THE ROYAL SOCIETY

10 February 2016

Royal Society response to the BIS Select Committee inquiry on Access to Finance

Summary

1. This submission concerns entrepreneurs and businesses – large and small – that commercialise scientific research and can sometimes struggle to access finance at various stage of their development.

2. Difficulties are particularly acute at the early stages of the commercialisation process due to the high risk and long-term nature of the investment required. Investors' desire for short-term returns can also alter the priorities of companies to the detriment of R&D programmes and long-term growth. The UK has a scale-up problem, with few businesses to rival those in the United States in terms of size.

3. These problems are structural and existed before the 2007 banking crisis, but responses from our Fellows suggest that the crisis exacerbated them. It is not clear how much improvement has occurred in recent years; however there has been a beneficial increase in angel investors.

4. Crowd funding may provide finance opportunities for some science entrepreneurs and businesses but there are challenges. These include the availability of the skills required to make a success of crowd funding strategies, variable validation of ideas and their chances of success, and lack of business support.

5. Government interventions should aim to increase both public and private investment in early-stage commercialisation, encourage long-term thinking among investors and encourage informed risk-taking. Support is also needed for scaling-up businesses. Specific actions that could be taken by the Government include:

    5.1. **Raise the maximum amount eligible for tax relief in the EIS and SEIS schemes**, which encourage angel investment. The Government should also be mindful of the unintentional impact financial regulation may have on individuals' and institutions' willingness to invest in science businesses.

    5.2. **Protect and increase where possible Government funding for commercialisation** through HEIF, Research Council innovation funding and Innovate UK's budgets. These help to create and support businesses in their early stages. Repayable financial products from Innovate UK, announced in the Spending Review, could adversely affect innovation within businesses and must be carefully designed to avoid this.

    5.3. **Promote reciprocal learning and understanding between the scientific and financial communities** to aid the commercialisation process and growth of science businesses.

    5.4. **Continue the Small Business Research Initiative (SBRI),** increase the amount of money available for innovative businesses through the scheme, and ensure it is operating optimally and promoted widely.

    5.5. **Aim to invest at least 0.67% of GDP in R&D by 2020**, which in turn would encourage industry to increase its investment.

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Introduction

6. The Royal Society is the national academy of science in the UK. It is a self-governing Fellowship of many of the world's most distinguished scientists working in academia, charities, industry and public service. The Society draws on the expertise of the Fellowship to provide independent and authoritative advice to UK, European and international decision makers. As the UK's academy of science, the Society is concerned with the health of the UK's research, innovation and education system as a whole.

7. In this submission, the Society provides evidence about the experiences of entrepreneurs and businesses operating in the science sector. The Society's submission has been developed through consultation with the Fellowship, specifically those involved in the commercialisation of research and those who work or have worked in industry. The Society also consulted researchers who are not Fellows but are in receipt of funding from the Society for their work with industry (see Annex 1 for more information on these funding streams).

8. The UK has a world class science base. With only 3% of global funding and 4% of the world's researchers, the UK research is responsible for 11% of citations in patents worldwide and 16% of the most highly-cited academic papers[1]. However, the UK is not so good at building on this strength to create large successful British businesses[2,3]. This fact was extensively studied in 2013 by the Commons Science and Technology Committee[4]; the findings and recommendations of their report provide a valuable benchmark for the current inquiry.

9. Science entrepreneurs and businesses faces significant barriers to development in the UK, some of which are financial. Entrepreneurs and businesses commercialising scientific research can find it difficult to access both public and private finance to fund their development. The scientists that provided evidence to the Society to inform this submission reported problems at every stage of the commercialisation pathway, from proof of concept to scaling up a business. However, proof of concept and seed funding were most commonly raised as areas of difficulty.

Problems of access to finance for science entrepreneurs and businesses

10. The commercialisation of research often takes many years and requires patient and sustained investment. Greater sums of money are required at each stage of financing during the iterative process, from proof of concept through to market. However, there are a number of problems that prevent science entrepreneurs and businesses from accessing finance:

    10.1. **There is a financial returns timeframe mismatch between investors' expectations and research commercialisation[5].** Investors commonly expect returns within two to five years. This does not match the timeframes of the commercialisation of most products of research; for example, it typically takes 12 years to take a new drug from discovery to market authorisation[6].

