

# **Nurse Review of Research Councils**

Submission from the Royal Academy of Engineering

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***About the Royal Academy of Engineering***

*As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.*

# Royal Academy of Engineering's Response to the Nurse Review Consultation

## Introduction

The Royal Academy of Engineering is pleased to respond to the call for evidence for the Nurse review of the Research Councils. The Academy works closely with the Engineering and Physical Sciences Research Council in particular and is appreciative of the important work that the Councils undertake. This response focuses on key principles that the Academy believes should underpin the operation of the Councils, as well as identifying some areas for potential improvement.

### 1. Strategic decision-making

- 1.1. The Academy strongly supports the notion that investing in research and innovation is vital for creating wealth and delivering improvements in quality of life. The recent report, *Engineering for a successful nation*<sup>1</sup>, produced jointly by the EPSRC and the Royal Academy of Engineering, demonstrates the huge value derived from engineering research in the UK.
- 1.2. The Academy believes that excellence should be the primary criterion guiding decisions regarding the allocation of funds by the Research Councils. While we recognise the need for Councils to take account of wider national interests, such prioritisation should not be at the expense of the quality of research supported.
- 1.3. Strategically-focused, managed calls are one way to generate economic and social impact but must not crowd out curiosity-driven research that creates the pool of ideas on which use-inspired research and innovation critically depend. Indeed, the REF2014 impact case studies provide a vivid illustration of the diversity of both intended and unintended benefits that have arisen from a broad base of publicly-funded research. Moreover, the focus on 'Impact' in the recent REF has done much to attune the academic community to the wider benefits of their work. It is therefore vital that an appropriate balance is found between government and societal priorities and emerging scientific opportunities, taking into account both the 'push' from curiosity-driven research and 'pull' from the societal and economic needs for research and innovation.
- 1.4. Greater clarification about who has strategic oversight of the Research Councils is required. In addition, more involvement of the expert communities that the Research Councils have access to (including through the National Academies) in shaping strategic priorities would be welcomed, alongside increased transparency of the decision-making process. In developing this approach, work will have to be done to mitigate the tendency for strong, well-established voices in the scientific and engineering communities to dominate the debate.
- 1.5. The Academy would welcome improved mechanisms for identification of areas where the UK needs to maintain strategic national research capabilities, for example in relation to security, energy and health. The Councils have valuable expertise that could usefully be deployed in shaping these priorities but their role in the process is unclear and there is general concern over the effectiveness of current approaches.
- 1.6. The 2014 Science and Innovation Strategy rightly highlights the importance of flexibility and agility. EPSRC is perceived as having greater freedom to allocate its funds in a flexible and responsive manner than Councils that have sponsored institutes. While the Academy recognises that large-scale institutes can work well, we note that there is scepticism in some parts of the engineering community over whether the institute model always delivers

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<sup>1</sup> Engineering for a Successful Nation, 2015. <http://www.raeng.org.uk/publications/reports/engineering-for-a-successful-nation>

the best research outcomes or value for money for engineering disciplines. That said, stable long-term funding is an essential component of a Research Council's funding portfolio, irrespective of whether it is directed towards institutes.

- 1.7. Roadmaps can be successful tools to ensure that strategies are enacted over a long time period. Roadmaps can help to signpost and funnel the benefits of fundamental research towards impact and wealth creation and avoid the risk of short-termism that can arise when markets dictate strategy. One such example is the roadmap used by the aerospace sector as part of the Industrial Strategy. For roadmaps to succeed, it is important that all parties are involved in their development, including the academic research community.
- 1.8. The Academy does not believe that regional balance should guide Research Council funding decisions: excellent research should be funded wherever it is found. However the Academy does recognise the political imperative to consider 'place' when considering support for innovation, rather than research, activities.
- 1.9. It is also worth noting that the definition of excellence needs to be sufficiently broad to encompass use-inspired research. Historically, incentive structures for academic researchers, including those employed by the Research Councils, have tended to provide greater recognition for achievements in curiosity-driven research. In fact, there is a complex interplay, including multiple feedback loops, between curiosity-driven research and use-inspired research: both can play key roles in driving innovation and provide rigorous intellectual challenges. The Councils need to ensure that excellence in use-inspired research receives appropriate recognition in the way that funding criteria are developed and applied.

