

# Submission to the Nurse Review of the Research Councils

**The Royal Society recommends that the Nurse Review should consider the following proposals:**

- UK investment in research has clear economic and social benefits and should be increased to align with other leading knowledge economies.
- Funding research excellence should be the main function of the Research Councils (RCs). Expertise and evidence is needed to ensure that excellence is reflected in decision making.
- The dual support system should be maintained but the Full Economic Cost (FEC) system and its adequacy should be reviewed.
- Funding decisions, from grants to large strategic investments, should be more transparent and those making them should be accountable to the public and the scientific community.
- An independent high-level Science Strategy Advisory Body (SSAB) should be established including representatives from the RCs, CST, research-intensive Government departments and the scientific and business communities. Its primary role would be to advise the Director General of Knowledge and Innovation, or equivalent, on strategic investment and national capability.
- There are opportunities to further strengthen RC leadership, cross-Council coordination, sustainability of investment and stakeholder engagement.

## **A. Introduction**

1. This response has been prepared by a working group of members of the Royal Society's Council, led by the Society's Vice-President Professor Alex Halliday, and approved by the Council on behalf of the Society. Fellows from diverse disciplines and organisations with experience of different funding models have been consulted.<sup>1</sup> Sir Paul Nurse, the Society's President, was not involved in the preparation of this submission.
2. The RCs provide a powerful mechanism to fulfil the Government's stated aim of making the UK the best place in the world for science and business<sup>2</sup>. In many regards they are effective and well-respected internationally. The opportunity to consider their evolution is welcomed. It is important that any reforms, do not inadvertently weaken the UK's ability to fund excellent research. Years of flat cash have left the system with little flexibility<sup>3</sup> and change will be difficult at a time when each RC is seeking to preserve its funding for front-line research.

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<sup>1</sup> Throughout this response the Society has focused on the research councils responsible for the natural, engineering and medical sciences as this is where the expertise of most of its Fellows lies. However, many issues will also be relevant to the social sciences, art and humanities, particularly given the importance of interdisciplinary research.

<sup>2</sup> BIS and Treasury (2014) *Our Plan for Growth* <https://www.gov.uk/government/publications/our-plan-for-growth-science-and-innovation>

<sup>3</sup> Campaign for Science and Engineering (2014). *Science and Engineering Investment*. <http://sciencecampaign.org.uk/Case2015InvestmentBriefing.pdf>

## B. Public benefits of research

3. The UK has created a world-leading research base that includes the pursuit of scientific inquiry<sup>4</sup> - the most reliable way to gain knowledge about ourselves and the natural world. This provides the foundation for new ideas and discoveries, and fuels economic growth and the creation of skills, high-value jobs and entrepreneurial businesses in our knowledge-driven economy<sup>5</sup>. Decision makers in business and government draw on expertise and advice from UK research to tackle national and global challenges from water scarcity to terrorism, from population change to the effects of new technology on our everyday lives. Research helps make the UK an open, vibrant and enquiring society with a deep cultural base and helps us to live healthier, fuller and better lives.
4. To prosper through research, the UK needs to be known as a place where:
  - a) Excellent research ideas and proposals receive appropriate levels of funding;
  - b) The infrastructure, facilities and equipment are of sufficient quality and scale to support cutting edge research;
  - c) Clear strategies are in place to provide stable and sustainable funding;
  - d) Excellent scientists are able to thrive with strong medium-term support;
  - e) Internationally significant discoveries are made; and,
  - f) These discoveries are translated into benefits for society.

## C. Investment in research

5. UK investment in R&D as a % of GDP is low compared to other leading knowledge economies. In the UK in 2013, overall R&D expenditure was 1.63% of GDP, a decrease from 1.73% in 2000, and R&D expenditure by Government was 0.44%, down from 0.52% in 2000<sup>6</sup>. Successive 'flat cash' settlements mean that the cumulative erosion of the ring-fenced science budget since the 2010 spending review to 2015/16 has been projected to be over £1.1 billion<sup>7</sup>.
6. Citations and reputation are delayed<sup>8</sup> measures of scientific success and can mask the current status of UK science. Research activity scales with investment<sup>9</sup>, which for resource has been eroded (see above), so quality and impact may also be in decline.
7. Meanwhile, our international collaborators and competitors have been increasing investments since 2000. Overall R&D expenditure as a proportion of GDP in 2012 was 2.81% in the US and 2.88% in Germany, up from 2.62% and 2.40% respectively in 2000 (Government-funded R&D was 0.86% and 0.84% respectively)<sup>10</sup>.

