



## Royal Society of Chemistry's response to the Nurse review of the research councils

April 2015

### Executive summary

The UK's research councils have a vital role in maintaining the strength of the UK's research and innovation landscape. The research councils are continually evolving and we have welcomed many of the recent changes. We caution that large-scale reforms, such as merging research councils or reallocating funding, could be disruptive and should be openly consulted upon before decisions about significant changes are made.

**Excellence should be the primary criterion when considering scientific research or infrastructure funding.** Peer review, the scientific 'gold-standard', should form a fundamental component of the assessment of any scientific research programme or investment.

**Fundamental research must continue to be supported across the board.** Research councils have a vital role in supporting fundamental research in core, intra- and inter-disciplinary areas. The impacts of fundamental research can often not be predicted in advance, but history demonstrates that they can be large and wide-ranging.

**Securing the UK's future as a knowledge-led economy relies on the provision of world-class instrumentation.** Equipment sharing helps researchers in the short-term but cannot act as a substitute for new mid-level equipment.

**A balance must be struck between concentration and breadth.** The research councils' investments have broad influence: supporting research, the provision of education and skills, and local and regional innovation. Over-concentration would damage many of the ecosystem's wider strengths.

**Postgraduate studentships are both a key component of training a highly-skilled UK workforce in science, technology and beyond, and a crucial mechanism to enable the delivery of team research projects and programmes.** Special attention will be required from the research councils to ensure that recently appointed academics and world-class researchers working outside clusters are able to build and sustain research groups.

**Coordination between the research councils is vital for supporting fundamental and strategic research across the disciplines.** Ongoing improvement of the compatibility of funding systems, and guidance for grant assessment, will assist researchers working at the interfaces.

**Coordination between the research councils and Innovate UK is essential in accelerating impact.** The research councils have an important role working alongside Innovate UK in developing networks across their community which will further facilitate transfer and translation of ideas across disciplines and between academia and industry.

## **Introduction**

The UK's world-leading science base creates growth and jobs. Depending upon the form of measurement, the UK ranks first or second for the strength of its science and is typically in the top cluster for innovation (the Global Innovation Index currently has UK in 2<sup>nd</sup> place). This success has continued over a period of tight funding, in part due to the strength of the dual-support system and strategic decisions by the research councils.

The research councils are continually evolving and we have welcomed many of the recent changes. We caution that large-scale reforms, such as merging research councils or reallocating funding, could be disruptive and should be consulted upon widely and openly before decisions about significant changes are made.

### **1. Funding the best research**

#### *1.1. Decision making and strategic approaches*

**Excellence should be the primary criterion when considering scientific research or infrastructure funding.** In an economic climate of austerity, the government has clearly recognised the social and economic value of UK scientific research with a cash-terms protected science revenue budget and, after initial cuts, a capital budget protected in real terms until 2020.

Despite these strong signals of support, returned capital funding has largely been concentrated into high-profile 'announceable' projects that do not appear to have undergone rigorous independent peer review and are not always matched with the necessary funding to support running costs and technical support. We are concerned that this additional capital funding then constrains the remaining non-capital budget by tying it into ensuring the new capital projects can operate.

**Independent peer review as the scientific 'gold-standard' should be fundamental in determining research infrastructure funding.** We understand that government will have a role in some larger strategic funding decisions, especially those related to industrial use and application. However, decisions should also involve in-depth consideration by the wider research and innovation community and the scientific case robustly peer-reviewed to ensure that the most value is made of the investment in both the immediate and long-term.

#### *1.2. The importance of fundamental research*

**Research councils have a vital role in supporting fundamental research.** The research councils' roles are far-reaching but they have a vital responsibility to support fundamental blue-skies research which will not be adequately supported elsewhere. This is essential if the UK's competitive advantage in technology-driven R&D is to be maintained in the long- and short-term.

**Excellent research and researchers create both paradigm-shifting discoveries and the strong knowledge base that enables innovation. Many impacts of fundamental research are not obvious in advance.** Many technologies ubiquitous today (for example lasers in telecommunications, semiconductors in electronics, and the measurement of nuclear spins in MRI) are based on fundamental research that was not undertaken with a view to application and did not see their value realised until many years after development.<sup>1</sup> This is exemplified by many of the recent REF case studies (e.g. Professor Hagan Bailey's research into the properties of membrane proteins, which has led to a step-change in the sequencing DNA and a spin-out company recently valued at \$1bn, or Professor Malcolm Heggie's research into the structure of graphite, which has lengthened lifetimes of nuclear reactors saving £100m).

**Quality must be maintained across all research council funding streams.** The most recent Science, Engineering and Technology Statistics,<sup>2</sup> which splits fundamental research into 'pure' and 'oriented', shows that research council expenditure on 'pure' research has undergone a slight decline versus 'oriented' over recent years. Some strategic oversight of the science base is essential, but anecdotal evidence from our community suggests that submissions for overly proscriptive research funding calls can be of lower quality. It is important to monitor if and how the balance of call types affects the international standard of the work supported.

