EXCELLENCE IN SCIENCE

THE ROYAL SOCIETY

Response to the House of Commons Science and Technology Select Committee inquiry on 'bridging the "valley of death": improving the commercialisation of research'.

The Royal Society welcomes the opportunity to respond to the House of Commons S&T Committee inquiry on the difficulties surrounding the commercialisation of research in the UK. This submission has been prepared in consultation with a number of Fellows of the Royal Society, and has been approved by the Treasurer and Physical Secretary on behalf of the Council of the Royal Society.

1. Scientific enquiry has always been concerned with both discovery and application. The scientific process is not a simple linear progression from the acquisition of knowledge to exploitation. In his 2011 Anniversary Address, the President of the Royal Society, Sir Paul Nurse, explained, 'There is a continuum from discovery science acquiring new knowledge, through research aimed at translating scientific knowledge for application, onto subsequent innovation. This spectrum should be considered as an interactive system, with knowledge generated at different places within the continuum, influencing both upstream in the creation of new discoveries and downstream in the production of new applications' (Royal Society 2011).
2. The 'commercialisation of research' cannot be isolated from the broader research enterprise. Past President of the Royal Society, George Porter FRS, spoke in 1987 of two types of research 'applied and the not-yet-applied'. As the Royal Society has discussed in its report *The Scientific Century* (Royal Society 2010), any strategy to improve the commercialisation of research must presuppose strong financial and policy support for the research base in the UK. The Royal Society has welcomed the continued ring fence around the science budget, and has been pleased to see the capital budget being partially restored by investments in recent budgetary statements, after an initial significant decrease. However, the science budget in the UK is still facing a significant real terms decline over this spending review period to 2015. UK research is the feedstock of innovation, and to be exploited to drive economic growth that research needs appropriate and sustained investment.

What are the difficulties of funding the commercialisation of research, and how can they be overcome?

3. In recent years researchers have been actively encouraged to pursue and demonstrate commercial applications of their research. This has been embedded in the quality assessment exercises, both the Research Assessment Exercise, and now the Research Excellence Framework ('impact on commerce' being one of the threads of the impact section of the REF [HEFCE 2012]). The need to identify impact from publicly funded research is clear, but the requirement to regularly demonstrate this impact, sometimes using crude or inappropriate metrics, has meant that UK research can be pushed into the market before it is ready to be picked up by industry, with knowledge therefore being 'lost in translation' (Royal Society 2011).
4. University Knowledge and Technology Transfer Offices are tasked with supporting and encouraging academics to exploit their research. With the impetus coming from the university 'supplier', evidence gathered for a 2009 Royal Society study on innovation indicated that the absence of a clear demand-side customer or driver is suggestive of an approach in which the institution is attempting to 'push' knowledge and skills towards the market—a 'broadcast' approach to innovation and knowledge exchange (Royal Society 2009). Policy and metrics which encourage this 'pushing on a string' without addressing industry and market exploitation demand are too narrow. While university based initiatives have been successful in supporting, for

example, spin out companies,[1] to increase the success rate of commercialisation, the UK should consider implementing a broader range of knowledge exchange/ technology transfer systems; many such examples exist in other countries. A combination of university based TTOs, which are well connected to the academic base, and more commercially oriented models, could create a more balanced market for research based innovations.

5. A noticeable gap in the UK system is the lack of corporate or national labs. The number of these has dramatically decreased in the last ~30 years, particularly compared to the situation in leading competitor countries. They provide an essential link between research and exploitation because their primary focus is set and measured in terms of commercial impact, and they have the knowledge base required to access and evaluate leading research. The Technology Strategy Board (TSB) and new Catapult Centres are useful, and the very few remaining national labs such as NPL contribute strongly, but the scale of UK Government support for such institutions is small compared to that of leading innovation focused economies such as Germany or the USA. The UK would benefit from a broader ecosystem of R&D institutions ensuring competitive exploitation. Spin-out +VC is not the only route to economic exploitation.
6. In his Anniversary address, the President spoke about 'pushing the bridgeheads further out into the valley of death' (Royal Society 2011). This refers to both sides of the valley. Not only does research and knowledge need to be suitably advanced to be ready for translation, but industry and business need to be better placed to identify and capture knowledge as it crosses the bridge. There must also be a recognition that the bridges are carrying two-way traffic.

