research facilities. Investment in national facilities will also facilitate international collaboration in new and existing partnerships beyond Europe.**
- **The UK should seek to maintain membership of the European Strategy Forum on Research Infrastructures (ESFRI) in order to influence decisions relating to infrastructures in Europe that are key to the UK, and ensure they remain world class.**
- **The Nuclear Safeguards Bill addresses the legislative issues associated with leaving Euratom, but there are still a number of risks to the nuclear industry, nuclear research and development and the security of supply of medical radioisotopes.**

## People and skills

1. The UK must retain its position as a destination of choice for qualified international students, and academic, technical and research talent, to encourage scientists to continue to come to the UK, and to stay, after the UK leaves the EU.
2. The recent commitment from the Government<sup>1</sup> to EU nationals currently in the UK that they can apply for 'settled status' after the UK leaves the EU provided some clarity to those working in UK science. However, while these assurances are positive, there are still risks to the critical science and engineering workforce as a result of the UK leaving the EU. Non-UK EU nationals make up 26% of all academic staff in UK physics departments.<sup>2</sup> The current uncertainty surrounding the future immigration system and UK participation in European programmes may deter scientists from choosing the UK as a destination for study and/or work. This includes EU nationals who hold crucial roles, leading high quality research programmes.
3. The impact of the current STEM skills gap is currently mitigated by migrant workers.<sup>3</sup> Brexit puts this mitigation at risk. The 2017 Confederation of British Industry skills survey found that 12% of businesses see difficulty accessing highly skilled migrants as a main driver of skills gaps in the future.<sup>4</sup> This could be further exacerbated if the demand for STEM skills increases as predicted: the Social Market Foundation predicted a shortfall of 40,000 STEM graduates between 2012 and 2020.<sup>5</sup> Even if the shortfall of STEM skills could be filled with domestic talent, which we do not believe is achievable in the short-term, migrant workers will always be in demand to allow businesses to recruit from a more diverse pool of talent, and where a particular skillset or area of expertise is required. When developing a new partnership with the EU, the UK must ensure a sustainable pipeline of STEM skilled workers is created, including those from overseas. This will be essential if the UK is to meet the demand from industry growth and maintain world-class universities.
4. There is an opportunity to create a new UK immigration system that is favourable towards scientists and students coming to the UK from both EU and non-EU countries. The current system for non-EU nations is burdensome and costly, with caps on the number of Tier 2 (General) visas available as well as specified minimum salaries. The recently raised salary threshold of £30,000<sup>6</sup> is higher than some highly-

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<sup>1</sup> Gov.UK. Status of EU citizens in the UK: what you need to know

<https://www.gov.uk/guidance/status-of-eu-nationals-in-the-uk-what-you-need-to-know>

<sup>2</sup> IOP, 2017. Academic staff in UK physics departments.

[http://www.iop.org/policy/consultations/file\\_69758.pdf](http://www.iop.org/policy/consultations/file_69758.pdf)

<sup>3</sup> House of Commons Science and Technology Committee, 2017. Industrial Strategy: Science and STEM skills. <https://publications.parliament.uk/pa/cm201617/cmselect/cmsctech/991/991.pdf>

<sup>4</sup> CBI, 2017. Helping the UK Thrive: Education and skills survey 2017.

[http://www.cbi.org.uk/index.cfm/\\_api/render/file/?method=inline&fileID=DB1A9FE5-5459-4AA2-8B44798DD5B15E77](http://www.cbi.org.uk/index.cfm/_api/render/file/?method=inline&fileID=DB1A9FE5-5459-4AA2-8B44798DD5B15E77)

<sup>5</sup> SMF, 2013. In the Balance: The STEM human capital crunch. <http://www.smf.co.uk/publications/in-the-balance-the-stem-human-capital-crunch/>

<sup>6</sup> Gov.UK. Points-based system: Tier 2. <https://www.gov.uk/government/publications/points-based-system-tier-2>

skilled early career roles, including postdoctoral researchers, may be paid. The Migration Advisory Committee's analysis of salary thresholds found that more than 30% of natural and social science professionals applying through the route were affected by the £30,000 salary threshold in the year ending March 2015.<sup>7</sup> This suggests that salary is not always an appropriate proxy for skill level. Postdoctoral researchers are a highly mobile group of the workforce: in UK physics departments, 31% are from non-UK EU countries and a further 30% from non-EU countries.<sup>8</sup> A new immigration system must be flexible, to allow international mobility of scientists and researchers on short, medium and long term timescales. The rhetoric around migration should be encouraging so that the UK is perceived to be welcoming and continues to support scientists and students who wish to work and/or study in the UK.