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[1] Elsevier, 2013, International comparative performance of the UK research base - 2013
[2] Sherry Coutu, 2014, The scale-up report
[3] Goldman Sachs, 2015, Unlocking UK productivity
[4] House of Commons Science and Technology Committee, 2013, Bridging the Valley of Death: improving the commercialisation of research
[5] Sir George Cox, 2012, Overcoming short-termism within British businesses
[6] Association of the British Pharmaceutical Industry, 2012, Time to flourish – Inside innovation: the medicine development process

10.2. **The desire for short-term gain leads to short-term business decisions that negatively impact on businesses' ability to grow.** Fellows raised concerns that too many businesses focus on selling out rather than scaling up. This can reduce their spending on R&D and may be why the UK lacks large companies to rival those in the United States[7]. This poses a significant threat to the UK's competitiveness; Britain already has significantly-lower private sector R&D expenditure than most of its international competitors[8]. There is a greater need for investment based on a solid understanding and belief in the business and innovation rather than short-term gains.

10.3. **Commercialisation of research is inherently risky, especially at the earlier stages, which can deter many investors.** Investors may instead opt for what they perceive to be safer investments in other sectors or financial products. However, without some risk taking, significant scientific breakthroughs, societal benefits and commercial success will be lost.

10.4. **There is commonly a low level of understanding of science and the innovation process within the investor community**, according to some responses from our Fellows. This problem can also exacerbate the problem of risk perception identified above. Greater understanding would allow investors to effectively identify credible science-based businesses. Similarly, many scientist entrepreneurs have little business experience or understanding of the finance sector, which makes it harder for them to find and access finance.

11. These problems are structural and existed before the 2007 banking crisis[9], but responses from our Fellows suggest that the crisis exacerbated them. It is not clear to what extent the problems have been relieved in recent years, although a number of Fellows have told the Society that angel investment has become more common. It should also be noted that some sectors have seen a significant upturn in financing in recent years, for example the BioIndustry Association reported a 143% increase in biotechnology financings between 2013 and 2014[10].

12. Problems accessing finance can result in businesses either moving overseas, usually to the United States, or being bought out by larger companies and being moved overseas[11]. While other factors beyond access to finance contribute to global business decisions, this suggests that the UK does not have a globally-competitive finance market for science businesses to access.

Government support for research commercialisation

13. It is vital that the Government continue to provide direct funding and policies that support business at every stage of the research commercialisation pathway.

14. There are a number of initiatives introduced or expanded since 2007 that have been of particular value (note: the list below should not be considered exhaustive):

14.1. The Enterprise Investment scheme (EIS) and the Seed Enterprise Investment Scheme (SEIS) both allow private investors to reduce their tax liability by 30% and 50%, respectively, of their investment in eligible enterprises. The schemes are primarily aimed at angel

[7] Sherry Coutu, 2014, The scale-up report
[8] BIS, 2014, Insights from international benchmarking of the UK science and innovation system
[9] House of Commons Science and Technology Committee, 2013, Bridging the Valley of Death: improving the commercialisation of research
[10] EY and the BioIndustry Association, 2015, Building the third global cluster
[11] Sherry Coutu, 2014, The scale-up report

investors and, according to responses from our Fellows, have helped to increase private investment in research commercialisation activities.

14.2. Innovate UK provides grants to companies and academics (when working in collaboration) for the commercialisation of research. Its budget has doubled since 2010, which enables it to invest over £500 million each year and leverage further private investment. Innovate UK received a flat cash settlement in the 2015 Spending Review, which will allow it to continue to provide valuable support to the science sector, including welcome increased funding for the Catapult centres. The Spending Review also announced that a proportion of its grants will in the future be issued as repayable finance products, to the value of £165 million per year by 2019-20[12]. It is not yet clear how these financial products will operate and the Society has heard concerns that they may not be so attractive to businesses and could negatively impact businesses' decisions to undertake R&D, which could decrease commercialisation.

