

UK research and
the European Union
**A shared vision for
European research**

June 2018

World-leading UK research is not produced in isolation

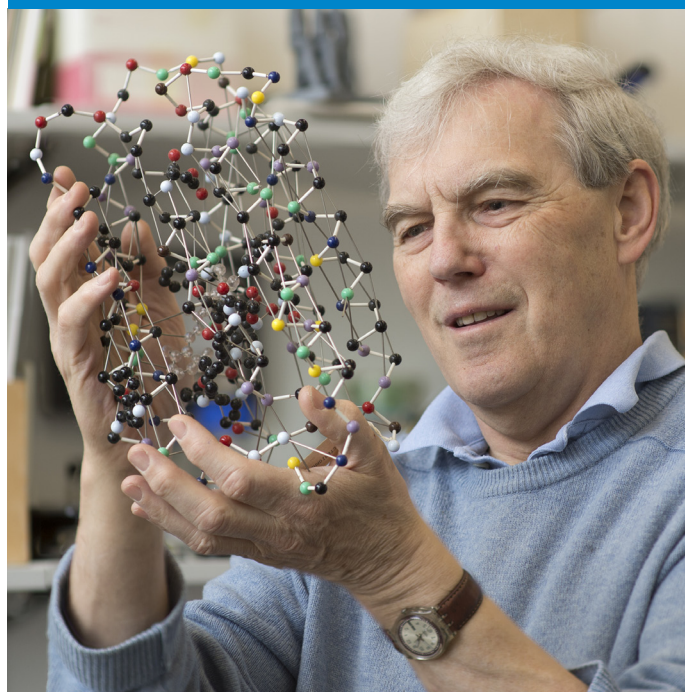
When we research, we build on the body of knowledge that has been accumulated through the work of people around the world, and add to this. Researchers often work with others, sharing ideas and collaborating with people both in the UK and further afield.

In 2015, **over half** of the UK's research output was the result of international collaborations and these collaborations are increasing – both in absolute terms and as a proportion of the UK's research output¹.

UK-based researchers most frequently partner with scientists from the US, with seven EU countries also among the UK's **top ten** strongest collaborators².

95% of National Academy Fellows and grant recipients have been involved with at least one international collaboration within the last five years³.

CASE STUDY 1



Scientific advances are made in collaboration.

Professor Richard Henderson FRS FMedSci received the Nobel Prize in Chemistry in 2017 for contributing to the development of cryo-electron microscopy, a method which both simplifies and improves the imaging of biomolecules that revolutionised biochemistry.

Working in Cambridge in 1990, Richard used electron microscopy to produce the first image of a protein at atomic resolution. When combined with the work of Jacques Dubochet (University of Lausanne, Switzerland) and Joachim Frank (Columbia University, US), his breakthrough made the technology possible. Every nut and bolt of the electron microscope was then optimised over the years and the desired resolution was achieved in 2013⁴.

1. The Royal Society. 2016 UK research and the European Union: The role of the EU in international research collaboration and researcher mobility.
2. *Ibid.*
3. Opinion Leader. 2017 The role of international collaboration and mobility in research: Findings from a qualitative and quantitative study with Fellows and grant recipients of the Royal Society, British Academy, Royal Academy of Engineering and the Academy of Medical Sciences
4. Nobel Prize. 2017 The Nobel Prize in Chemistry 2017. See https://www.nobelprize.org/nobel_prizes/chemistry/laureates/2017/press.html (accessed 10 May 2018).

Science seeks to understand the world, and there is value in doing this together

European countries have a proud tradition of jointly investing in science and supporting excellent research. This makes a considerable long-term contribution to sustainable economic growth and to improve wellbeing.



Collaboration brings the benefit of scale

The European Space Agency (ESA) is an independent intergovernmental organisation devoted to conducting aero-space research and exploration.

ESA is not an agency or body of the EU, but it maintains close ties with the EU and the two organisations have jointly developed a European Space Policy.

Among its missions are projects studying how to deflect asteroids to protect the planet and human spaceflight missions which included British astronaut Tim Peake⁵.

Ambitious projects such as the creation of the European Research Council have earned a strong international reputation, establishing European research as a global player, and attracting top researchers from the rest of the world to improve people's lives around the globe.

