ROYAL ACADEMY OF ENGINEERING

Research integrity

House of Commons Science and Technology Committee

Submission from the Royal Academy of Engineering

March 2017

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.

Research integrity inquiry

House of Commons Science and Technology Committee

March 2017

1. As the UK's national academy for engineering, the Royal Academy of Engineering welcomes the Science and Technology Committee's inquiry, as drawing timely attention to the importance of research integrity. Committed as we are to making the UK the world's leading nation for engineering innovation, and to improving public awareness and understanding of engineering, we are deeply concerned about issues that could undermine the benefits that research has for society or the trust that the public has in research.

2. We support the *UUK Concordat to Support Research Integrity*. For research that the Royal Academy of Engineering funds, we require that the receiving organisation endorse the commitments of the Concordat and have in place formal written procedures and policies to promote and ensure compliance with the commitments. For most of our research schemes, we also appoint a Fellow of the Academy as mentor to the grant holder, and they provide independent, experienced advice around the full range of research and career development issues, as well as reporting progress to the Academy. We believe that such mentoring supports research integrity.

3. We are in the early stages of developing a new Research Strategy, planned to be published in late 2017, and we are considering within that process whether to evolve our policies, grant conditions and processes in relation to research integrity and related issues around responsible innovation.

4. As well as research integrity, the Academy is also concerned with ethics in professional practice. The Academy, along with the Engineering Council and a number of the leading professional engineering institutions, has created a Statement of Ethical Principles to which it believes all professional engineers and technicians, and related bodies should subscribe. The current version (published April 2014) can be found here: http://www.raeng.org.uk/publications/other/statement-of-ethical-principles

   These principles include: Accuracy and rigour; Honesty and integrity; Respect for life, law and the public good; and Responsible leadership: listening and informing. A revised version of these principles is currently under development, and we plan it will be published later in 2017. We believe that engagement with professional ethical principles, and with the cultures, institutions and process that enforce them, supports both research integrity and responsible innovation.

The extent of the research integrity problem and causes and drivers of recent trends

5. The extent of integrity issues in engineering has not been explored or investigated to the same extent as in some other disciplines, such as medical sciences or psychology. We believe it would be complacent to take this current absence of evidence as proof of absence of integrity issues, and therefore encourage and welcome further investigation of the extent of these issues in engineering and related fields. We believe it will be beneficial if such investigations are undertaken by a variety of stakeholders (such as engineers and non-engineers, employers of researchers, funders of research and so on) to give diversity of perspective.

6. The Royal Academy of Engineering has never terminated one of our own awards because of a research misconduct issue, or been notified by a UK research organisation in receipt of a grant of an accusation of misconduct in research concerning one of our grant holders. However, our research programmes are only a relatively small portion of the UK's overall engineering research activity, so this again should not be taken as evidence of the absence of issues.

7. Given this absence of evidence on the extent of integrity issues in engineering research, it is not possible to comment authoritatively on recent trends, their causes and drivers. However, we do believe that engineering research has particular characteristics in comparison with other disciplines that will frame the way that integrity issues present themselves. For example, in comparison with other fields:
    - Engineering research is more often collaborative, with extensive cooperation between individuals, groups and institutions. These ongoing connections should make concealment of some forms of error or deception less common than in fields where results are usually shared only at the point of publication.
    - Engineering research is more often collaborative with industry, and funders of engineering research, including the Academy, promote and support such collaboration. This again means that some forms of error or deception may be identified more rapidly because they fail to fit with evidence from practice. Industrial researchers and innovators generally have incentives grounded in reliability and reproducibility, and hence that culture acts to reinforce their importance with academic researchers. However, collaboration with and funding by industry may raise concerns around potential conflicts of interest. Moreover, such collaboration can expose researchers to unfair criticism based on misconceptions about the role of industry in their research. In addition, issues around protection of intellectual property in collaborative research can place restrictions on the extent to which researchers can share underlying data.
    - By and large career advancement and research assessment within engineering research are based on a more rounded conception of impact and achievement than in some other disciplines, where publication in particular high prestige journals or citation numbers are overwhelmingly important indicators of esteem. Hence, the incentive structures around integrity issues in engineering may be different from such disciplines. We think there is less evidence that engineering researchers are inclined to or incentivised to prioritise novelty over robustness and repeatability, which is often perceived as a major cause of poor practice in research.
    - Engineering researchers are often, but not always, registered professional engineers, and hence are bound by codes of ethics associated with their profession, such as the Statement of Ethical Principles above.
    - Engineering research is usually directed towards some particular innovation goal. Hence, a key set of issues concern who will benefit from that innovation. Thus, issues around responsible innovation and the potential consequences of research are more significant for engineering research than in fields that are further from application. The Engineering and Physical Sciences Research Council has set out a framework for Responsible Innovation that provides a useful model: https://www.epsrc.ac.uk/index.cfm/research/framework/
    - The engineering community, and engineering research community, has notable and worrying diversity issues – see for instance http://www.raeng.org.uk/policy/diversity-in-engineering/key-facts . The Academy is working with the wider profession to focus on the development of inclusive and