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<sup>4</sup> BIS and Treasury (2014) *Our plan for growth: science and innovation – evidence paper*

<https://www.gov.uk/government/publications/our-plan-for-growth-science-and-innovation-evidence>

<sup>5</sup> BIS and Treasury (2014). *Our plan for growth: science and innovation – evidence paper*

<https://www.gov.uk/government/publications/our-plan-for-growth-science-and-innovation-evidence>

<sup>6</sup> OECD Main Science and Technology indicators [http://stats.oecd.org/Index.aspx?DataSetCode=MSTI\\_PUB](http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB)

<sup>7</sup> Campaign for Science and Engineering (2014) *Science and Engineering Investment*.

<http://sciencecampaign.org.uk/Case2015InvestmentBriefing.pdf>

<sup>8</sup> Elsevier (2013) *International comparative performance of the UK research base*.

[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](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)

<sup>9</sup> Office of Health Economics and the Science Policy Research Unit at the University of Sussex (2014) *Exploring the interdependencies of research funders in the UK*. <http://news.ohe.org/2014/07/02/interdependence-funding-medical-research-uk/>

<sup>10</sup> Source OECD, *Main science and technology indicators*. Data refers to 2012 (latest available data)

8. To ensure the UK can exploit its research and tackle major national problems like energy and healthcare, it must increase investment to keep pace with other leading economies and build an environment in which research prospers and ideas and their translation flourish. This means that success rates for research proposals should be high enough to incentivise application, and application processes encourage high-quality ideas. The UK cannot afford to be weak in science.

#### **D. Research Councils: a foundation of the UK research system**

9. Public investment in UK research flows through a number of channels that form part of a research and innovation ecosystem. This brings together public, private, philanthropic and other funding for UK research<sup>11</sup>. At the heart of public investment lies the dual support system, which provides a stable platform upon which universities can develop<sup>12</sup>.
10. A 2013 report on the performance of the UK research base showed that it delivers 11.6% of global citations and 15.9% of the world's most highly cited articles with only 3.2% of global R&D expenditure and 4.1% of global researchers<sup>13</sup>. The exceptional productivity of the UK research system suggests that the dual support system is fit for purpose and the RCs perform well. The dual support system should be maintained and any reform of the RCs should maximise excellent research and its benefits, while minimising harmful disruption.
11. The Royal Charters that govern the RCs describe objectives that contribute to what the Society believes to be their principal function: supporting excellent research and people<sup>14</sup>. This is primarily achieved through responsive mode funding guided by expert peer review. Responsive mode funding should encourage risky, creative, innovative research that has the potential to deliver substantial returns. At present this is not always the case. The emphasis that has also been placed on supporting talented individuals is welcomed, provided it is focused on the best ideas and not just the track records of individuals. Excellence, identified by high-quality peer review, should be the primary guiding principle for RC investment.
12. Several other functions of RCs, such as strategic planning and prioritisation, supporting national research capabilities, leadership and engagement, are discussed in the following sections.

#### **E. Strengthening strategic decision-making**

13. To capitalise on its scientific strength and public and private investment, the UK needs a comprehensive strategic approach to research for:
  - a) deciding on research priorities given the continuously evolving nature of science;
  - b) flexibly focusing resources where needed;
  - c) deciding on the location and support of key facilities and research centres;

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<sup>11</sup> Royal Society (2013). *Submission to the Triennial Review of the Research Councils* <https://royalsociety.org/policy/publications/2013/triennial-research-councils/>

<sup>12</sup> Royal Society (2010). *The Scientific Century* <https://royalsociety.org/policy/publications/2010/scientific-century/>

<sup>13</sup> Elsevier (2013) *International comparative performance of the UK research base*. [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](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)

