Department of Business, Innovation and Skills Triennial Review of the Research Councils: Call for Evidence

The Royal Society of Chemistry (RSC) welcomes the opportunity to input to the BIS Triennial Review of the Research Councils.

The RSC response has focussed on the broader themes and not on the individual questions within the consultation document.

The RSC is the largest organisation in Europe for advancing the chemical sciences. Supported by a network of 47,000 members worldwide and an internationally acclaimed publishing business, its activities span education and training, conferences and science policy, and the promotion of the chemical sciences to the public. This document represents the views of the RSC. The RSC has a duty under its Royal Charter "to serve the public interest" by acting in an independent advisory capacity, and it is in this spirit that this submission is made.

Chemistry for Tomorrow's World,[1] the RSC's roadmap for the chemical sciences, identifies ways in which the chemical sciences can address global challenges; solutions to these challenges will require a multidisciplinary approach. The importance of the chemical sciences to the UK economy cannot be underestimated. In 2010 the RSC and Engineering and Physical Sciences Research Council (EPSRC) published a joint report, *The economic benefits of chemistry research to the UK*.[2] This report found that chemistry research broadly underpins 6 million jobs in the UK and enables the UK to generate £258 billion each year, or 21% of GDP.

The structure, governance and coordination of the Research Councils and the extent to which this contributes towards the successful delivery of their functions.

1. **The Royal Society of Chemistry (RSC) strongly supports the existence of the Research Councils as Non-Departmental Public Bodies and believes that the scientific community is best placed to decide the best targets for new research through peer review. We consider that the Research Council Royal Charter objectives are relevant and important and reflect the Research Councils' activities.**

2. **Common working between Research Councils requires improvement to ensure proper oversight of interdisciplinary areas—for example, that there are enough appropriately trained chemists to contribute to synthetic biology or environmental chemistry *etc.*; in particular to facilitate cross discipline collaboration and shared funding models.** RCUK coordinates the delivery of multidisciplinary research in six priority areas.[3] The coordination used in these priority areas should be extended to support other inter- and multidisciplinary areas of research to allow for a more agile and supported research landscape. We strongly recommend that there is more transparent consultation with the scientific community and all relevant Research Councils/RCUK. Consultation on important issues should not be conducted only through bilateral discussion with various stakeholders (*e.g.* Research Council – individual university or department); it should be complemented with additional stakeholder forums (*e.g.* Research Councils, researchers, Learned Societies).

3. **The RSC recommends that the RCUK executive group should be augmented or partnered with an executive whose responsibility is to drive effectiveness and coordination between the Research Councils.** RCUK provides an important collective and strategic position for the Research Councils in providing a unified voice for research advocacy at governmental level both within and outside the UK. In addition, RCUK has a clear role to play in coordinating a unified approach on disciplines that underpin the other sciences, *e.g.* analytical sciences.

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[1] Royal Society of Chemistry, Chemistry for Tomorrow's World, a roadmap for the chemical sciences, 2009.
[2] Royal Society of Chemistry, EPSRC, The economic benefits of chemistry research to the UK, 2010.
[3] RCUK. "Cross-Council Research." Accessed February 2013. http://www.rcuk.ac.uk/research/xrcprogrammes/

4. **The RSC recommends that multidisciplinary proposals are handled by multidisciplinary review panels.** Funding research that crosses the remit of several Research Councils is challenging. Yet, interdisciplinary and multidisciplinary research is increasingly common and is essential to address major societal challenges. Research topics that lie at the boundaries of two funding bodies run the risk of being under supported by both. Soil science is one such area. The RSC recently published a report on soil science, based upon a workshop where participants assessed the strengths and weaknesses of the UK in linking soil science, food security and agricultural sustainability. Amongst the weaknesses, there was a perception that within this area there is a "Fragmentation of the research base among different disciplines, competing institutions and research councils operating with strict limits on remit and research priorities".[4]

   A survey of the chemistry-biology interface community highlighted the importance of seeking clarity on remit and procedures from Research Councils prior to grant proposal submission.[5] Submission to the wrong Research Council caused delays in having the proposal reviewed and required reformatting and refocusing the language. This time spent on remit and administration would be better directed to other activities, both for researchers and within the Research Councils. It is also important to note that interdisciplinary divisions are artificial and will always have 'fuzzy' boundaries.