14.3. The Higher Education Innovation Fund (HEIF) provides funding to universities to use as they wish for knowledge exchange, including research exploitation. Of the £601 million HEIF budget for 2011 to 2015, £318 million was invested in supporting researchers to commercialise their research[13]. The Government has not yet committed to continuing the fund in this Parliament. The Research Councils also individually provide innovation funding, such as the Engineering and Physical Sciences Research Council (EPSRC) Impact Accelerator Account. These types of funding help universities bring research closer to market, where it can then attract investment from external sources. However, Fellows noted that these funds are sometimes bureaucratic to access.

15. The Royal Society also provides funding to promote innovation and fill the funding gap between scientific research and the exploitation of an idea through third-party investment (see Annex 1 for a full description). The Brian Mercer Feasibility Award and related Innovation Award support researchers to develop their scientific ideas into products with commercial potential. And the Society's Industry Fellowships support scientists to work across the academic-industry boundaries. As with similar schemes run by other public and third-sector funding bodies, finite budgets mean that the application process is highly competitive and not all worthy projects can be funded.

16. The above finance support from the Government and funding bodies, such as the Royal Society and Research Councils, primarily support the early stages of commercialisation, which is where many of our Fellows told us it is difficult to access finance.

Crowd funding for research commercialisation

17. Crowd funding is a very broad term that can be considered to cover many approaches to obtaining finance from the public. There are many crowd funding platforms that enable people to directly finance research[14] and business ideas[15].

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[12] HM Treasury, 2015, Spending Review and Autumn Statement 2015
[13] HEFCE, 2012, Strengthening the Contribution of English Higher Education Institutions to the Innovation System: Knowledge Exchange and HEIF Funding
[14] See for examples: https://experiment.com/ and http://myprojects.cancerresearchuk.org/ (accessed 4 February 2016)
[15] See for example: https://www.indiegogo.com/ and: https://www.scanadu.com/products for an example of a successful venture. (accessed 4 February 2016)

18. Some Fellows raised specific concerns regarding crowd funding for research and its commercialisation that the Committee may wish to explore:

    18.1. It may be that crowd funding will be more valuable in some fields of science than others, depending on the interests of the public and amount of money required to make the enterprise viable.

    18.2. The process of crowd funding provides an opportunity to validate, to an extent, the market demand for the product. However, it requires the entrepreneur to be adept at "selling" their idea, which could result in many good ideas not being supported where such ability is lacking in the scientist entrepreneur.

    18.3. Crowd funded ideas may not receive expert review to ensure quality, and chances of success. Such peer review is also valuable as it can help an idea or strategy to be refined.

    18.4. Recipients of crowd funding may not receive other forms of support that can help increase their chances of commercial success, such as mentoring, which can be provided by angel investors and venture capitalists, for example.

19. Organisations, including universities, may also employ crowd funding to raise money from the public and often specifically their alumni[16]. Charities could also be considered crowd-funders: 7.4 million people donate to UK medical research charities each month[17]. Collectively these charities invested over £1.2 billion into medical research in 2014, some of which is invested in partnership with businesses to support commercialisation[18,19].

Actions the Government could take to increase the number of successful science businesses in the UK

20. To increase the number of successful science businesses in the UK, the Government must seek to address access to finance problems at every stage of the business development pathway – from the academic researcher seeking a small amount of proof of concept funding to develop a prototype to the large company seeking to open up global markets.

21. **EIS and SEIS should be continued and the upper limits on how much can receive tax relief through the scheme should also be raised**; EIS is currently capped at £1 million and SEIS at £100,000. This could encourage angel investors to make greater sums available by de-risking more of their investment.

22. **Policies to promote investment from longer-term investors such as pension funds, sovereign wealth funds, insurance companies and livery companies should be developed.** Equally, the Government should be cautious of unintended consequences of regulation. The Commons Science and Technology Committee has raised concerns that regulation to de-risk pension and insurance funds has had the effect of starving technology companies of a source of long-term patient capital[20].

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[16] See for example: http://files.hubbub.net/casestudyyustart2015.pdf (accessed 4 February 2016)
[17] Charities Aid Foundation, 2015, UK Giving 2014
[18] Association of Medical Research Charities, 2014, Research expenditure database
[19] Association of Medical Research Charities, 2014, An essential partnership
[20] House of Commons Science and Technology Committee, 2013, Bridging the Valley of Death: improving the commercialisation of research

23. Fiscal incentives for investors are not enough to improve businesses' access to finance, however. **Support is also required in the form of sign-posting, training and mentoring:**

    23.1. **Investors are able to make more informed decisions through better understanding of the scientific products** that they are considering for investment. For example, the Science and Technology Committee has highlighted a scheme run by Lloyds Banking Group where senior staff attend a Warwick based engineering course designed to give them a better understanding of innovation[21].

