Proposals for long term Capital Investment in Science and Research

A response from the Society of Biology to the Department for Business, Innovation and Skills

04 July 2014

The Society of Biology is a single unified voice, representing a diverse membership of individuals, learned societies and other organisations. We are committed to ensuring that we provide Government and other policy makers, including funders of biological education and research with a distinct point of access to authoritative, independent, and evidence-based opinion, representative of the widest range of bioscience disciplines.

The Society welcomes the Department for Business, Innovation and Skills consultation on long term capital investment in science and research. We are pleased to offer these comments as representative of our members across the biological disciplines.

Summary and Recommendations

1. **Capital investment should remain research led, with the research councils and higher education funding bodies maintaining the majority of the available funding for the proposed spending period.**
2. **Spending should support resource sharing and collaboration to ensure good value for money**. There are good examples of this within the scientific community that serve to promote interaction between the sectors.
3. **A mixed portfolio of investment is required**. Investment should support local to international infrastructure, sustain a diverse array of projects and be accessible to the breadth of the scientific community. The renewal of existing equipment, and facilities (including buildings) is as important as investment in new facilities and technology
4. **The allocation of large project funding should be led by the scientific community and not political priorities, in line with the Haldane principle**. It is important that the process is based on research priorities, scientific, societal need and peer review, as well as job creation and economic pull. Large project funding should be prioritised according to research excellence, likely impact, accessibility and sustainability.
5. **Capital investment must be supported by funding for resources, training and research activity**. The importance of a skilled workforce cannot be underestimated; it is essential in order to ensure that capital investment is utilised efficiently and well. Operation, maintenance and decommissioning costs should be available to support existing infrastructure and should be incorporated into plans for new facilities and equipment.

Research investment in the UK

1. The Society of Biology welcomes the announcement of increasing capital spend in science and research each year until 2021.This comes after a particularly difficult period for UK science where in the year 2011/12 real term research and development (R&D) spending was at its lowest for ten years[1], despite the ring-fenced funding for projects and programmes. In this period, spending on capital infrastructure was only 12% of the total science budget, although *ad hoc* spending announcements such as on the *eight great technologies*[2] means that this percentage will be higher for 2013/14 and 2014/15[3].

2. Sustained investment in the science and technology sector is critical to the competiveness of the UK. Germany, Japan and the USA[4] spend 3% of GDP on R&D; with the UK spend in 2012 at only 1.72% of GDP. **The UK's international reputation for world class research is at risk if investments in research and capital infrastructure are not sustained, enhanced and appropriately valued**.

3. It is important to note that it is not only the UK's reputation that will be at stake if research funding is neglected. Research and innovation underpin a healthy economy, create jobs and are vital to prepare the nation for future challenges. Haskell (2010) showed that a decline of £1bn in Research Council funding could cost £10bn in GDP losses[5].Across Europe the bio-based sector already represents a market worth over €1.5Tn, and **more than 22 million people are employed in the bio-economy[6].** In the UK 5.8million people employed in science based occupations, equating to 20% of the UK workforce[7]. This is an endeavour in which the UK must continue to excel.

4. Perhaps most importantly, scientific research is critical to future-proofing the UK and the world. Research is vital to meet energy demands, establish food security and cope with and combat climate change and extreme weather events. The strategic challenges needs are vast, and the scale of funding must be commensurate.

Spending Strategy

5. A healthy capital infrastructure not only creates opportunity for innovation, but also draws in private investment. This link between public spend and private investment was explored in a recent report for the Campaign for Science and Engineering (CaSE), which shows that public investment drives a

[1] CaSE (2014) Budget Briefing: putting the figures in context
http://www.sciencecampaign.org.uk/documents/2014/CaSEBudget2014Backgroundbriefing.pdf
[2] Willets, D.(2013) Eight great technologies,
http://www.policyexchange.org.uk/images/publications/eight%20great%20technologies.pdf
[3] Simmonds, P. et al (2013) Big Science and Innovation
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249715/bis-13-861-big-science-and-innovation.pdf
[4] Office for National Statistics (2012) , UK Gross Domestic Expenditure on Research and Development
http://www.ons.gov.uk/ons/dcp171778_355583.pdf
[5] Haskel, J. and Wallis, G. (2010). Public Support for Innovation, Intangible Investment and Productivity Growth in the UK Market Sector, IZADP Discussion Paper Series No. 4772, February, Imperial College London.
http://ideas.repec.org/p/iza/izadps/dp4772.html
[6] http://www.bbsrc.ac.uk/news/policy/2012/120309-n-bio-based-economy-highlighted-in-parliament.aspx
[7] The Science Council (2011)The current and future UK science workforce
http://www.sciencecouncil.org/sites/default/files/UK_Science_Workforce_FinalReport_TBR_2011.pdf

20% rise in private sector R&D output per year due to a higher level of skills and knowledge in science institutions[8].