<sup>14</sup> BIS (2014). *Triennial review of research councils* [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/303327/bis-14-746-triennial-review-of-the-research-councils.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/303327/bis-14-746-triennial-review-of-the-research-councils.pdf)

- d) establishing a national network of capabilities and a framework of science facilities that optimises resources and is strategically aligned with regional and business priorities; and
  - e) establishing and funding international collaborations in which the UK is involved (e.g. CERN, EMBL).
14. The RCs provide a broad and potentially deep interface with the scientific community and they should be well placed to contribute to strategic decision-making about science investment and national and regional capability by harnessing the insight of scientists, business and Government. At present this opportunity is not being fully realised.
  15. To better align strategic priorities across the RCs and other funders it is proposed that a high-level, transparent, accountable and independent Science Strategy Advisory Body (SSAB) be established, including representatives from RCUK, CST, research-intensive Government departments and the wider scientific, business and charitable communities. Its primary role would be to advise the Director General of Knowledge and Innovation, or their equivalent, on strategic investment and national capability. Care should be taken to ensure that SSAB avoids the challenges faced by similar bodies in the past, particularly ensuring an appropriate balance of the interests of Government and other stakeholders.
  16. In considering research priorities and how to focus resources (including the balance of funding between RCs) SSAB should reflect on how effective the UK has been in addressing the need for change. For example, to what extent has EPSRC been able to grow to accommodate the expansion of energy research or IT-related research such as data analytics and robotics? To what extent have BBSRC and MRC been able to address the growing challenges (and expenses) of genomics?
  17. The identification of “place” as a new and prominent element of Government thinking in research and innovation policy presents an exciting opportunity but also a different kind of strategic challenge<sup>15</sup>. If UK funding becomes increasingly regionalised the risk of duplication and unhelpful competition grows. Therefore, the “place” theme needs careful development and SSAB should play an active role in advising upon the location of capital and resource investment.
  18. To ensure good decision-making and high levels of confidence SSAB must engage widely and actively, its advice must be transparent and it should be accountable to the public and the scientific community. It should connect scientists, funding bodies, businesses and politicians so that no party can ignore another to the detriment of all. Excellence should be a primary guiding principle.
  19. The Higher Education Funding Councils are undertaking extensive work on the research impact agenda and a recent review of RC impact<sup>16</sup> focused primarily on procedure rather than principles. There is a case for SSAB to undertake a review of RC impact which, when considered alongside the HEFCs work, will allow a rounded consideration of ‘the impact of impact’ on the UK research base.

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<sup>15</sup> BIS and Treasury (2014) Our plans for growth: science and innovation.

<https://www.gov.uk/government/publications/our-plan-for-growth-science-and-innovation>

<sup>16</sup> RCUK (unknown) *Pathways to impact*. <http://www.rcuk.ac.uk/RCUK-prod/assets/documents/documents/PtolExecSummary.pdf>

### **Research Councils and research centres**

20. Research centres can range from units that provide a particular cutting edge focus (e.g. the Francis Crick Institute), to expensive facilities (e.g. the Diamond Light Source), to institutes that provide an essential monitoring capability (e.g. British Geological Survey).
21. Running strategic national facilities or laboratories alongside the provision of responsive-mode funding does not appear to sit comfortably with the RCs (with the possible exception of STFC). In many advanced countries (e.g. USA) aspects of national capability (e.g. the geological survey) are funded separately from RCs. National capability funding should not be tensioned against responsive mode research.
22. There have been moves by MRC, BBSRC and NERC to privatise or otherwise relinquish stand-alone research centres, including parts of the UK's national capability. This potentially weakens the work carried out in the institutes unless the future of their funding is secure and understood (but not necessarily with RC funds). The Society understands that part of this has been driven by a need for greater flexibility in salaries and the ability to carry over end of year surpluses. This is particularly important for centres with major technical infrastructure.
23. Much of the UK's research capability also lies beyond the RCs in Public Sector Research Establishments and the private sector. In recent years important changes have been made to national capability, but these do not all seem to have been undertaken in a coordinated and strategic fashion. The RCs' role in providing national capability must be considered by SSAB.
24. Independent panels of international experts supplemented by external peer review are needed to assess whether particular centres are necessary, provide what the UK needs, function at the right level and have optimal governance. Whether these should be inside, outside or across RCs needs to be discussed and may require both depending on circumstances. Such independent expert scrutiny would help RCs to make objective assessments without relying on expertise and judgement of the centres themselves or their competitors. SSAB should play a role in overseeing this.
25. Competitive RCUK funding should only be made available to Government-funded national capability laboratories such as NPL, AWE, the Met Office etc. if budgets are appropriately expanded to accommodate this.

