HM Treasury
Comprehensive Spending Review 2015
Submission by the Science Council

1 The Science Council

1.1 The Science Council is a membership organisation of learned societies and professional bodies drawn from across science and its applications. Collectively our members represent almost 500,000 individuals including scientists, teachers and senior executives in industry, academia and the public sector. There are currently 41 member organisations: a list is attached. In addition to providing a mechanism for the sector to work collectively, the Science Council develops and leads collaborative projects working with member organisations and the wider scientific community: examples include LMI analysis of the UK Science Workforce and Diversity, Equality and Inclusion.[1]

1.2 The Science Council's principal area of work is to advance the professional practice of science across the breadth of the science workforce, including non-graduate and technical roles in science. A key aspect of this is professional registration and having introduced Chartered Scientist (CSci)[2] in 2004, the Science Council has added Chartered Science Teacher (CSciTeach), Registered Scientist (RSci) and Registered Science Technician (RSciTech).[3] RSci and RSciTech aim to raise the profile, aspirations and retention of scientists at graduate and technician level.

1.3 The Science Council welcomes the opportunity to contribute to the 2015 Comprehensive Spending Review (CSR). In preparing this submission we have consulted with member organisations to identify areas of common interest. In addition a number of member organisations will be responding individually to the inquiry.

1.4 We would welcome the opportunity to discuss further with ministers and officials our ideas for strengthening the science sector in the UK.

2 CSR 2015: an opportunity for government to continue support for UK science

2.1 Over the past five years the government has stated its desire to establish the UK as a 'great place to do science'[4] [5] and has demonstrated that it sees science as an investment for future security and prosperity; the Science and Innovation Strategy states that science and innovation are at the heart of the government's long term economic plan.[6] The government's 2015 manifesto also states that "*We will continue to invest in science, back our industrial strategies and make Britain the technology centre of Europe*"[7].

2.2 The 2015 CSR provides the government with the perfect opportunity to deliver on these pledges, turbocharge the UK economy, build on the past five years and invest further in the resources, capital and skills necessary to set the UK on the path to increased productivity and wellbeing, and a thriving economy with world-leading businesses that creates high-value jobs and sustained growth. To achieve long-term stability for UK science, decisions on investment in science should be achieved through continuing engagement between the government, the science community, and wider user groups and communities.

2.3 The Science Council recognises the government's commitment to reducing public spending. However, when considering spending and investment options, it must consider the cumulative consequences of not making a significant investment in science; it will potentially derail existing science projects, thus wasting public money already invested; and will hinder the development and delivery of future projects. These consequences will convey the message to science communities in the UK and abroad, and global businesses that the long-term health of UK science is at risk.

[1] http://www.sciencecouncil.org/content/diversity-equality-and-inclusion
[2] http://www.charteredscientist.org/
[3] http://www.professionalregisters.org/
[4] http://www.policyexchange.org.uk/images/publications/eight%20great%20technologies.pdf
[5] https://www.gov.uk/government/speeches/g8-dementia-summit-prime-ministers-speech
[6] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387780/PU1719_HMT_Science_.pdf
[7] https://s3-eu-west-1.amazonaws.com/manifesto2015/ConservativeManifesto2015.pdf

3 Investment in science is an investment in future security, resilience and prosperity

3.1 Investment in science is an investment for future prosperity. The application of science is key to underpinning a strong and sustainable economy, the creation of high-value jobs, and will be vital for preparing the nation for current and future policy challenges, such as an ageing population, climate change and food security. It must be the **government's aim to match the levels of investment in science and research with that of the UK's international competitors**[8] to ensure the UK continues to be seen as a global partner and leader in science, and to reflect the considerable strategic need to address global challenges.

3.2 Investment decisions must be based on long-term strategic considerations and where there is the greatest potential for long-term growth and delivery of positive economic and social returns. Investment must include commensurate investment in the necessary resources, capital infrastructure and people. This will help ensure that resources are used efficiently and achieve the greatest impact. This will help create stability and certainty, and make long-term planning easier; government-funded projects will be more resilient to unforeseen global events which threaten the capacity to maintain existing projects, those in development, or provide flexibility to rapidly exploit new scientific discoveries. Stability will also strengthen the development and sustainability of the UK's ability to attract leading international scientists and researchers, promote confidence within the science community at home and to potential overseas investors.