## Collaboration

5. The UK should ensure that the current level of international collaborations can continue and that UK researchers can retain leadership positions internationally, as this is an essential component of the strength of the UK research base.
6. Brexit creates risks to international collaboration, which is a distinguishing feature of UK science and has been linked to the recently observed sustained upward trend of UK science productivity.<sup>9</sup> Over 51% of all UK publications in 2014 were co-authored with at least one international researcher, a proportion surpassed only by France amongst leading scientific nations.<sup>10</sup> A number of mechanisms contribute to this, including the strong history of collaboration with European partners through EU, pan-European and other multilateral and bilateral initiatives. It is positive that many of these are acknowledged in the Government's future partnership paper,<sup>11</sup> but broader issues such as a new immigration system will have a direct impact on the nature of future collaborations with the EU.
7. The vote to leave the EU provides an opportunity to strengthen ties with other research intensive nations as well as maintaining the essential, strong collaborations with the EU. The UK has a number of important bilateral and multilateral arrangements in science and research. For example, the joint Science and Innovation strategy signed between the UK and China extends existing collaborations; including a focus on innovation to tackle global challenges and mutual access to research infrastructure, as well as considering the establishment of new

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<sup>7</sup> MAC, 2015. Review of Tier 2 – Analysis of salary thresholds.  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/452805/Review\\_of\\_Tier\\_2\\_-\\_Analysis\\_of\\_salary\\_thresholds.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/452805/Review_of_Tier_2_-_Analysis_of_salary_thresholds.pdf)

<sup>8</sup> IOP, 2017. Academic staff in UK physics departments.

[http://www.iop.org/policy/consultations/file\\_69758.pdf](http://www.iop.org/policy/consultations/file_69758.pdf)

<sup>9</sup> Elsevier, 2017. *International comparative performance of the UK research base.*

[https://www.elsevier.com/\\_data/assets/pdf\\_file/0018/507321/ELS-BEIS-Web.pdf](https://www.elsevier.com/_data/assets/pdf_file/0018/507321/ELS-BEIS-Web.pdf)

<sup>10</sup> Elsevier, 2017. *International comparative performance of the UK research base.*

[https://www.elsevier.com/\\_data/assets/pdf\\_file/0018/507321/ELS-BEIS-Web.pdf](https://www.elsevier.com/_data/assets/pdf_file/0018/507321/ELS-BEIS-Web.pdf)

<sup>11</sup> Gov.UK. Collaboration on science and innovation. A future partnership paper.

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/642542/Science\\_and\\_innovation\\_paper.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/642542/Science_and_innovation_paper.pdf)

joint laboratories and research centres. In physics, this supports links with physicists in China in important areas where they are making rapid advances, including in large scale facilities such as constructing the world's biggest radio telescope, a Circular Electron-Positron Collider, investments in new energy generation and storage, and a mission to the far side of the moon.<sup>12</sup> Similarly, the recent UK and US arrangement provides new opportunities.<sup>13</sup> Global challenges can be a driver of new international partnerships, on issues which cross borders, such as healthcare, climate change and food security. The Global Challenges Research Fund, supported by Government to foster collaborations between the UK and developing nations on tackling global challenges, is one such example of this, supporting challenge-led and interdisciplinary research.<sup>14</sup> New ways to collaborate will always be beneficial to UK science, but maintaining existing networks and methods of funding are of equal importance, and they underpin these new relationships.

## Funding

8. The UK should aim to participate in Framework Programme 9 (FP9) and other European programmes, to support a continued close partnership with the EU as well as providing funding for UK R&D.
9. The Government commitment to raise the UK's gross domestic expenditure on R&D as a proportion of GDP from 1.7% to 2.4% by 2027, followed by a longer term target of 3%<sup>15</sup> is very welcome and will bring us in line with comparator countries and the OECD average, which was 2.2% in 2014.<sup>16</sup> Achieving this growth will rely on private sector investment and the public investment will require careful staging and must be aligned with other funding sources to be effective. It must also support the whole research base, and be driven by the principles of growing and supporting excellence. An appropriate balance must be struck between money for research and innovation: fundamental research must continue to be supported as it forms the basis of future technology and development. Without this strong foundation the UK would have no longer term development of intellectual property.
10. The increased funding from Government must be genuinely additional to EU sources rather than substitutional. UK physics currently relies on EU funding: 18.8% of research grant funding to UK physics departments in the 2015-16 academic year came from EU sources, primarily through Horizon 2020 grants. The UK received £3.5 bn from the programme between January 2014 and September 2017 and had the

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<sup>12</sup> IOP news, 2017. Top-level Chinese delegation meets senior UK figures in visit hosted by the IOP. [http://www.iop.org/news/17/july/page\\_69803.html](http://www.iop.org/news/17/july/page_69803.html)

<sup>13</sup> Gov.uk. First ever UK US science and technology agreement paves the way for closer research collaborations <https://www.gov.uk/government/news/first-ever-uk-us-science-and-technology-agreement-paves-the-way-for-closer-research-collaborations>

<sup>14</sup> RCUK. Global Challenges Research Fund. <http://www.rcuk.ac.uk/funding/gcrf/>