CASE STUDY 2

Working together can help tackle big questions.

The International Human Genome Sequencing Consortium published the first complete human genome in April 2003 with the sequence of the entire genome's three billion base pairs. This knowledge will help us better understand and treat health conditions. The project involved researchers in 20 organisations across 6 countries, including the UK⁶.

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Scientists seek to work with the most outstanding scientists in their field⁷. According to one scientist at Imperial College, "if you are the best, geography doesn't exist".

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The European Atomic Energy Community (EURATOM) was established in 1957 with 28 countries. Its research and training programme aims to improve nuclear safety and radiation protection⁸.

5. European Space Agency 2015, ESA and the EU. See https://www.esa.int/About_Us/Welcome_to_ESA/ESA_and_the_EU (accessed 14 October 2015).

6. National Human Genome Research Institute. An Overview of the Human Genome Project. See <https://www.genome.gov/12011238/an-overview-of-the-human-genome-project/> (accessed on 17 April 2018).

7. Day N, & Stilgoe J. 2009 Knowledge nomads: why science needs migration. Demos: London, UK.

8. European Commission. Nuclear Energy. See <https://ec.europa.eu/energy/en/topics/nuclear-energy> (accessed 17 April 2018).

EU funding forms part of a diverse mix that supports UK research

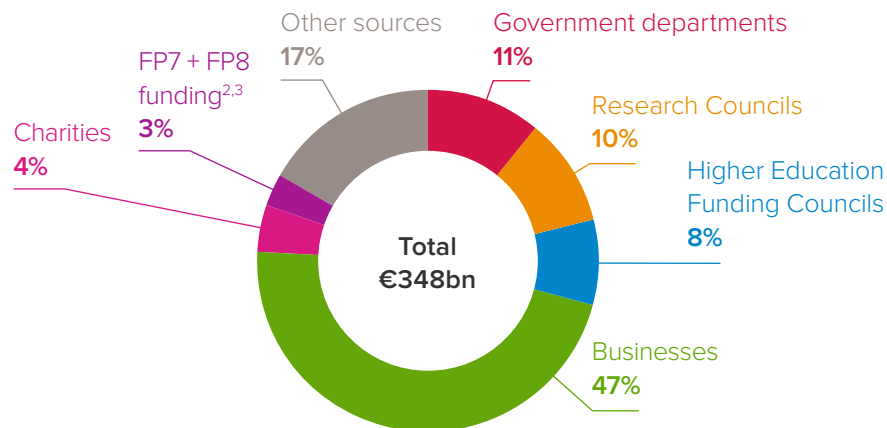
Research and innovation in the UK is supported by a range of sources including the public purse, business, charities and overseas investment. This includes EU research funding, which may be accessed directly by researchers or can support business or charity investment in research and innovation.

This research takes place in lots of different locations – in universities, research institutes and businesses – and often uses infrastructure such as telescopes, supercomputers,

archives or databases that may be located elsewhere in the UK or overseas.

FIGURE 1

Breakdown of funding sources for R&D in the UK (2007 – 2016)¹.



1. Office for National Statistics. 2018 UK gross domestic expenditure on research and development: 2016.

2. European Commission, Seventh FP7 Monitoring Report, March 2015.

3. European Commission. 2018. Horizon 2020 in full swing – three years on – key facts and figures 2014-2016. Data refers to grants awarded in funding calls with deadlines in 2016 which were signed by 1 September 2017. Horizon 2020 total funding may vary year on year.

Note: The chart separates figures for Horizon 2020 funding from 'Overseas' category published by ONS and combines the remaining overseas funding with figures from 'Higher Education' into a new category named 'Other sources'. EU research and innovation funding through structural funds is not captured in this as only some of these activities fall under the ONS definition of research and development used to calculate the domestic data. Exchange rates are calculated based on yearly average rates (GBP to EUR) from <http://www.ukforex.co.uk/forex-tools/historical-rate-tools/yearly-average-rates>

Framework Programmes (FPs) are the main EU funding mechanism for research, development and innovation. The current Framework Programme is called Horizon 2020 and runs from 2014 to 2020. It will be followed by Framework Programme 9 (Horizon Europe) between 2021 and 2027. Funding is distributed through a number of schemes and agencies, including the European Research Council (ERC), Marie Skłodowska-Curie Actions (MSCAs), the Small and Medium sized Enterprises (SME) instrument, the European Institute of Innovation and Technology (EIT), and partnerships with Member States and industries.