3.3 Long-term investment must also seek to strengthen and sustain the UK's international collaborative activities. No single country can solve global challenges alone. Science increasingly transcends national borders and solutions to global challenges will advance best through international collaboration. Maintaining the UK's international connections and capabilities is critical to ensuring it shapes and influences international science projects.

3.4 The Science Council welcomes the government's commitment to invest £6.9 billion on science capital by 2021[9]. We appreciate that decisions on where and how much to invest can be difficult for governments to make, and sometimes have to be determined by immediate priorities rather than long-term strategic decisions. To ensure that the government's science capital commitment is invested in a transparent, strategic and effective way, **a cross-government national science skills and capital advisory group should be established to help advise and guide the direction of investment across the UK and outline a long-term skills needs and a timetable of continuous replacement and improvement of capital facilities.**

3.5 Further investment in big data, digital technologies and services has the potential to increase efficiencies in the delivery of public services. Across the NHS, for example, harnessing digital technologies so that a comprehensive picture of a patient's health record is readily available to appropriate health professionals can help in more accurate diagnosis and treatment, thus reducing potential and unnecessary costs and improving health outcomes. Other examples might include identifying the interventions that are likely to support a job seeker back into work, or predicting the types of books required in a particular library.[10]

4 The relationship between departmental science investment and the science budget

The Science Budget

4.1 The Science Council recognises that budgets needed to be tightly controlled in the previous spending round; the ring-fenced science budget was therefore welcomed by the science community, particularly in light of significant cuts elsewhere across government. This demonstrated the government's appreciation of investing in the science base to deliver long-term social, economic and environmental benefits. However, figures show that there has been a £1 billion shortfall in investment over the course of the last Parliament.[11] This has, inevitably, put pressure on departmental science budgets. The government has itself recognised that departmental R&D spending is poorly protected from short-term budget cuts.

[8] http://www.oecd.org/innovation/inno/researchanddevelopmentstatisticsrds.htm
[9] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443232/50325_Summer_Budget_15_Web_Accessible.pdf
[10] https://www.civilserviceworld.com/articles/opinion/josie-cluer-spending-review-challenge-will-mean-radical-rethink-public-services?utm_source=Adestra&utm_medium=email&utm_term=&utm_content=Josie%20Cluer%3A%20The%20Spending%20Review%20challenge%20will%20mean%20a%20radical%20rethink%20of%20public%20services&utm_campaign=Wednesday%2012
[11] http://sciencecampaign.org.uk/CaSE2015BudgetBriefing.pdf

4.2 As the economy continues to grow, and to ensure continuity and stability across the research community, the government should continue to ring-fence its investment in science with a commitment to long-term above inflation investment for science, including departmental R&D budgets and capital investment.

4.3 The Science Budget should not be considered in isolation from departmental or government agency science spending. While there must be a clear distinction between the types of research carried out by government departments, its agencies and central government, all are vitally important in supporting the UK's long-term strategic goals and should complement rather than compete with each other. Moreover, there should not be an expectation that the research councils will provide compensatory research funding when Departmental funds are cut.

4.4 The Research Councils are an important part of the UK's science and innovation infrastructure and are key funders of 'blue skies' research as well as strategic initiatives. As science becomes increasingly multi-disciplinary and complex they need to maintain a balanced portfolio of science training and research. Their connection to the research base, along with other arms-length public bodies such as higher education institutions and Innovate UK, makes them well-placed to inform investment priorities on the basis of evidence of scientific outputs and potential societal impact. Their independence in making such decisions must be protected.

4.5 To maximise the connectivity between fundamental and applied science, the government should facilitate partnerships with non-departmental public bodies, government agencies, research institutes, charities and NGOs. These organisations are in a position to plan and execute projects with more explicitly applied research objectives and outputs. Greater connectivity across the science base will also empower government departments to better engage with both fundamental and applied research communities at appropriate stages of decision-making.