<sup>15</sup> Gov.UK. Record boost to R&D and new transport fund to help build economy fit for the future. <https://www.gov.uk/government/news/record-boost-to-rd-and-new-transport-fund-to-help-build-economy-fit-for-the-future>

<sup>16</sup> Elsevier, 2017. *International comparative performance of the UK research base*. [https://www.elsevier.com/\\_data/assets/pdf\\_file/0018/507321/ELS-BEIS-Web.pdf](https://www.elsevier.com/_data/assets/pdf_file/0018/507321/ELS-BEIS-Web.pdf)

second highest number of participations out of all countries.<sup>17</sup> European programmes have an important role in supporting international collaborations, existing networks and basic science alongside the UK's science budget and industrial strategy, and both have a place in ensuring the future success of UK science. The commitments from Government to allow UK scientists to continue to participate in Horizon 2020 and intentions to maintain a close relationship with the EU beyond the leave date are positive. However, if the UK has to 'buy its way in' to the programmes, there is a risk that the additional cost could be detrimental to the overall science budget. There is a further risk that the UK's influence on the development of FP9 is not guaranteed.

## Facilities

11. The UK must prioritise arranging access to shared EU research facilities following Brexit. While this is likely to involve numerous new agreements, each taking time to negotiate and formalise, and come with access costs, it is preferable to losing access to the facilities.
12. Leaving the EU risks the UK's leadership in large facilities. The UK should seek to maintain membership of the European Strategy Forum on Research Infrastructures (ESFRI) to play a part in decisions relating to research infrastructures in Europe that are key to the UK, and ensure they remain world class. ESFRI supports a coherent, multi-national approach to developing research infrastructure: currently only EU member states and countries associated to Horizon 2020 are members. The UK might have to link its investment in facilities into the ESFRI planning process in order to maintain membership. The UK should also maximise the opportunity to invest in national facilities in key research areas as a method to improve and facilitate international research collaboration in new and existing partnerships.

## Euratom

13. The UK must prioritise addressing the remaining significant risks to the nuclear industry and to nuclear research and development as a result of leaving Euratom that are that are outside the scope of the Nuclear Safeguards Bill.
14. The Prime Minister's letter to European Council President Donald Tusk in March 2017 stated the UK's intention to leave the European Atomic Energy Community (Euratom) as well as the EU.<sup>18</sup> This decision has raised concerns around nuclear safeguarding, the trade of nuclear materials and medical radioisotopes, the movement of nuclear services and expertise and research in nuclear fission and

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<sup>17</sup> Gov.UK. UK's participation in horizon 2020: September 2017.

<https://www.gov.uk/government/statistics/uks-participation-in-horizon-2020-september-2017>

<sup>18</sup> Gov.UK. Prime Minister's letter to European Council President Donald Tusk, 29 March 2017.

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/604079/Prime\\_Minister\\_s\\_letter\\_to\\_European\\_Council\\_President\\_Donald\\_Tusk.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/604079/Prime_Minister_s_letter_to_European_Council_President_Donald_Tusk.pdf)

fusion.<sup>19</sup> A recent statement from the Secretary of State Greg Clark<sup>20</sup> confirmed that the UK will aim for continuity with current relevant Euratom arrangements.

15. There are still a number of significant risks relating to leaving Euratom that must be resolved in the second phase of Brexit negotiations. These include the transport of nuclear waste, securing an extension to the Joint European Torus (JET) and participation in the International Thermonuclear Experimental Reactor (ITER), the application of Euratom rules during any post-Brexit implementation period and arrangements for the import of medical isotopes during such a period.<sup>21</sup> The UK has a leading role in nuclear R&D and maintaining this strength should be a priority after the UK leaves the EU.

### **About the Institute of Physics**

The Institute of Physics is a leading scientific membership society working to advance physics for the benefit of all. We have a worldwide membership ranging from those early in their career or in academic or technical training to those at the top of their fields in academia, business, education and government. Our purpose is to gather, inspire, guide, represent and celebrate all who share a passion for physics. And, in our role as a charity, we aim to ensure that physics delivers on its exceptional potential to benefit society. Alongside professional support for our members, we engage with policymakers and the public to increase awareness and understanding of the value that physics holds for all of us. Our subsidiary company, IOP Publishing, is a world leader in scientific communications, publishing journals, eBooks, magazines and websites globally.

**For more information, contact  
Alex Connor, head of policy ([alex.connor@iop.org](mailto:alex.connor@iop.org))**

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<sup>19</sup> IOP submission to the House of Lords EU Energy and Environment sub-committee inquiry into Brexit and energy security. [http://www.iop.org/policy/consultations/file\\_70086.pdf](http://www.iop.org/policy/consultations/file_70086.pdf)

<sup>20</sup> Energy Policy: Written Statement, 11 January 2018. <http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2018-01-11/HCWS399/>

<sup>21</sup> House of Commons European Scrutiny Committee, 2018. European Atomic Energy Community. <https://publications.parliament.uk/pa/cm201719/cmselect/cmeuleg/301-viii/301-viii.pdf>