European Investment Bank (EIB) is the European Union's bank. The primary focus is not research and innovation. However, the EIB has provided multiple loans to support the renewal and expansion of university campuses and research centres.

European Structural and Investment Funds (ESIF) are a set of funds targeted especially (though not exclusively) at building capacity in the least economically developed regions of the EU. The European Regional Development Fund (ERDF) is part of ESIF and supports research and innovation activities. The UK receives approximately €200m a year from ERDF⁹.

9. Technopolis. 2017 The role of EU funding in UK research and innovation – an analysis commissioned by the UK's National Academies – The Royal Society, British Academy, Academy of Medical Sciences and Royal Academy of Engineering.

Different funding sources interact and can leverage further investment into UK research

The interactions between different investors in UK research will be important in delivering the government's target to increase overall investment in UK R&D to 2.4% of GDP within ten years, and 3% in the longer term.

For every £1 spent by the government on R&D, private sector R&D output rises by **20p per year** in perpetuity, by raising the level of the UK knowledge base¹⁰.

The **€9.6bn** received by the UK from EU Framework Programmes 2007 – 2016 is estimated to have helped generate a total of **€16.6bn** in R&D expenditure¹³.

More than half of the 'Stars Wales' programme to attract top talent and provide training to leading Welsh research groups was funded by EU programmes, with the remaining coming from local government¹¹.

ERDF part-funds (60%) a **€200m** EU Investment for Growth and Jobs Programme run by Invest Northern Ireland, which assists Northern Irish businesses via R&D support, a design service and access to financial instruments¹⁴.

The Nanotechnology and Integrated BioEngineering Centre near Belfast was supported through £6m in ERDF grants, with an estimated further £50m of investment received from other sources. The Centre has generated 35 patents, and high value spinout companies valued collectively at **£100m**¹².

10. Haskel J, Hughes A, Bascavusoglu-Moreau E. 2014 The Economic significance of the UK science base: a report for the Campaign for Science and Engineering.

11. Haskel J, Hughes A, Bascavusoglu-Moreau E. 2014 The Economic significance of the UK science base: a report for the Campaign for Science and Engineering.

12. Technopolis. 2017 The role of EU funding in UK research and innovation. Appendix: Case studies – an analysis commissioned by the UK's National Academies – The Royal Society, British Academy, Academy of Medical Sciences and Royal Academy of Engineering.

13. *Ibid.* note 10.

14. *Ibid.* note 11.

Different parts of the UK research ecosystem have a different relationship with the EU

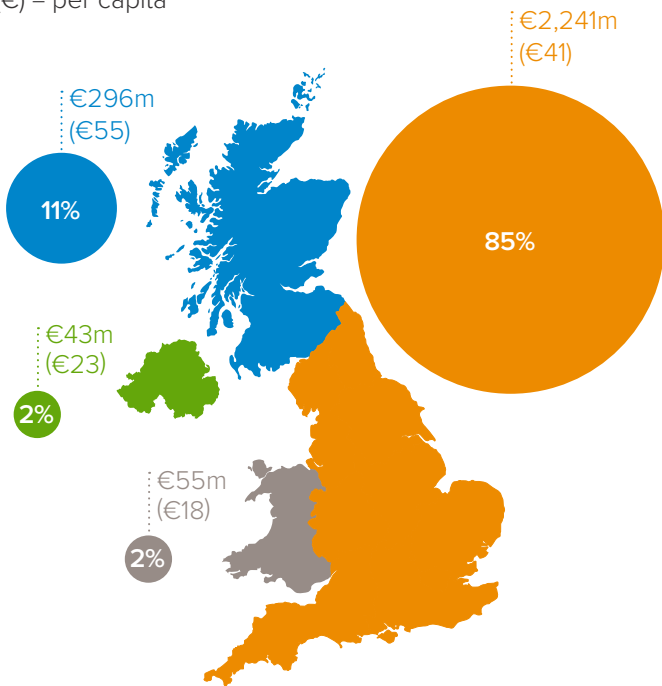
Any change to the UK's relationship with the EU will impact parts of the system in different ways. The following figures show how EU research funding varies across the different UK nations.