4.6 Joined-up science and research investment policies across government will generate greater coherence, collaboration and efficiencies across research communities, and maximise the potential benefits to society from the opportunities provided by investment in the science base.

4.7 Fundamental research often does not deliver the expected outcomes either because barriers exist to further development and practical application, such as access to funding streams, highly skilled people or world-leading infrastructure. Insufficient attention to the need for research ecosystems allowing knowledge exchange between universities, small technology enterprises and large companies can also lead to failure to translate the research. This can lead to extended timescales and threatens the premature abandonment of highly promising and innovative products and services that can deliver better public services and significant savings. Science Parks, for example, can provide the appropriate environment for efficient knowledge transfer activities between universities, businesses and high-tech enterprises, and should be supported by government.

4.8 It is crucial that the Dual Support System is maintained through the Research Councils and HEFCE, and that they work in conjunction to provide the necessary support for a range of different institutions and disciplines. It is likely that reduced resources and capacity in one funding stream will place unsustainable pressure on the other, as well as on the wider science budget.

Departmental science investment

4.9 The Science Council believes that tackling the major social, economic and environmental challenges in the UK and globally requires departmental R&D budgets to be protected and no cross-subsidisation of non-science departmental expenditure. While fundamental and strategic science should be funded through the Research Councils, departmental R&D budgets are best employed to support government policy development through commissioning applied research to target real-world problems.

4.10 The reality of proposed reductions in departmental resource budgets of 25-40% is likely to undermine the UK's ability to administer vital and highly sensitive scientific programmes. We have heard concerns from the Institution of Environmental Sciences that, given that over 95% of the Department for Energy and Climate Change's budget is reserved for nuclear clear-up,[12] significant reductions could result in the department and its agencies being unable to safely and securely dispose of nuclear waste.

[12] http://www.carbonbrief.org/blog/2015/05/analysis-how-decc-spends-its-annual-budget/

4.11 To maximise government investment, departmental science budgets should be used more effectively to incentivise greater private sector investment in R&D, thereby accelerating the translation of fundamental research to commercialisation.

4.12 Smarter public sector procurement policies can stimulate the market to develop new and innovative products and services that can be used to deliver better, and more targeted public services in an efficient and cost-effective way. This approach can increase government's ability to draw down on science and innovation and also support high-tech and innovative SMEs develop new products and services that can be exported around the world, thus helping to tackle the UK's trade deficit.

4.13 **The Small Business Research Initiative should continue to be expanded and supported**. It should be the first port of call for government departments and other public bodies looking to resolve significant policy challenges through the private sector. Innovate UK should also be given enhanced supported to invest in high-tech companies to help deliver UK-wide growth.

4.14 Scientific advisors within central government, devolved administrations and arms-length bodies play an important role in ensuring that policy decisions are informed by the best available evidence, thus helping to make sure public money is invested in the most efficient and effective way**. Departmental Chief Scientific Advisors (CSAs) should be given oversight of a dedicated ring-fenced departmental science budget**. Their links with academia, industry and professional bodies make the well-placed to commission high-quality, independent research and connect with experts, user-groups and other stakeholders to best inform policy and spending decisions.

4.15 To achieve this, it is vital that all government departments retain a CSA to ensure policy and investment decisions are informed by high-quality evidence. All CSAs must have the authority and capacity to work across the whole of their respective departments, and should be graded at the Permanent Secretary or Director General-level. To execute their responsibilities effectively, CSAs will also require adequate support staff.

5 Stimulating private sector investment in science

5.1 A competitive tax system can provide a necessary stimulus for home-grown and international high-tech companies to invest in the UK. The R&D tax credits scheme, for example, is increasingly well-used[13] and should be uplifted to continue to support and encourage greater private sector R&D spending.