    23.2. Likewise, **scientist entrepreneurs and businesses require support to help them understand and navigate the finance system and grow.** For example, the Society works with the Imperial College Business School to offer grant holders a training course on the Innovation and Business of Science (see annex 1 for more information). And, in 2014, the Society hosted a CEO Summit, called *Silicon Valley Comes to the UK*, which matched fast growing UK science companies with Silicon Valley entrepreneurs to provide advice and mentoring[22].

    23.3. **More opportunities for entrepreneurial scientists and SMEs to meet potential investors are also needed.** National academies such as the Royal Society can play a part in brokering such engagements.

24. **Greater public investment is required** to ensure that science innovations in the early stages, which private investors tend to consider too risky, are supported. This will leverage additional private investment and support businesses to grow to a stage at which they can access third-party finance.

    24.1. **The Government should make a long-term commitment to HEIF and increase its funding**. For every £1 of HEIF invested, there is a return £6 in gross additional income[23].

    24.2. **The Research Councils should also continue to support the commercialisation of research** that they have funded through dedicated streams and work to make sure they are widely promoted and accessible to researchers.

    24.3. The replacement of some Innovate UK grants with new financial products, as announced in the 2015 Spending Review[24], could reduce their attractiveness to businesses and could discourage firms from undertaking R&D that does not have a high chance of success. As great advances can be made from more-risky projects, **the Government must ensure that the new financial products do not adversely affect science-based innovation activity in UK businesses.**

    24.4. Government investment also encourages businesses to invest in their own R&D in the UK or provide finance for R&D performed by external partners[25]. The UK's gross expenditure on R&D of 1.7% of GDP is significantly below the 3%, recommended by the House of

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[21] House of Commons Science and Technology Committee, 2013, Bridging the Valley of Death: improving the commercialisation of research
[22] https://royalsociety.org/events/2014/06/science-ceo-summit/ (accessed 4 February 2016)
[23] HEFCE, 2012, Strengthening the Contribution of English Higher Education Institutions to the Innovation System: Knowledge Exchange and HEIF Funding
[24] HM Treasury, 2015, Spending Review and Autumn Statement 2015
[25] Jonathan Haskel, Alan Hughes and Elif Bascavusoglu-Moreau, 2014, The economic significance of the UK science base

Commons BIS Committee[26] and the Science and Technology Committee[27]. This is due to low investment by both the Government and industry[28]. **The Government should aim to be investing at least 0.67% of GDP in R&D by 2020, which in turn would encourage industry to increase its investment** and help the UK reach the 3% target recommended by both committees.

25. The Government can also support the sustainability and growth of UK businesses by being a good customer. According to the Royal Society of Chemistry, the UK's public sector spent approximately £236 billion on goods and services in 2010–2011, which is significantly higher than the annual investment in all aspects of research and innovation of £11 billion[29]. The UK's Small Business Research Initiative (SBRI) is one such way Government procurement can support companies with innovative products by providing income as a customer. In its March 2013 Budget, the previous Government signalled its intention to increase the value of SBRI contracts to £200m in 2014/15[30]. **The Government should continue to refine SBRI to efficiently support science businesses and aim to increase funding available to UK businesses through the scheme.**

For further information, please contact Becky Purvis, Head of Public Affairs (rebecca.purvis@royalsociety.org).

[26] House of Commons BIS Committee, 2016, The Government's Productivity Plan
[27] House of Commons Science and Technology Committee, 2015, The science budget
[28] BIS, 2014, Insights from international benchmarking of the UK science and innovation system
[29] House of Commons Science and Technology Committee, 2013, Bridging the Valley of Death: improving the commercialisation of research
[30] HM Treasury, 2013, Budget 2013

Annex 1: Royal Society funding to support research commercialisation

The Royal Society offers a number of schemes to support innovation in science. As well as funding through our Brian Mercer Awards and Industry Fellowships, we offer a course on the Innovation and Business of Science (in partnership with Imperial Business School).