FIGURE 2

How much funding for research and innovation does each UK nation receive from EU programmes?

Horizon 2020 (2014 – 2016)

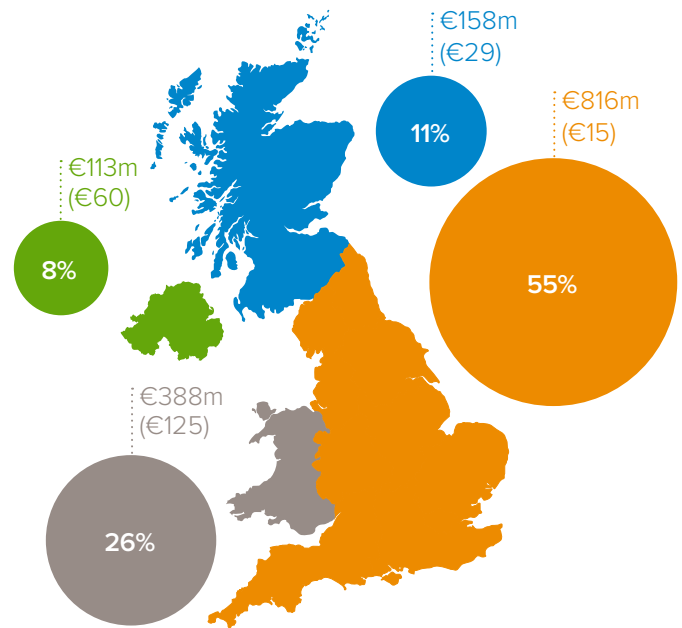
(€) = per capita



ERDF research and innovation (2014 – 2020)

One of the three main funds under ESIF

(€) = per capita



Source: Technopolis. 2017 The role of EU funding in UK research and innovation – an analysis commissioned by the UK's National Academies – The Royal Society, British Academy, Academy of Medical Sciences and Royal Academy of Engineering.

England took the **largest share** of funding from both Horizon 2020 and ERDF, with a total of €3 bn¹⁵.

Scotland received the **most funding** per capita from Horizon 2020 with €55 per head¹⁶.

Wales (€125) and Northern Ireland (€60) receive the **most funding per head** from the European Structural Investment Fund supporting research and innovation projects¹⁷.

15. Technopolis. 2017 The role of EU funding in UK research and innovation – an analysis commissioned by the UK's National Academies – The Royal Society, British Academy, Academy of Medical Sciences and Royal Academy of Engineering.

16. *Ibid.*

17. *Ibid.*

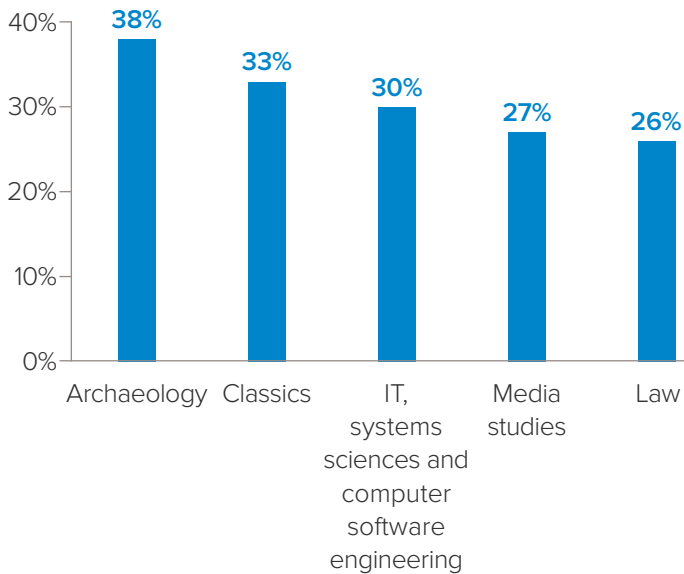
EU research funding in the UK is distributed across academic disciplines. For some disciplines, EU funding is a considerable amount of money but this may not represent a large proportion of its total funding. In other cases,

funding from EU bodies makes up a considerable proportion of the total research funding for that discipline. It is important to understand these dependencies and the impact of changes in the UK's relationship with the EU.