5.2 Other, more imaginative uses of the tax system can be implemented to encourage greater private investment in scientific research, such as tax relief for philanthropic support for research. The government may wish to consider **tax breaks for companies that employ STEM professionals** in order to stimulate employment. The government has adopted a similar approach with regard to apprenticeships, whereby employers do not pay National Insurance contributions for apprentices under 25 years of age.[14]

5.3 Using the tax system is only one way in which the government can use to encourage long-term investment from the private sector and will be most effective in combination with other, complementary policies. These include ensuring businesses have access to a highly-skilled workforce; that businesses have ready access to finance; ensuring the resilience of national physical infrastructure; maintaining a stable regulatory, legislative and planning environment[15] and having a population that welcomes new technologies.

5.4 If long-term investment from the private sector is to be secured there must be confidence in the government's long-term commitment to science funding. Without this commitment there is a real danger that the UK's research capabilities in important areas will be permanently damaged.

6 Supporting local and regional-level science and innovation ecosystems

6.1 Science and innovation can be the drivers of growth, productivity and job creation at the local and regional level. All regions of the UK must have the capacity to nurture and sustain their own science and innovation ecosystem. We therefore welcome the government's intention to

[13] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/356382/Research_and_Development_Tax_Credits_-_August_2014.pdf
[14] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/385150/TIIN_2143.pdf
[15] http://www.cbi.org.uk/media/934670/making-the-uk-the-best-place-to-invest-report.pdf

undertake regional science and innovation audits to identify local and regional strengths and capacity,[16] and consider where strengths can be best used to exploit opportunities in science.

6.2 Government has the capacity to unlock regional growth potential even more through existing institutional infrastructure. Local Enterprise Partnerships (LEPs), Catapult Centres, Enterprise Zones, universities, further education colleges, Regional Growth Funds and science parks, for example, can all play key roles in developing and sustaining local and regional ecosystems that supports science and innovation through joint research and development projects, acting as incubators to develop excellent science high-level skills, particularly in STEM sectors[17], leveraging private investment, supporting innovation-driven businesses, and addressing local and regional infrastructure needs[18]. Sir Andrew Whitty's review, in particular, recommends that universities include facilitating economic growth as a core strategic goal.[19]

6.3 Re-shaping the existing infrastructure landscape is likely to be costly and time-consuming. It would be **more efficient and cost-effective in the long-run to provide the necessary resources to existing institutions to build and strengthen current networks and relationships** to develop the coherence and critical mass necessary to maximise the opportunities from science.

6.4 However, there exist disparities in the ability of different regions to maximise potential opportunities. Some regions are well-connected; they have responsive local governments, ready access to a highly skilled and educated workforce, good transport links and broadband connection, an established infrastructure of schools, centres of culture, and leisure facilities which attracts significant inward investment. Other regions have fewer resources of this kind and science and innovation communities in these areas can be inhibited from participation.

6.5 The government has acknowledged the need to rebalance the economy, both sectorally and geographically, particularly through devolving responsibilities to cities and local government.[20] To ensure this is achieved most effectively and sustainably, there needs to be the corresponding long-term investment in the institutions and networks that can deliver increased local and regional growth and productivity.

7 Investing in the UK's skills ecosystem

7.1 A highly-skilled science workforce must be nurtured to maximise the social, economic and environmental benefits from investment in the science and research base, and will increase the attractiveness of the UK to domestic and overseas businesses to invest both R&D and commercial translation activities in the UK.

7.2 A **priority for government must be to significantly increase investment in the UK's skills pipeline** to enable both young people and adults to gain the skills and experience necessary to progress in science. To maximise the number of people entering science, there must be a diverse range of education and training routes that provide the flexibility to enable movement across different strands of the education system, as well as between vocational and academic fields.

Focusing greater effort on increasing non-graduate routes into science

7.3 As science becomes more complex and inter-disciplinary and applied in all sectors of the economy, high-quality, work-related vocational routes into science must to be developed to ensure that the UK has the higher-level technical and practical skills needed for the modern science and technology-based economy. Demand for workers across the UK economy with science qualifications is high, particularly for those with practical and technical skills. Widening access to high-quality vocational education must therefore be a key strategic aim for the UK.