### **F. Leadership**

26. Strong leadership is essential at *all* levels in the RCs and their centres. Leadership could be improved in four ways:
  - a) Ensure leadership roles in the RCs and their centres are attractive to top researchers. This might include giving freedom to offer competitive salaries to attract researchers from abroad or compete with the packages offered by many Higher Education Institutions.
  - b) Outside of research centres, strong research experience and expertise is sometimes limited to a handful of staff within RCs. Seconding top researchers to the RCs, as in the US and elsewhere, builds leadership, engagement and scientific strength. Such

opportunities are only likely to attract high-calibre individuals if they are placed in charge of significant research budgets.

- c) The Chair of the RC should be an accomplished organisational leader with strong business acumen who can provide firm, helpful and insightful support.
- d) The Council of the RC should comprise strong leaders from research, business and the broader public, who are able to think strategically (beyond the interests of their own constituencies) and command considerable respect in the community.

#### **G. Coordination and collaboration between research councils**

- 27. The RCs should work together more effectively. In particular, they should:
  - a) Use similar processes and structures except when the specific needs of a given subject require otherwise. For example, it does not seem necessary to have seven different standard grant schemes (accepting that there are some exceptions<sup>17</sup>);
  - b) Develop and prioritise innovative inter- and cross-disciplinary strategic programmes (rather than re-badging existing programmes as joint activities). Cross-Council panels to award grants should be common and supported by a cadre of interdisciplinary researchers to referee proposals with cross-Council themes; and
  - c) Jointly work with Innovate UK and other funders to ensure that scientific developments can be fed into commercial opportunities.
  
- 28. RCUK needs to be more effective and nimble in supporting interdisciplinary areas and cross-Council collaboration. Developing RCUK as an overarching umbrella organisation with some centralised research leadership instead of just a rotating RC Chief Executive would be helpful. Progress has been made with the appointment of an RCUK Executive Director, the success of which should be reviewed in 3-5 years.

#### **H. Optimising sustainable and competitive research investment**

- 29. The Society welcomes the long-term investment in research capital announced by Government in 2013<sup>18</sup>. Capital and resource are interdependent, as infrastructure requires maintenance, staffing, refurbishment, upgrades and running costs. If these requirements are to be met from RC budgets, the funding landscape risks being distorted. Investment in resource and capital should be better aligned and this should be part of the mandate of the SSAB. Such decisions need to be transparent and accountable to the public and the scientific community.
  
- 30. Higher Education Institutions (HEIs) are heavily dependent on adequate research overheads (FEC) from RCs to fund infrastructure. Many top research intensive universities are both borrowing significant sums to replace ageing infrastructure and using teaching income to subsidise research. The requirement for matched funding for equipment by some RCs is challenging and European funding comes with lower overheads. FEC was introduced to help make HEIs and the research base financially sustainable. The goal of financial sustainability must remain a priority. The last RCUK/UUK review of FEC was in 2010<sup>19</sup> so it now seems timely to once again review whether FEC has been effective, or whether a more sustainable way of funding research can be implemented.

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<sup>17</sup> For example, it is clear that STFC's Rolling Grant system has in the past provided some necessary stability for the long-term capability needed for astrophysics and particle physics instrumentation development.

<sup>18</sup> Treasury (2013). *Spending round 2013*.