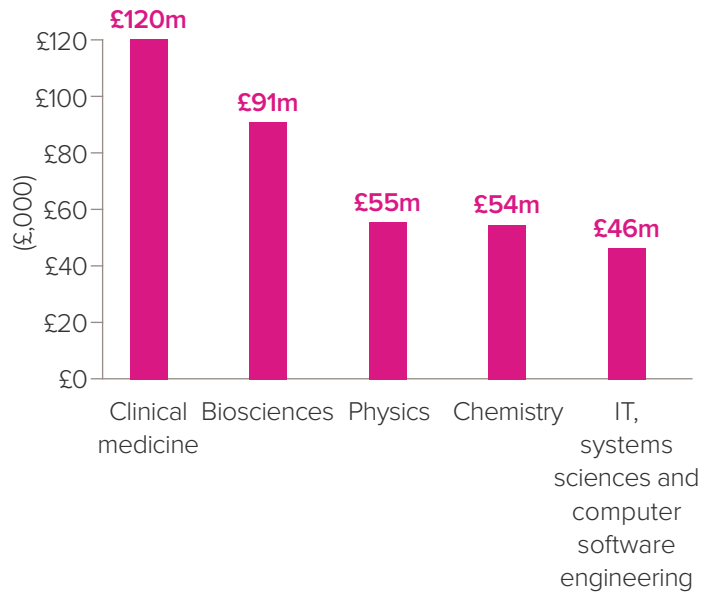
FIGURE 3

Which disciplines receive the most EU research and innovation funding and which disciplines are most dependent on this?

The five disciplines that receive the largest proportion of its research funding from EU government bodies in 2014 – 2015.



The five disciplines that receive the most research funding from EU government bodies in 2014 – 2015.



Source: Technopolis. 2017 The role of EU funding in UK research and innovation – an analysis commissioned by the UK's National Academies – The Royal Society, British Academy, Academy of Medical Sciences and Royal Academy of Engineering. Data from Higher Education Statistics Authority. Figures refer to all research grants and contract income received from all government bodies operating in the EU, including the European Commission but excluding bodies in the UK.

IT, systems sciences and computer software engineering is **one of the five disciplines most dependent** on EU funding and it also receives the fifth largest amount from the EU in absolute terms. Employers project that the number of careers depending on computing skills will grow¹⁸.

Archaeology is most dependent on the EU, receiving **38%** of its funding from EU government bodies¹⁹.

Clinical medicine receives the **largest amount** of funding from EU government bodies, totaling £120 million in 2014/15²⁰.

18. Technopolis. 2017 The role of EU funding in UK research and innovation – an analysis commissioned by the UK's National Academies – The Royal Society, British Academy, Academy of Medical Sciences and Royal Academy of Engineering.

19. *Ibid.*

20. *Ibid.*

The EU can be a partner in engaging with the rest of the world

The EU has an internationalist vision for research. The UK is involved in many international collaborations with partners around the world, independently and in partnership with the EU.

The EU has **20** international agreements on science and technology²¹.

60% of the UK's internationally co-authored papers are with EU partners²³.

Pascal Lamy, former Director General of the World Trade Organisation²², in a report commissioned by the EU, called for international research and innovation to become a trademark of the EU by opening up the EU's research and innovation programme to association by the best and participation by all.

There are 16 countries associated to Horizon 2020²⁴.

21. European Commission. 2017 Countries with EU international agreements on science and technology. See http://ec.europa.eu/research/iscp/pdf/policy/st_agreement_ec_euratom.pdf (accessed 29 March 2018).

22. European Commission. 2017 LAB-FAB-APP Investing in the European future we want.

23. Royal Society. 2016 UK research and the European Union The role of the EU in international research collaboration and researcher mobility.

24. European Commission. 2016 Directorate-General for Research & Innovation: Associated Countries. See http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf (accessed 11 May 2018).