7.4 However one of the **most urgent issues for UK STEM employment sectors is the lack of skills at technician level**. It is vital therefore that the UK rebalances its STEM education priorities towards developing education and training pathways to meet anticipated skills demands across the knowledge and science-based sectors, and in particular to developing a highly skilled technician workforce. Apprenticeships at level 3-5 are part of the solution to this skills shortage but in science there is no evidence that the current schemes have taken root.[21]

[16] https://www.gov.uk/government/speeches/one-nation-science
[17] http://www.russellgroup.ac.uk/uploads/Economic-impact-of-the-Russell-Group_1.pdf
[18] http://www.policy-network.net/publications/4695/Mending-the-Fractured-Economy
[19] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249720/bis-13-1241-encouraging-a-british-invention-revolution-andrew-witty-review-R1.pdf
[20] https://www.gov.uk/government/publications/queens-speech-2015-what-it-means-for-you/queens-speech-2015-what-it-means-for-you#cities-and-local-government-devolution-bill
[21] https://www.gov.uk/government/statistical-data-sets/fe-data-library-apprenticeships

7.5 **To be an attractive and aspirational route in to science for young people, apprenticeships must lead to entry into a recognisable occupation or a profession. It is essential therefore, that apprenticeship standards directly link to professional registration requirements in sectors where they exist to support young people's career progression. The Science Council has built progression and transferability into its professional registers to provide a clear route from technician level through to Chartered status.**[22]

7.6 Further education (FE) must be seen as an integral part of the UK's skills 'ecosystem' and complement investment elsewhere in the skills system. FE prepares over three million students with valuable employability skills and helps them to develop their career opportunities.[23] It is well-placed to meet demands for training and developing high-quality technicians to meet the anticipated demand for a non-graduate technician workforce across the knowledge and science-based sectors. In principle we support National Colleges as a mechanism for delivery of higher-level technical and vocational training, and provide access opportunities for learners to undertake practical and technical experiments. The education and training offered must provide learners with a wide range of skills and knowledge to move through and across different employment sectors, and link their qualifications and training to professional registration.

7.7 We acknowledge that high-quality vocational education can be costly to deliver as it often requires specialist facilities. Many FE colleges do not have the financial resources to provide the specialised technical training and facilities to support learners. However, long-term funding and resources must be found for the FE sector and the adult skills budget for the skills system to meet employers' demand for people with high-level technical skills and knowledge.

7.8 We note that the government has protected spending on 5-16 year olds' education and training (E&T), but not for 16-18 year olds.[24] While all young people must now remain in E&T until 18 years old, under-funding of post-16 education significantly narrows their progression options, particularly in science subjects, which can be costly to deliver. This will do little to incentivise students to pursue a scientific career at a time when the UK needs to attract more young people to study science, not fewer. The government must consider greater and sustained investment in post-16 E&T as an opportunity to secure the long-term health of UK science.

7.9 The Science Council has welcomed the Wakeham Review of STEM graduate employability. However, to ensure that there are a range of appropriate STEM qualifications that enable young people to become professional scientists, we call on the government to review the provision and range of vocational science qualifications to develop high-quality non-graduate vocation pathways into science.

Supporting STEM subjects in higher education

7.10 A vital component in developing a highly-skilled workforce will be to encourage and facilitate more young people to study science in higher education (HE). As STEM graduates are in high demand globally,[25] the UK's long-term support for STEM subjects in HE will also encourage the world's best students, scientist and researchers to come to the UK. To support the government's goal of increasing the number of people studying STEM[26] in HE, **HEFCE must continue to provide additional, non-mainstream funding allocations for the delivery of high-costs STEM subjects.** This approach, accompanied by a measured and balanced immigration policy, will underpin the UK's global reach and reputation for excellent science.

The role of Local Enterprise Partnerships in supporting the UK's skills ecosystem

7.11 LEPs should be encouraged to play a significant role in developing high-quality post-16 routes into science careers through their regional skills strategies in collaboration with other regional actors. Regional skills strategies must be appropriate for a particular area but must also be part of a joined-up national strategy founded on the UK's key strategic goals and reflecting

[22] http://www.sciencecouncil.org/professional
[23] https://www.aoc.co.uk/media-and-parliament/our-work-mps/briefings-mps
[24] https://s3-eu-west-1.amazonaws.com/manifesto2015/ConservativeManifesto2015.pdf
[25] http://www.obhe.ac.uk/newsletters/borderless_report_january_2013/global_race_for_stem_skills
[26] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387780/PU1719_HMT_Science_.pdf

emerging global skills demands such as digital skills, biotechnology and advanced manufacturing.