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/209036/spending-round-2013-complete.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209036/spending-round-2013-complete.pdf)

<sup>19</sup> RCUK and UUK (2010). Financial Sustainability and Efficiency in Full Economic Costing of Research in UK Higher Education Institutions. <http://www.rcuk.ac.uk/RCUK-prod/assets/documents/reviews/fec/FECReviewReport.pdf>

31. The UK lagged behind other countries in instrumentation until the peer-reviewed Wellcome-JIF was established. Replacing this with an algorithmic HEFCE formula took away the opportunity of using peer review to focus funding on the most scientifically worthy cases. The subsequent decline in this HEFCE funding in recent years has to some extent been replaced by RC funding and RPIF. This should be encouraged further. Consideration should be given to the possibility of each science RC having its own instrumentation funding panel to provide oversight of UK capability.
32. The current RC focus on supporting UK students greatly limits their ability to bring brilliant young minds to this country and compete with top HEIs in the US, Europe and Asia. This not only limits UK science, it also impacts UK business and international partnerships and influence. The RCs should invest more in this low cost opportunity to strengthen UK research and facilitate “brain circulation” in an increasingly networked world.

#### **I. Engagement**

33. RCs should engage more closely with the scientific community. At present, some do this well; others less so. Close engagement means that RCs benefit from advice and direction and carry the respect and trust of the scientific community. The costs of inadequate engagement are poor decision-making, misguided strategies and low confidence. Examples of good practice include EPSRC’s Strategic Advisory Teams, which comprise academic researchers (among others) and help to set subject strategy, but these must feed usefully into the RC governance structure.
34. It is also essential that funding processes are first rate and transparent and that review panels are composed of outstanding scientists. However, this has not always been the case. The situation has improved in certain cases (for example at MRC) with open election to review panels and increasing utilisation of the expertise available among UK investigators and their collaborators to ensure that sound decisions are made.
35. For such mechanisms to be effective adequate resourcing must be available. Indeed Councils should place a premium on efforts to inform and engage, especially when resources are tight.
36. Engagement and participation requires research leaders to volunteer. This does not always happen, so professional research bodies have a responsibility to encourage participation.
37. There may be room for further improvements, such as including international representatives on panels to independently assess whether research is “world-class”.
38. Public engagement helps to ensure that research and innovation is open and inclusive, that citizens make informed choices about their lives and those of others and that the benefits arising from advances in research and innovation can be realised<sup>20</sup>. Public engagement is enshrined in the Royal Charters of the RCs who

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<sup>20</sup> UK National Academies (2015). *Building a Stronger Future, UK national academies*  
<https://royalsociety.org/policy/publications/2015/stronger-future/>

should identify and share good practice to ensure that public benefits of research are maximised.

39. It is also important that the RCs engage with other government funders, businesses and charities that so often perform and use research.
40. Science and innovation are increasingly international and the UK is well placed to benefit from a more global, networked science and innovation system, particularly in Europe. The UK has sometimes struggled to maintain its subscriptions to international programmes and collaborations and has thereby lost the opportunity it once enjoyed to provide leadership in some areas<sup>21</sup>. Efforts to strengthen UK science and innovation must be accompanied by better-resourced mechanisms for orchestrating research across international networks, not just in the context of major research facilities such as CERN, but also in response to global challenges such as climate change and food security<sup>22</sup>.

## **J. Concluding statements**

41. Public investment in research delivers substantial economic, social, health and environmental returns through the UK's world-class research system. The RCs, with their focus on excellence and high-quality peer review, have proven to be a strong delivery mechanism for much of this investment as part of the dual support system. The current Review offers an excellent opportunity to build on this strength through the establishment of a high-level independent SSAB. Progress would also be made through further strengthening leadership, cross-Council coordination, investment sustainability and engagement.
42. The breadth and depth of the Society's response has been limited by the space available so the Society would like to offer to arrange one or more roundtables to allow the Review Team to hear more detailed views from the Society's Fellowship.

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<sup>21</sup> House of Lords Science and Technology Committee (2013). Scientific Infrastructure <http://www.publications.parliament.uk/pa/ld201314/ldselect/ldsctech/76/76.pdf>

<sup>22</sup> The Scientific Century, Royal Society (2010) <https://royalsociety.org/policy/publications/2010/scientific-century/>