Brian Mercer Awards

The Brian Mercer Awards were established by the Royal Society in 2001 after a generous bequest received from the late Dr Brian Mercer OBE FRS. Brian Mercer was an enthusiastic entrepreneur and inventor who believed in the importance of cooperative research and development. The awards marked a significant step for the Royal Society in its work towards supporting and encouraging innovation in science and technology.

Two types of Brian Mercer Award are available:

- The Brian Mercer Innovation Award (up to £250k) is available for researchers who wish to develop an already-proven concept or prototype into a near-market product ready for commercial exploitation.
- The Brian Mercer Feasibility Award (up to £30k in value) enables researchers to investigate the technical and economic feasibility of commercialising an aspect of their scientific research, possibly in conjunction with a third party.

Applications are assessed on the scientific, engineering and technological excellence of the applicant(s) and the quality, novelty and commercial potential of the proposed project. Between one and two Awards for Innovation and up to nine Feasibility Awards have been made annually. Since 2008, success rates have been 7% for the Innovation Award (9 awards made) and 20% for the Feasibility award (28 awards made).

Almost all Brian Mercer award holders undertake further downstream commercialisation activities, including industry collaborations, start-up formation, consultancy and new product development. As part of an independent review, over half of the award winners said, when asked, that no commercialisation activities would have been possible without receiving the award.

Notable success include:

- Professor Adel Sharif (University of Surrey) used his Brian Mercer Award for Innovation (2005) to develop a desalination process for converting seawater to drinking water. His technology was spun out into the company Surrey Aqua Technology Ltd, later incorporated into Modern Water plc which was listed on the Alternative Investment Market (AIM) in 2007 at a value of £70m. The company now operates two desalination plants in Oman and Gibraltar[31].
- Dr Semali Perera (University of Bath) was awarded a Brian Mercer Award for Innovation in 2007 to commercialise her environmentally-friendly fibres for gas and air filters. Dr Perera spun-out the company nano-porous solutions limited (n-psl), which secured a further £2m of investment between 2007 and 2010, before being bought by the Norgen Group in 2013.

[31] http://www.setsquared.co.uk/impact/environment-case-studies/low-energy-production-fresh-water-sea-water-manipulated-osmosis (accessed 9 February 2016)

Based in Gateshead, n-psl plans to increase its staff to 100 by 2018 and achieve a turnover of £20m[32].

Industry Fellowships

The Society's Industry Fellowships support academic scientists who want to work on a collaborative project with industry and for scientists in industry who want to work on a collaborative project with an academic organisation. It aims to enhance knowledge transfer in science and technology between the academic and private sectors. The Society typically awards 8 Industry Fellowships each year, with a success rate for applicants of approximately 15%. Funders who have supported the scheme including the Research Councils and multinational science and engineering companies.

As a consequence of the nature of the scheme, Industry Fellows typically use it to support and grow industrial collaborations, but some do undertake spin-out formation and leverage further investment for their research. For example, Professor Mark Maslin (University College London) has used his Industry Fellowship to focus on the development of his spin-out company, Rezatec Ltd. Rezatec, formed in 2012, uses satellite and ground data to solve business problems related to the environment. In 2015, it had grown to 12 employees, received funding from the European Space Agency, InnovateUK and NERC, raised £700k of Angel Investment and reached a turnover of £1.5m[33].

Innovation and Business of Science course

Our course on the Innovation and Business of Science is offered free-of-charge to all holders of a Royal Society grant or research fellowship[34]. It is run as a series of three residential training workshops and provides participants with a solid grounding in the commercial aspects of research, including understanding intellectual property, technology transfer, working with industry and the wider innovation policy landscape. Since its inception in 2006, nearly 400 individual researchers have taken one or more of the modules (N.B. the Society gives out 200 grants or research fellowships each year), and feedback suggests that it has a profound effect on how those taking the course think about the commercial aspects of their research.

[32] https://royalsociety.org/~/media/policy/topics/industry-innovation/case-studies/success-stories-booklet.pdf?la=en-GB (accessed 9 February 2016).
[33] https://royalsociety.org/people/mark-maslin-7610/ accessed 9 February 2016)
[34] https://royalsociety.org/grants-schemes-awards/innovation-course/ (accessed 4 February 2016)