7.12 However, we have heard anecdotally that many LEPs have not yet progressed with developing a skills strategy as the government would have liked. Greater government investment and leadership is needed to encourage LEPs to take responsibility and ownership to formulate and implement regional skills strategies. Government should work closer with the LEP network to understand local priorities and needs for government funding.

7.13 The Science Council recommends government **establish an independent national science skills advisory group** to provide advice, leadership and guidance to the Secretary of State on the long-term science skills needs of the economy. The group would have wide-ranging representation across professional bodies, trade unions and associations, academia, charities, employers, qualification agencies, education providers and reciprocal membership with the National Science Capital Investment advisory group. The group would help ensure that science education and skills policy was aligned to an overarching, long-term science strategy.

8 Maintaining funding for public engagement activities

8.1 The Science and Society programme should be maintained with continual active public support for the pursuit and application of science for society.

8.2 Science and its applications have the ability to provide advances of great benefit and importance to society, and often these benefits will be unforeseen. However the acceptance and adoption of new technologies and innovations is unlikely to be widespread if wider society does not value science and is distrustful of its benefits and of scientists. Society needs to be excited by science, value its importance to our social and economic wellbeing, feel confident in its use and support a representative well-qualified and diverse scientific workforce.

8.3 Greater understanding, knowledge and acceptance enables the public to become informed customers of new and existing technology and will be an attractive destination for global companies, international scientists and students. [27] Access to new technologies can also help empower people, enabling them to participate in society, in political debate and, as more and more aspects of our lives move to online and digital platforms, and participate in everyday life.[28]

8.4 We would caution against any plans to restructure the Department for Business, Innovation and Skills (BIS), its agencies and public bodies. While more can be done to achieve greater coherence and efficiency across its responsibilities, the current inter-departmental synergy between science, higher education and business enables closer resource and information sharing to be made, thus ensuring there is a clear and well-recognised innovation pathway. In addition, continuing the ministerial link between pre and post-19 education across BIS and the Department of Education helps to joined-up education policy.

We would welcome the opportunity to discuss further with the government the above issues and our ideas for strengthening UK science.

[27] http://eml.berkeley.edu/~bhhall/papers/HallKhan03%20diffusion.pdf
[28] http://www.sciencecouncil.org/sites/default/files/UK%20Digital%20Skills%20Taskforce_Science%20Council%20evidence%20submission.pdf

Member Organisations of the Science Council

September 2015

Association for Clinical Biochemistry and Laboratory Medicine
Association of Neurophysiological Scientists
Association for Science Education
British Academy of Audiology
British Association of Sport and Exercise Science
British Computer Society
British Psychological Society
British Society of Soil Scientists
Chartered Institution of Water and Environmental Management
College of Podiatry
Energy Institute
Geological Society of London
Institute of Biomedical Science
Institute of Brewing and Distilling
Institute of Corrosion
Institute of Food Science and Technology
Institute of Marine Engineering, Science and Technology
Institute of Materials, Minerals and Mining
Institute of Mathematics and its Applications
Institute of Measurement and Control
Institute of Physics and Engineering in Medicine
Institute of Physics
Institute of Science and Technology
Institute of Water
Institution of Chemical Engineers
Institution of Environmental Sciences
London Mathematical Society
Mineralogical Society
Nuclear Institute
Oil and Colour Chemists' Association
Operational Research Society
Physiological Society
Royal Astronomical Society
Royal Meteorological Society
Royal Society of Chemistry
Royal Statistical Society
Society for Cardiological Science and Technology
Society for General Microbiology
Society of Biology
Society of Dyers & Colourists
The Organisation for Professionals in Regulatory Affairs