## **2. Collaborations and partnerships**

- 2.1. Innovation with the potential to deliver national benefits frequently occurs at the interface between disciplines, thus interdisciplinary and multidisciplinary research are of growing significance. It is important that the Research Councils are flexible and responsive to novel and multidisciplinary collaborations, both in terms of allocating funding and ensuring that peer review mechanisms are appropriate – in the experience of the engineering community, there is still significant room for improvement in this area. Identifying reviewers who are specifically qualified to review interdisciplinary and multidisciplinary applications would be a positive development.
- 2.2. Interactions between Research Councils are perceived as variable. Where mechanisms supporting good practice exist, they should be shared and ultimately used to inform a more strategic approach to cross-Council working. A well-regarded example is the partnership between EPSRC and BBSRC in developing the Synthetic Biology Research Centres and the Synthetic Biology Innovation & Knowledge Centre. Strong leadership, support from both Councils, development of a plan and a clear vision for how to implement the plan were key success factors. Funding calls in which multidisciplinary work is required are also considered to be valuable tools for incentivising collaboration.
- 2.3. The Academy believes the Research Councils are uniquely well placed to look for opportunities for collaboration and proactively encourage their formation, particularly at an earlier stage in the research timeline than currently occurs. Improved engagement of the Councils' programme managers with the research community could help them to better identify emerging topics and technologies and 'match-make' where there is a strong but untapped potential for collaboration. For this approach to be effective, Council staff need to have a sophisticated understanding of their brief and the external context. Opportunities for academics on secondment to serve as programme managers, similar to the system used by many US funding agencies, could be extremely valuable if they could be made sufficiently attractive. For example,

programmes in DARPA, IARPA and the NSF are typically run by well-connected and well-respected academics on secondment for the duration of that funding programme. They truly understand the research questions, and who or what is most likely to solve them, as well as being able to translate research into appropriate terms for politicians to understand.

- 2.4. There is inevitably some overlap and duplication between the current seven Councils and the disciplinary divisions that are used should be under continual review as subject areas change and develop. However, the Academy is not convinced that the cost-benefit ratio of a major restructuring would prove to be favourable.
- 2.5. Vigilance is required to ensure that any gaps between Councils are identified as early as possible. For example, a 2013 Academy report on the impacts of space weather highlighted the disjuncture between EPSRC, NERC and STFC on the funding of space engineering research and the potential negative consequences of this<sup>2</sup>. Although the executive agency UKSA provides support for specific space missions, it is not a direct research funding body with responsive mode awards. It is worth noting that gaps between Councils can in fact signal valuable opportunities for collaboration between them.
- 2.6. As the UK's research and innovation system continues to evolve, it will become increasingly important to consider the architecture of the instruments available to support innovation and in particular the connections between instruments provided by different agencies. Further work is needed to clarify the roles and responsibilities of the agencies in the UK's research and innovation landscape, in order to help academics, businesses and the wider community navigate these agencies more easily. In particular, clarification is needed regarding the areas of distinctiveness and overlap between the Research Councils and Innovate UK. A greater understanding of the relationship between the Catapult centres and the Research Councils would also be welcomed by many in the engineering community.
- 2.7. The Academy believes it is appropriate for the Research Councils to continue to concentrate on funding excellent research at the 1-3 TRL, while Innovate UK focuses on TRL 4-6. However, there is a need for greater alignment between the two, to bridge the 'valley of death' and enable a more seamless transition between the funding agencies. It has been suggested that high-quality research with strong commercial potential can reach a 'cliff-edge' when it becomes ineligible for Research Council funding. While it cannot be expected that Innovate UK will always step into the breach, especially as Innovate UK focuses on incentivising business-led technology innovation, there may be merit in providing better support to academics who find themselves in this situation, for example by helping them identify industrial partners. In addition, the Catalyst initiatives have been seen as very positive developments and consideration should be given to extending the use of that model.
- 2.8. There is also a need to ensure greater continuity between the Councils and Innovate UK at the strategic level. Regular meetings between the senior management teams of individual Research Councils and Innovate UK may be beneficial in improving overall coordination and coherence of strategy. Similarly, it is important to ensure that the Research Councils are better connected to the Industrial Strategy activity – including both sector strategies and Eight (+2) Great Technologies – to enable mutual understanding and, where appropriate, alignment in approach.
- 2.9. Business-university collaboration is an important feature of the broader innovation system and Dame Ann Dowling DBE FREng FRS, President of the Academy, is currently leading a review to examine how more effective business-university collaborations can be developed. Evidence from the review, which will report to Ministers in May 2015,

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<sup>2</sup> Extreme space weather: impacts on engineered systems and infrastructure, 2012.  
<http://www.raeng.org.uk/publications/reports/space-weather-full-report>

shows that there is a clear demand for improved mechanisms to allow those in both business and universities to find potential partners for collaborative research. The UK's research and innovation landscape, including the Research Councils, is perceived to be unduly complex. The National Centre for Universities and Businesses has been tasked to create an online brokerage portal which is expected to launch in full in 2017. It is too early to fully understand the scope of this system, but the importance of ensuring that such resources operate effectively must not be underestimated.