Should the UK seek to encourage more private equity investment (including venture capital and angel investment) into science and engineering sectors and if so, how can this be achieved?

7. Technology development is not a quick, or always controllable, process. VC fund structures are not, however, typically designed to allow for a long-term or fluid timeframe. Business angels, however, can be more 'flexible', and as such can provide a more sympathetic match for developing research towards commercialisation. There is some anecdotal evidence that researcher-innovators are now avoiding traditional venture capitalists, and preferring to seek investment from a range of 'angel' investors, who may each invest less, but who are more adaptable, and have longer term horizons.
8. The taxation environment is a critical parameter in encouraging both 'angels' and venture capitalists alike – and especially in inducing the founders of companies to take the enormous financial risks which are often necessary. The past 20 years have seen a number of beneficial tax measures in this regard, including, for example, the establishment of Venture Capital Trust and Enterprise Investment Schemes. However, the abolition of the 10% business assets capital gains tax rate in the 2009 Finance Bill almost doubled the exit tax rate for founder entrepreneurs who subsequently sell their businesses. Taxation incentives are an important factor in the passage over the 'valley of death'; the Royal Society recommends the Government address the issue of CGT in the first instance, and investigate other ways in which taxation might be used to stimulate entrepreneurship. The incentive competition from other countries is serious.
9. There needs to be a more flexible approach to encouraging innovative ways of supporting the private innovation and exploitation sector. For example the Royal Society's own Enterprise Fund has not been eligible for government support because it does not fit a 'standard model' of venture capital or business angel support, with, for example, fixed (short) timescales for investment and exit.
10. In the absence of many major corporate labs in the UK and other long-term technology 'incubators', ways to support the maturing of technology for longer are needed. Government procurement could help to do this, as would a broader Small Business Research Initiative (SBRI) in the style of the US Small Business Innovation

[1] In 2007/8, university spin-out companies employed nearly 14,000 people and had a combined turnover of £1.1billion (BIS 2008); in the first decade of the 2000s, university bioscience departments generated over 200 spin-out companies (BBSRC 2009).

Research system (SBIR), and tax breaks for longer-term and early investment. The TSB Catapult Centres may help in certain narrowly-defined areas, but it is too early to assess their impact.

Royal Society activities in the area of commercialisation

11. The Royal Society is a Fellowship of 1,400 scientists based around the world. These Fellows and Foreign Members are all world class researchers, and many are also successful entrepreneurs and innovators.
12. Many Fellows of the Royal Society have direct experience of crossing the 'valley of death'. Fellows have founded a number of successful British companies. Examples include ApaTech, Biogen, CAT, Domantis, Oxford Instruments, Plastic Logic, Renishaw and Ubisense. These companies have had a multi-billion impact on the UK economy, through investment and market capitalisation.
13. In March 2010 the Royal Society published a report on the vital contribution of science and research to the nation's wealth. *The Scientific Century: securing our future prosperity* (Royal Society 2010) emphasised the need to place science and innovation at the heart of a long-term strategy for economic growth. The report highlights the successes of policies in the early 2000s to generate value from investment in research – for example the increase between 2000 and 2008 of patents granted to UK universities (136%) and consultancy income (222%) – but calls for more to be done to improve knowledge exchange between universities, researchers and business.
14. The Royal Society Enterprise Fund (RSEF) was set up by the Royal Society in 2008 to make equity investments in early-stage companies based on outstanding UK research. To date the Royal Society has raised over £7m in philanthropic donations for the RSEF and invested in 5 businesses, backing them with finance and other support. Encouraged by the early reaction to this initiative intended to help bridge the 'valley of death', the Society is looking to expand this activity.

References

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Further information

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