   The Cross-Council Funding Agreement leads to duplication of effort where both a receiving and supporting council consider a proposal and nominate peer reviewers. Moreover, the use of a 'chemical sciences' and a 'biology' peer reviewer, for example, would not necessarily capture the expertise of the chemistry-biology interface.

5. **Consistency between the Councils on policies that cut across disciplines should be improved.** A more cohesive approach from the Research Councils would benefit the scientific community for areas that cover the remit of several Research Councils, *e.g.* chemical biology, drug discovery, materials sciences and so on. In addition, lack of consistency becomes important when one considers that individual university departments where chemical science is performed could be seeking funding and interacting with five Research Councils: BBSRC, EPSRC, MRC, NERC and STFC. The following examples highlight some areas which would benefit from a more streamlined approach.

   We recommend more consistency across research grant formats and expectations, *e.g.* Industrial CASE Studentship Schemes are not consistent across the Research Councils. In addition, the level of disparity between Research Council policies and procedures can be seen in the amount of Council specific information in the Je-S Handbook.[6] A notable example is *Ethical Information* in *Guidance on Completing a Standard Grant Proposal*, which could be unified to provide concise and clear information to all researchers.

   A small but important point is that the individual Research Council websites are formatted entirely differently, so that to find, for example, information regarding the Disabled Students Allowance requires a different path from each Council homepage. Moreover, the eligibility for PhD funding is given at different levels of detail by each Research Council so that interested parties would need to check each one separately to ensure that they meet the requirements.

6. **When planning a strategy for postgraduate researcher provision it is essential that supply is balanced against UK strategic requirements. Achieving this will require cross-Research Council discussion.** In the current system EPSRC and BBSRC

[4] Royal Society of Chemistry, NERC Biological Weathering Consortium, and Environmental Sciences Knowledge Transfer Network. *Securing Soils for Sustainable Agriculture, A Science-Led Strategy*, 2012.
[5] Royal Society of Chemistry. *Face to Face: The UK Chemistry Biology Interface*, 2008.
[6] RCUK. "Je-S Handbook." Accessed February 2013. http://je-s.rcuk.ac.uk/Handbook/index.htm

Centres for Doctoral Training (CDT) provide localised centres of specific research. The RSC supports the findings of the House of Lords Science and Technology Select Committee, in particular their recommendation that a variety of methods of studentship provision should be developed. Whilst CDTs may be the most effective method to train cohorts of researchers in interdisciplinary fields, the RSC recommends the reintroduction of project studentships.[7] This will ensure that the UK research base is both agile and competitive when maximising first advantage in areas of fundamental and blue skies research which may currently not be captured by CDT themes. The Researcher Development Framework (RDF) put together by RCUK/Vitae should be better promoted to the community and RCUK have a greater role in facilitating cross-discipline collaboration and shared funding models.

[7] Royal Society of Chemistry, *Response to the Engineering and Physical Sciences Research Council Centres for Doctoral Training 2013 exercise*, 2012.

The relationship between the Research Councils and other funding bodies, including governmental, private and third sector funders.

7. **Research Councils should be more transparent and provide a clear analysis of how focusing on 'Grand Challenges' may restrict research grant funding for 'responsive mode' funding in fundamental research.**

   In 2011, Research Councils experienced a mostly universal 3% reduction in resource expenditure (excluding capital). The subsequent stratagem implemented by each Council to manage this budgetary reduction varied between Council, in some cases this has led to proposed budget cuts for research grants of up to 14% (EPSRC)[8] and 7% (BBSRC)[9] over the period 2010/2011 to 2014/2015.

8. **Research funding decisions must fully support fundamental research as well as complementing a national industry strategy**. The RSC supports the Haldane principle, whereby the direction of the science base is underpinned by sound scientific advice and peer reviewed by the scientific communities involved. The funding landscape in the UK should be structured to ensure that it is both supportive of fundamental research in the longer term and agile enough in the short term to capitalise upon scientific breakthroughs - and the significant economic impact that comes attached.[10]

   Eight priority growth areas in science for the UK were recently identified by the Treasury and BIS.[11] These included energy storage, synthetic biology, regenerative medicine and advanced materials, all of which are dependent on chemical science research and innovation. We welcome additional focus on these priority areas but it must not weaken support for fundamental and blue skies research which as well as underpinning the eight priority growth areas will also contribute to the next generation of commercial opportunities.