### 1.3. Capital funding

**Securing the UK's future as a knowledge-led economy relies on the provision of world-class instrumentation.** The government's recent Science and Innovation Strategy recognises this by setting capital investment at its core, outlining funding for both large-scale infrastructure and individual laboratory-level discovery science. These two scales complement each other well, but current structures leave a 'hole' for mid-scale capital.

Following the capital funding reduction in 2010, EPSRC and BBSRC contribute only 50% of the cost of equipment between £10,000 and ca. £100,000 with the rest required to be found from elsewhere. In some instances the shortfall can be made up by an industrial partner, but in many cases it is made up by the academic institution. This scale of equipment is essential for much of the chemical sciences, for example providing imagers or spectrometers for characterisation and analysis.

**Equipment sharing helps researchers in the short-term but cannot act as a substitute for new mid-level equipment.** The research councils and the research community have worked together to alleviate the strain by setting up equipment sharing systems and developing programmes such as *Core Capability for Chemistry Research*,<sup>3</sup> whereby specific equipment was funded to be shared across a network of universities, or regional partnerships of universities (e.g. N8 or ScotChem). However, this situation is manageable

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<sup>1</sup> Curiosity-driven 'Blue Sky' Research: a threatened vital activity?, Sir John Cadogan (2014)  
<http://learnedsocietywales.ac.uk/sites/default/files/Curiosity-driven%20Blue%20Sky%20Research%20WEB%20LSW.pdf>

<sup>2</sup> UK Government Expenditure on Science Engineering and Technology, Office for National Statistics (2012)  
[http://www.ons.gov.uk/ons/dcp171778\\_370646.pdf](http://www.ons.gov.uk/ons/dcp171778_370646.pdf)

<sup>3</sup> <http://www.epsrc.ac.uk/funding/calls/corecapability/>

only in the short-term and the ability to sustain excellence becomes more precarious as broader stocks of equipment become progressively more obsolete.

## **2. Wider role of the research councils**

### *2.1. Strategic skills provision*

**Investment in our science base acts to support a triple-helix of capability: performing world-class research, providing education and skills, and contributing to local and regional economies by spinning out companies and working with industry.** The three strands support each other, especially at universities, and are vital across the whole of the UK. Any changes in one area therefore also need to be considered in light of their impact on the others.

This interconnectedness requires particular attention as studies show that funding is tight on all sides. Chemistry (and physics) departments already operate in significant deficit in both their teaching and research activities,<sup>4,5</sup> and the chairs of the Chemistry REF Panel recently warned that many departments are struggling to diversify funding to make up for the real-terms decline in RCUK funding.<sup>6</sup>

**A balance must be struck between concentration and breadth of funding.** Concentrating funding into only a small number of universities would enhance their ability to attract academics and students, but to the detriment of the rest of the system. Our present university system is already struggling to produce enough highly skilled employees<sup>7</sup> and if we are to continue to meet the demands of our world-leading knowledge economy then we will need a diverse range and significant number of universities researching, teaching and accelerating innovation across the UK. Professional bodies and sector skills councils may be able to act as honest brokers to identify skills gaps or shortages.

**Postgraduate studentships are both a key component of training a highly-skilled UK workforce in science, technology and beyond, and a crucial mechanism to enable the delivery of team research projects and programmes.** PhD students are an essential component of the UK innovation system as well as the wider economy. A PhD is a period of training, producing very highly skilled people, whilst simultaneously involving them as an integral part of a research team. The research councils have a vital role in ensuring the supply of PhDs and the quality of their training. Models such as the Centres for Doctoral Training (CDTs) provide one way to raise the level of PhD training and a mechanism for supporting interdisciplinary research but, as with the wider funding system, it is important to have a range of funding mechanisms for postgraduate students,<sup>8</sup> striking a balance between concentration and breadth.

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<sup>4</sup> Follow-up Study of the Finances of Chemistry and Physics Departments in UK Universities, Royal Society of Chemistry and Institute of Physics (2010)

[http://www.rsc.org/images/IOP\\_RSC\\_finance\\_report\\_June\\_2010\\_tcm18-185300.pdf](http://www.rsc.org/images/IOP_RSC_finance_report_June_2010_tcm18-185300.pdf)

<sup>5</sup> Finances of Chemistry and Physics Departments in UK Universities, Royal Society of Chemistry and Institute of Physics (In preparation, 2015).

<sup>6</sup> Reflections on the REF, Chemistry World (2014) <http://www.rsc.org/chemistryworld/2014/12/reflections-ref-research-excellence-framework>

<sup>7</sup> Building for growth, CBI (2011)

[http://www.cbi.org.uk/media/1051530/cbi\\_edu\\_education\\_skills\\_survey\\_2011.pdf](http://www.cbi.org.uk/media/1051530/cbi_edu_education_skills_survey_2011.pdf)

<sup>8</sup> House of Lords Science and Technology Select Committee, Higher Education in STEM Subjects (2012)

<http://www.publications.parliament.uk/pa/ld201213/ldselect/ldsctech/37/37.pdf>

There are many models for the provision of postgraduate student training which both ensure the quality of student experience and empower researchers to assemble the most effective team to perform their research. It is vital that the portfolio of postgraduate student training options is supportive of newly appointed academics who will be the researcher leaders of the future and of small research groups who are not part of CDTs.