6. A funding commitment is welcome and will promote confidence within the sector as well as allowing for strategic planning based on need and potential outcome. This is particularly important for larger projects that require in-depth planning as well as financial commitment. Without this structured spend a degree of disruptive uncertainty is present for both researchers and investors.

7. Long term strategy is vital, enabling structured planning, investment and prioritisation of important projects. It is essential for maintaining and improving key infrastructure as well as the development of new projects. It also fosters confidence, and in turn investment, from the private sector, aiding collaboration at home and abroad. We therefore welcome the principle of the "Science Capital Roadmap" detailed in the consultation. This is a positive step in assisting the UK to remain a world leader in science and technology. The Roadmap should provide long term direction, but not be overly-prescriptive; the UK must be able to responds to priorities and new opportunities for innovation and development.

Q1: How does the UK address the balance between capital investment in individual projects and institutions against investment in large scale projects (national and international)?

Funding Scenarios

8. The consultation sets out three potential scenarios for how money might be split between investment in individual projects and institutions through the Research Councils, Higher Education funding bodies and large investment projects. In fact, this is an over simplification of the capital spending structure. They each play a vital role in the research landscape and they are increasingly required to interact with one another and pool skills and resources; it is vital that they are able to work together in an effective way, when appropriate, to provide capital infrastructure to different institutions (Figure 1). Interaction of these institutions, supported by sustained funding, is key to forming a coherent research infrastructure that works at local, regional, national and international levels.

[8] Haskel, Hughes and Bascavusoglu-Moreau (2014) The Economic Significance of the UK science base http://sciencecampaign.org.uk/UKScienceBase.pdf