   For example, blue skies research into the properties of graphene in 2004 led to two UK researchers being awarded the 2010 Nobel Prize; and graphene research has recently secured €1 billion funding from the European Commission. Fundamental chemical sciences research carried out at University of Hull led to a big step forward in Liquid Crystal Display (LCD) technology. LCD technology has many applications; in 2008 the global flat panel display industry was estimated to be worth $115 billion, with LCD technology having a market share in the region of 90%.[12]

9. **Capital investment (Infrastructure) is an area that RCUK have a clear role in coordinating a coherent national strategy; in consultation with the scientific community.**[13] The ability of Research Councils to work in partnership with other funders has been demonstrated by the establishment of the Diamond Light Source facility, a source of electromagnetic radiation from infra-red to x-ray. This important UK research tool has received £370 million of investment, and has already had a global impact in human health, environmental science, manufacturing and energy. Funded by UK Government via the Science and Technology Facilities Council (STFC) and by the Wellcome Trust, it provides scientists around the world with powerful crystallographic and spectroscopic tools. RCUK have a role to play in overseeing the development of a strategy to include regional provision, specific equipment/facilities and capabilities to address global challenges and national need as well as ensuring that current capacity within the UK is maintained.

10. In 2013-2014, HEFCE funding to universities will be £4.98billion. The majority of this will be used to support teaching activities and represents ca. 40% of total income of English

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[8] EPSRC, *Delivery Plan 2011-2015*, 2010.
[9] BBSRC *Delivery Plan 2011-2015*, 2011.
[10] Russell Group, *The Economic Impact of research conducted in Russell Group universities*, 2010.
[11] Speech by the Chancellor of the Exchequer, George Osborne MP, at the Royal Society, 2012.
[12] Matharu, Avtar S., and Yanbing Wu. "Liquid Crystal Displays: From Devices to Recycling." In *Electronic Waste Management*, 2008.
[13] Royal Society of Chemistry, *Response to Research Councils UK's consultation on the Capital Investment Roadmap,* 2012

HEIs. These funds are provided to individual universities through their 'block grant' and are used according to institutional priorities. Consequently, the strategic connectivity for any one science between HEFCE block grants and Research Council funding is small. Indeed, when faced with the budget reductions in 2010-11, HEFCE chose to 'salami-slice' whereas Research Councils chose to direct their funding to particular institutions.

As RCUK and HEFCE work together to develop consistent incentives for impact, this should be carefully monitored to ensure it does not lead to a culture of short-termism and that impact incentives are appropriate to the type of research proposed.

11. **RSC recommends that RCUK works to increase the visibility of, and opportunities for, UK scientists submitting and obtaining grants through ERC funding schemes.** Between 2014 and 2020, Horizon 2020[14] has proposed a budget of *ca.* €70 billion funding for research and innovation across Europe. A recent report indicated that the UK secured 14.6% of FP7 budget, below the UK's share in FP5 (15.9%).[15] Schemes such as the European Research Council Starting and Consolidating Grants[16] provide flexibility and support for up and coming research leaders, similar schemes could be explored by RCUK.

12. **RSC recommends coordinated interactions between TSB and RCUK, with a clearer remit on who coordinates/supports various parts of research and innovation landscape to ensure that both the "valley of death" is successfully bridged (TSB-led) and fundamental research is supported (RC-led).** For the life sciences sector, the biomedical catalyst (a joint venture between the TSB and MRC) is providing tailored support to drive the development of innovative life sciences products and services. Continued consultation between the Research Councils, TSB, the scientific community and industry stakeholders will ensure that the most effective mechanisms are in place to facilitate technology transfer[17] as well as enable industry access to the research base (*e.g.* extending KTPs). In particular, new initiatives to support SMEs would be welcomed.