- 2.10. The UK needs to commit to building partnerships at scale with countries whose investments, talents, infrastructure and industry will make them world leaders in research and innovation in the future, as well as the countries that are today's science and engineering superpowers. A strategic approach should be taken to embrace the international nature of research and address the scale of the challenge to remain a competitive global leader. This may require more funding for international collaborations, more effective tackling of barriers to collaboration (such as double jeopardy), more active involvement in European and international funding schemes and more enlightened interpretation of the Research Councils' national remit. The UK needs to compete proactively for the best international talent and the Research Councils have not been sufficiently active on this front so far.

### **3. Balance of the funding portfolio**

- 3.1. Concerns regarding the balance of the Research Councils' funding portfolio are heightened due to lack of overall resource. While recent investment in research capital is welcome, 'flat cash' settlements mean that the cumulative erosion of the ring fenced science budget from the 2010 spending review to 2015/16 will be over £1.1 billion<sup>3</sup>. Although the research community has made large savings through efficiencies such as equipment sharing, this cannot continue indefinitely. The Academy, along with the other National Academies, has called for the UK to increase its public investment in research and innovation to levels closer to those of its international competitors<sup>4</sup>.
- 3.2. Capital investment in equipment and infrastructure is crucial, but these are only as good as the skilled professionals running the equipment, accessing the facilities, interpreting the results and providing the intellectual challenge for the future. An appropriate balance needs to be struck to ensure that enough well-trained scientists and engineers are present to make the most of all capital investments. Where the geographical distribution of capital investments such as new facilities or centres of excellence is politically important, these investments should be made outside of Research Council budgets. Recurrent funding for facilities and centres should be dependent upon demonstration of excellence, but adequate revenue funding to ensure expensive capital facilities can be operated effectively is equally important.
- 3.3. There is a view amongst the engineering community that the trend for allocating PhD studentships through Centres for Doctoral Training (CDTs) is narrowing the range of institutions and topics that potential students can apply for. Consequently there is a risk that research ideas and opportunities that fall outside the silos of CDTs are being missed. There is a strong desire in the community to see PhD studentships reinstated on project grants and a firm belief that this will lead to better research outcomes for the UK. Industrial Case studentships are well-regarded among the business and academic communities but recent changes in their allocation are perceived as having restricted access. An evaluation of recent changes would be timely.

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<sup>3</sup> Campaign for Science and Engineering 2014 *Science and Engineering Investment*. (See <http://sciencecampaign.org.uk/CaSE2015InvestmentBriefing.pdf>)

<sup>4</sup> Building a Stronger Future, 2015. <http://www.raeng.org.uk/publications/reports/building-a-stronger-future-research-innovation-and>

- 3.4. Echoing concerns raised about strategic decision-making, the engineering community is not always clear on how funding decisions are made, and greater transparency would be welcomed. A specific concern is that without peer-reviewed feedback on reported outcomes of research grants, research decisions are overly influenced by skill in preparing convincing grant proposals rather than evidence of achievement in previous work.
- 3.5. Research of excellent quality is not equally distributed throughout the country and it is clear that some universities are disproportionately successful in obtaining funding. Care needs to be taken to ensure that new academics and staff from institutions with low levels of Research Council funding are not deterred from applying due to misconceptions about how funding decisions are made.

#### **4. Effective ways of working**

- 4.1. The Academy continues to support the peer review process, regarding it as a trusted and reliable way of ensuring that quality prevails in funding decisions. Nevertheless, there is room for improvement. For example, consideration should be given to the training of the panel and the possibility of introducing an iterative digital component to the review process, such as the ability for individual reviewers to provide feedback on other reviewers' comments and scores. The Academy welcomes international peer review for large awards and believes this should be adopted as a matter of course.
- 4.2. Although significant efforts have been made to improve coordination across the Councils in recent years, the Academy is of the view that there is more that can be done. Successful approaches developed by one Council that have broad applicability to other research disciplines should be adopted across the Councils unless there is a compelling reason not to do so – the Impact Acceleration Accounts piloted by EPSRC provide one such example. Similarly, unnecessary variation in the approaches adopted by the Councils to similar schemes should be eliminated. Examples of this include the differing eligibility requirements and approaches taken to CASE studentships which create unwelcome complexity for the community.
- 4.3. The Academy also notes that an algorithmic approach to funding decisions is increasingly being utilised by the Councils, including to determine eligibility for IAA and allocations of Industrial CASE partnerships. While this may be an administratively efficient approach, it risks reinforcing concentration of funding and limits access to a valuable funding stream. We would therefore caution against this approach to funding, except where there is a compelling logic and where the disadvantages are clearly outweighed by the benefits.