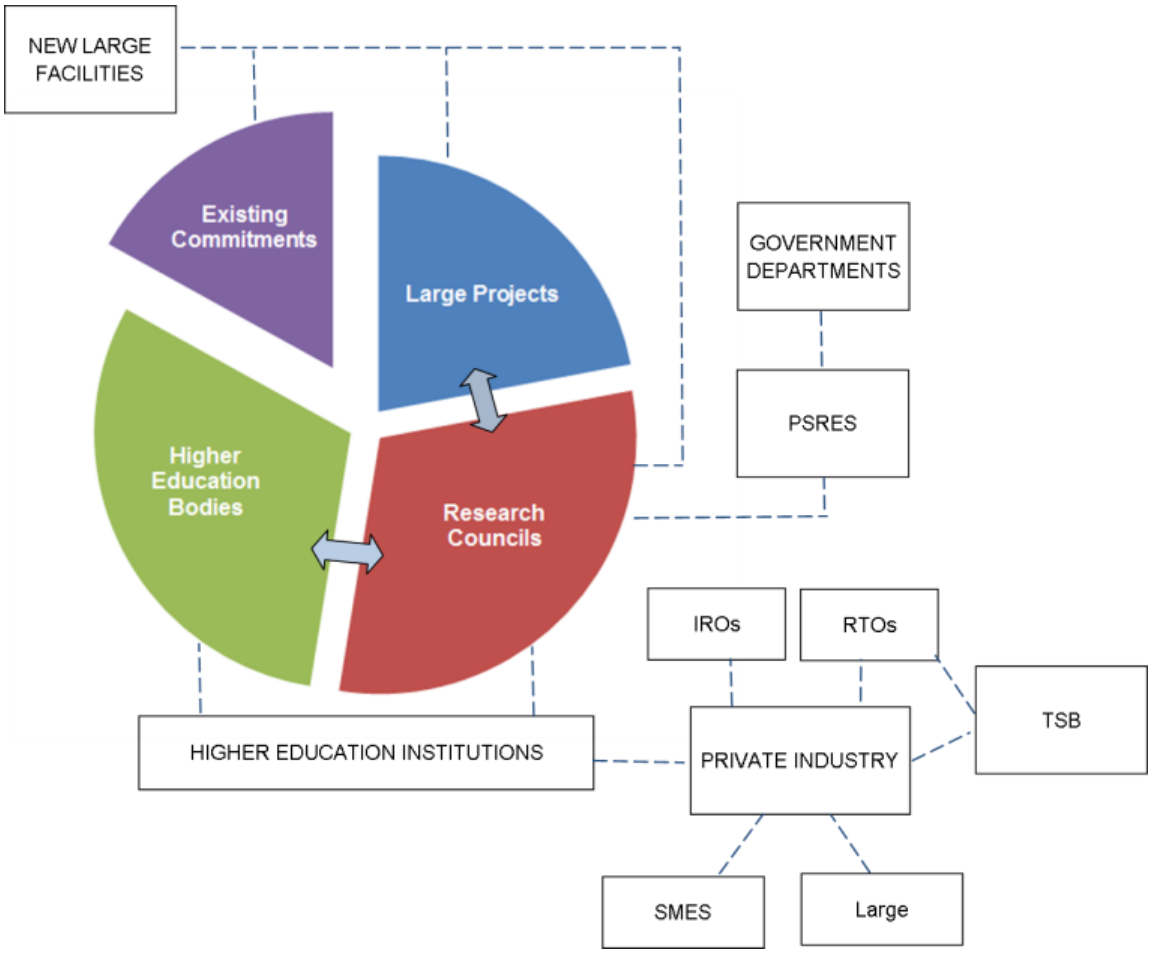

Figure 1: Schematic of the UK research ecosystem showing the major funding groups and research institutions. This includes more traditional models such as higher education institutions and large private sector companies alongside public sector research establishments (PSREs), research and technology organisations (RTOs), independent research organisations (IROs), government departments and small and medium enterprises (SMEs). The technology strategy board (TSB) also provides s funding and support to private industry.

9. The Society of Biology recommends scenarios in which the majority of funding remains with the **Research Councils and the higher education funding bodies** as outlined ideally at higher levels as per scenario one and to a lesser extent in scenario two, see Figure 2. However the scenarios are not sufficiently detailed to allow a detailed analysis.

10. Small and medium sized investment funded through the Research Councils and higher education funding bodies are crucial to the biological sciences. It should also be emphasised that whilst small and medium sized funding might not have the “wow factor” of large new projects, the allocation of funding for mid-level kit and infrastructure is essential to support development, jobs and discrete areas of excellence in the biosciences.

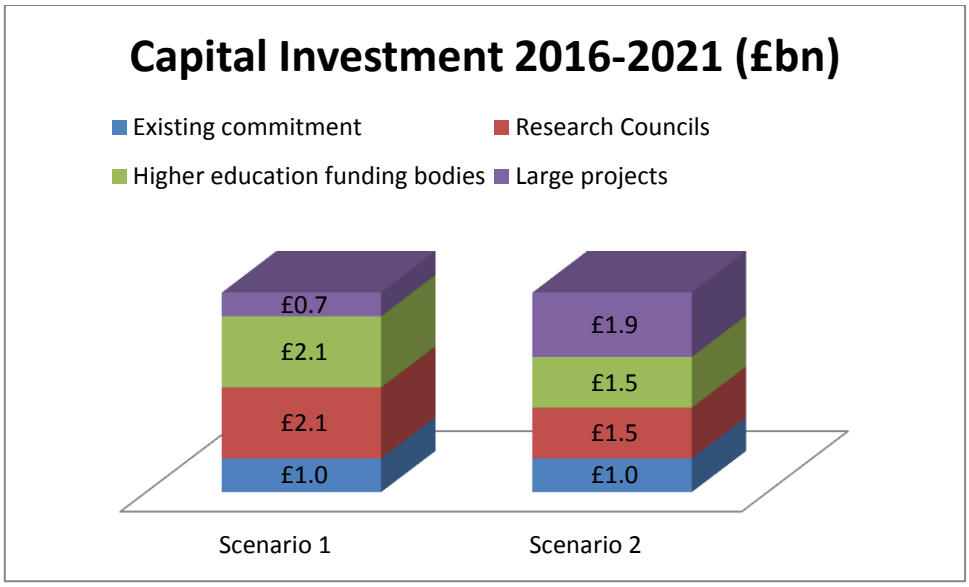

Figure 2: Spending breakdown of the proposed capital investment in science and research. These two scenarios, outlined within the consultation document, are our preferred options in favour of the majority of funding remaining with Research Councils and Higher Education Funding Bodies.

Forms of Capital Investment

11. A mixed portfolio of investment will maintain excellence across the sciences in particular, where breadth and depth of research are imperative. This means that all types of research are important for innovation and must be supported, including ongoing, novel, applied and blue skies research, and short term and longitudinal projects.

12. Sustained long term funding presents the best value for money. A stable, predictable funding stream attracts private investment and fosters innovation. Long term funding is vital for biological disciplines such as, for example, ecology, which is inherently reliant upon long term monitoring and data in both terrestrial and marine environments. The UK has a long history of excellence in ecology and this should be supported by continued funding. There are also parallels in the biomedical sciences, where long term studies and cohort monitoring have a significant role to play and the potential to yield real benefits within the emerging capabilities of *big data* handling and interpretation.