## **Partnerships**

### *2.2. Between research councils*

**Research council coordination is important in accelerating both fundamental and strategic research within and across disciplines.** Support for multidisciplinary and translational research has improved significantly over recent years: examples of new initiatives where the research councils are working together to deliver strategic projects, especially in challenge-oriented research include:

- RCUK Energy Programme's work in linking research at different stages and across disciplines based on a technology challenge area.
- Several recent funding calls have required a multidisciplinary approach to research proposals, and involvement by industry e.g. the calls on *low carbon fuels*<sup>9</sup> and *future manufacturing hubs*<sup>10</sup>.
- The cross-research council approach taken by EPSRC, BBSRC and MRC to consulting with the community on 'Technology Touching Life' and the strategic perspective being developed on short and long term technology innovation in the Life Sciences, beginning with the physical sciences.
- The Antimicrobial Resistance Funders Forum<sup>11</sup> (AMRFF) which brings together several research councils and a number of research charities and government departments to share information on activities and funding schemes relevant to the challenge of antimicrobial resistance.

**The grant application process for fundamental interdisciplinary research remains a work in progress.** While the process for challenge-oriented interdisciplinary research grants is largely viewed positively, fundamental interdisciplinary research at the boundary of research council remits is an area for improvement, particularly with regard to specific expertise being required to judge the quality of interdisciplinary proposals. For example, the use of a 'chemical sciences' and a 'biology' peer reviewer does not necessarily capture the expertise of chemical biology, and a similar argument applies to other interdisciplinary research areas such as biomaterials. Where possible, panels reviewing proposals for interdisciplinary research should consist of interdisciplinary researchers, or reviewers should be asked to judge only the section of grant proposal within their area of expertise.

**Increased compatibility between research council funding schemes would allow universities to engage flexibly in more interdisciplinary research.** The following specific example was raised in a RSC member's consultation: A large chemistry department was planning to fund a number of interdisciplinary PhD students by combining funds from their

<sup>9</sup> <http://www.epsrc.ac.uk/funding/calls/multidisclowcarbonfuels/>

<sup>10</sup> <http://www.epsrc.ac.uk/funding/calls/future-manufacturing-research-hubs/>

<sup>11</sup> <http://www.mrc.ac.uk/research/initiatives/antimicrobial-resistance/antimicrobial-resistance-funders-forum/>

EPSRC Doctoral Training Partnership (DTP) fund with similar funds from the BBSRC, however despite the councils' desire to support interdisciplinary research they found the two systems to be incompatible.

### *2.3. With Innovate UK*

**Coordination between the research councils and Innovate UK is essential in accelerating impact.** The research councils and Innovate UK have a key shared role in enabling research translation from lower to higher Technology Readiness Levels. It remains important that the research councils' strategies are not 'captured' resulting in public funding for research that would otherwise be performed in private sector.

True partnerships that add value to both sides of the university-business interface are vital for the UK's future success. This will certainly be the case for the Catapult centres: the Hauser review recommended that Catapults should develop a stronger, more coherent engagement model for working with universities and the research councils will clearly play a key role in this.<sup>12</sup>

**The research councils have an important role in developing networks alongside Innovate UK** to build links between researchers, and have been successful in stimulating exchange of ideas and closer working. Scientific meetings and stakeholder workshops that bring together the physical, life and biomedical sciences research communities facilitate research opportunities and knowledge exchange. The recently established BBSRC Networks for Industrial Biotechnology and Bioenergy (NIBB)<sup>13</sup> are a good example of this. The research councils should aim to strengthen these types of programmes, including in areas that are not currently covered.

### **Contact**

The Royal Society of Chemistry would be happy to discuss any of the issues raised in our response in more detail. Any questions should be directed to **Dr Richard Walker**, [walkerr@rsc.org](mailto:walkerr@rsc.org), 01223 432234.

### **About us**

With over 51,000 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.

A not-for-profit organisation with a heritage that spans 170 years, we invest in educating future generations of scientists, we raise and maintain standards and work with industry and academia to promote collaboration and innovation. We advise governments on policy and we promote the talent, information and ideas that lead to great advances in science.

This response has been prepared in consultation and discussion with members of the chemical sciences community, including members of the Heads of Chemistry UK group.

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<sup>12</sup> Review of the Catapult network, Hermann Hauser (2014)  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/368416/bis-14-1085-review-of-the-catapult-network.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/368416/bis-14-1085-review-of-the-catapult-network.pdf)

<sup>13</sup> Networks in Industrial Biotechnology and Bioenergy (NIBB) (2013)  
<http://www.bbsrc.ac.uk/funding/opportunities/2013/networks-in-industrial-biotechnology/>