cultures in the work place. We believe this work may well provide a model that can be usefully adapted to promote the development of cultures that support integrity in research.

- The most common form of dispute that arises within engineering research concerns the ownership of elements of intellectual property. Whilst rarely highlighted in discussions of research integrity, this is often at root an integrity issue. Thus, policies intended to clarify ownership of intellectual property in research, also support research integrity.

Collectively, these suggest that the way research integrity issues arise in engineering research may be significantly different from how they present in other fields.

The effectiveness of controls/regulation (formal and informal), and what further measures if any are needed; What matters should be for the research/academic community to deal with, and which for Government

8. We do not believe at present there is a sufficiently strong case for moving from the approach to control embodied in the UUK Concordat, which has widespread support across the research community. Research integrity is in many ways a cultural issue, reliant on the behaviour of many diverse organisations and individuals. Like any significant cultural change, impacts take time to realise and are complex to evidence. We also believe that the sorts of complex, interacting discipline specific considerations set out in 7 above suggest caution in extrapolating from trends, patterns and perceptions of research integrity issues in some well-examined fields to the whole of research. This in turn suggests careful, widespread engagement with the many different and diverse research communities that might be effected would be required to develop any further measures to expand control and regulation.

9. We do believe that more can be done to ensure that researchers, employers of researchers and funders of researchers energetically and proactively observe their commitments under the Concordat. One measure that should promote such observance among employers of researchers is to make evidence of activities delivering the commitments of the Concordat an element of the assessment of the excellence of Research Environments in the next Research Excellence Framework. In particular, we suggest that training of researchers in integrity related issues should be a factor in evidencing the vitality and sustainability of a Research Environment.

10. An area where we are conscious of particular room for improvement is the promotion and implementation of institutional conflict of interest policies. These should be an essential element in maintaining public trust in industrially funded research. This was highlighted in the Dowling Review of Business-University Research Collaborations.[1] Recommendation four stated 'universities must be robust in the promotion and implementation of their institutional conflict of interest policies to help protect individual researchers who receive funding from industry against personal criticisms based on misconceptions about the role of industry in this research. The wider research community, including the Research Councils and Innovate UK, needs to be more proactive in engaging with the media to discuss the significance of industry funding for academic research.' Beyond this, the Review suggests that 'there may also be a need for the research community to engage more proactively with the media to address misconceptions about the consequences of industry funding' (p.30).

[1] The Dowling Review of Business-University Research Collaborations, 2015

11. As the UUK Concordat highlights funders of research should 'periodically review their policies, grant conditions and processes' (p.20). As noted above, the Academy is in the process of doing so in the context of our new Research Strategy and its implementation.

12. We believe that the forthcoming formation of UK Research and Innovation (UKRI) will support the development and implementation of policies on broad cross-cutting issues such as research integrity. However, smaller, more specialist, funders of research, such as the National Academies, must also be part of those conversations. We welcome advice as to how such engagement should take place and on proportionate and effective measures that funders such as ourselves can use to encourage observance of Concordat commitments.

13. Research is a global endeavour and the interaction between different national systems and practices on research integrity is therefore an important issue. Particularly relevant as support for research in the UK and abroad from UK Official Development Assistance (ODA) grows is how to embed good practice within that activity. Where ODA support is intended to build research and innovation capacity within the Global South, we believe that support for developing good research integrity practices along with that capacity is essential. We welcome advice as to how ODA delivery partners can support this goal.