13. Public and private sector funding for research and innovation must be balanced;[18] longer term fundamental research should be primarily publically funded.[19] At present, UK business conducts two thirds of R&D in the UK, but this is still below the level in the US (72.6%).[20] Whilst it may be tempting to think that the removal of public funding for R&D would lead to its replacement by private money, research has shown that private and public funding are linearly correlated:[21] public spending encourages increased levels R&D investment by business.[22]

[14] European Commission. "Horizon 2020 - the Framework Programme for Research and Innovation." Accessed February 2013. http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020
[15] technopolis, *The impact of the EU RTD Framework Programme on the UK*, 2010.
[16] European Research Council. "Funding Schemes." Accessed February 2013. http://erc.europa.eu/funding-schemes
[17] Royal Society of Chemistry, *EPSRC call for evidence and information sources for consideration*, 2011.
[18] Royal Society of Chemistry, *Bridging the Valley of Death*, 2011.
[19] Royal Society of Chemistry, *The importance of long term investment in fundamental research*, 2010.
[20] http://www.bis.gov.uk/policies/science/science-funding/set-stats
[21] The Royal Society, *The Scientific Century*, 2010.
[22] Falk M, *What drives business research and development intensity across OCED countries?* Applied Economics, 2006, 38, 533-547.

The relationship between the Research Councils, those they fund, the 'customers' of research and the wider public and the extent to which these relationships enable the functions of the Research Councils to be delivered with maximum impact.

14. **Engagement between the scientific community and the Research Councils must continue to improve (*e.g.* engagement/consultation in relation to the peer review process; adequate provision/support for postgraduate students) to ensure that the funding is used to best advantage in terms of supporting the best research and maximising its outcomes.**

15. **Learned Societies and Professional Bodies, such as the RSC, can act as 'honest brokers' and work with Research Councils to better engage with the subject community and vice versa to coordinate the communication of the viewpoints and needs of the UK research communities.**

    In the current economic climate it is more important than ever for the Research Councils to work closely with the scientific community to develop our world class science base and drive economic growth. It is important that peer review procedures remain robust as a more directed approach to research funding is pursued by the Government and the Research Councils. The individual scientific communities, *e.g.* chemical sciences, physics, tend to deal directly with the relevant Research Council rather than with RCUK. RCUK itself could benefit from engaging directly with the research communities, as it is not clear how their views feed into RCUK policy other than through individual research councils.

16. RCUK should explore mechanisms, in communication with universities and the learned societies, to improve access to unpublished data as recommended in the recent Royal Society report *Science as an Open Enterprise*.[23] It is believed that 75% of scientific data generated by the research community remains unpublished,[24] which represents a large proportion of publicly-funded research. There is a distinct problem here that RCUK must tackle. Currently, universities are charged with the problem of data curation and are tending to pursue this as individual institutions; while this may be appropriate for an institution, it has the potential (for any one discipline) to be fragmented and uncoordinated.

17. Of the publicly funded work that is published, building and maintaining a sustainable environment for the dissemination of research outputs will require investment and support from the Research Councils. As the published outputs of research are being made public, support from the Research Councils will be required during the transition period.

18. **In order to maximise the benefit of publically funded research, the RSC encourages RCUK to extend their support of scientists that engage with the public to also include scientists that engage with policy makers and in knowledge transfer.** The RSC is supportive of the role of RCUK in supporting scientists that engage with the public, and encourages scientists to take responsibility for carrying out outreach activities. There is an opportunity for RCUK to expand this supportive role to include scientists that engage with policy makers so that policy may benefit further from publicly funded research.

    Knowledge transfer as an output of research is also important. A process that allows researchers to engage with a wide range of stakeholders can help to define future research direction. For example in 2011, the RSC, alongside the Environmental Sciences Knowledge Transfer Network and the NERC Biological Weathering consortium (formed of research teams from the Universities of Sheffield, Leeds and Bristol) held a workshop bringing together researchers and policymakers to discuss future issues in the area of soil sustainability. The meeting acted as the main knowledge exchange mechanism for the project teams involved in the NERC Biological Weathering

[23] The Royal Society. *Science as an Open Enterprise*, 2012.
[24] "Open access in the UK and what it means for scientific research", David Willetts MP, Speech at the Royal Society February 2013.

Consortium. Following on from this, the RSC published a jointly authored report[4] that summarised the discussion from the meeting, which included the identification by participants of four future interdisciplinary research opportunities in the area of soil science.

The RSC would be happy to discuss any of our recommendations to this consultation in more detail.

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