13. Capital investment is needed for individual projects at the institutional level as well as for large facilities. **Low levels of capital funding since 2010 have increased the need to replenish and renew basic pieces of equipment in research institutions and this should not be overlooked.** Good facilities, appropriate buildings and laboratories are of great significance in producing high quality research. Facilities, both existing and new must be sustainable in the long term and this requires capital, ongoing support and planning.

14. **Researchers should be able to access enough specialist kit within institutions or locally**. Often such pieces of equipment are bought when a critical mass dictates a need within a HEI, using Research Council grants or from combined consumables funds. This works well, and should continue to receive support.

Skills

15. A well skilled and supported workforce is an absolutely essential part of the research ecosystem and its importance cannot be underestimated. A high quality infrastructure supported by highly skilled people provides the best environment for innovation and will attract and maintain high calibre individuals within the UK R&D sector. The Government, in its response to the House of Lords report into scientific infrastructure, emphasised that skills training, including apprenticeships, will be provided for under resource funding[9]. In order to get optimal results from our infrastructure investment we must prioritise embedding the technical skills required for specialist pieces of equipment. **Funding for training and skills development must complement funding in research infrastructure**. This is also a pipeline issue; training for undergraduates, postgraduates and technicians is essential to ensure a good skills base for the future.

Operational costs

16. Operational costs must be considered within the planned long term capital investment. Without investment towards operational support of both existing and new infrastructure, equipment is likely to be underutilised and will fail to provide a good return in investment. Key operational costs identified within the House of Lords committee report into scientific infrastructure[10] include utility bills and maintenance of hardware and software.

Decision making

17. **The Research Councils are a valued source of capital investment and their funding allocation should continue to reflect this**. The framework that currently exists, with the seven UK Research Councils funding projects according to their strategic priorities, through open peer reviewed competition, is felt to be fair, even if levels of investment have not been adequate in recent years. There is a role for RCUK to co-ordinate cross-council initiatives and provide critical oversight for multidisciplinary research proposals such as Big Data projects. The Research Councils should continue to have a leadership role in horizon scanning and setting strategic priorities, using the expertise of the scientific community to identify and assess research requirements.

18. **Allocation of funds should be based on peer review and excellence, not according to region or geography**. The UK is small; campus-like in itself and although care should be taken to ensure that research is not focussed in the South East of England alone, geography should not be a determining factor for the distribution of capital. We also note the uncertainty about Scotland's position within the funding landscape after the referendum on independence; decisions may have to be made in light of this after September.

19. The economic benefits of research, whilst important, should not be the top priority when deciding on allocation of funds. A healthy capital investment portfolio is one that also benefits the wider

[9] Government response to House of Lords Science and Technology Committee report: Scientific Infrastructure (2014) http://www.parliament.uk/documents/lords-committees/science-technology/ScientificInfrastructure/GovtresponseScientificInfrastructure.pdf

[10] House of Lords Science and Technology Committee report on Science Infrastructure (2013) http://www.publications.parliament.uk/pa/ld201314/ldselect/ldsctech/76/76.pdf

science community through interaction, training, and access to resources, or provides non-economic societal benefit. **Periodic reviews could help to ensure that money has been well invested and that facilities and equipment are well utilised.**

20. The need for specialist facilities should be determined on a case by case basis depending on need and institutional expertise. Highly specialist, high cost, large equipment should be made available on a national level or internationally through collaboration. Capacity must be considered at all levels, locally to internationally, with an emphasis on co-ordination across these levels. Researchers 'at the bench' are best placed to guide these decisions.

21. There is concern that the UK may be moving away from peer reviewed competition-based funding towards a large project focus decided by Government. We support the *Haldane principle* that researchers should determine the destination of research funds rather than politicians[11]. We therefore do not recommend that this should not be delegated to a ministerial group and that where Ministerial commitments are necessary, the Research Councils and other sector bodies should be charged to advise Government.

How can we maximise the investment by collaboration, equipment sharing and industry access?

22. Resource sharing is already a mainstay within, and increasingly between, institutions. It is often initially supported by the Research Councils and external funding from the private and third sector. **Where these collaborative efforts are driven by researcher need, they often work very effectively**. For example, research groups will often seek out other groups with similar needs and work together to gain initial investment and share the maintenance and ongoing costs of new equipment or facilities. Once purchased, making resources available to other users, including those in industry and the third sector is commonplace, the aim being to recover costs and become self-sufficient.

23. Small and medium size enterprises are often dependent on access to mid-range equipment and the accompanying expertise that is available in higher education establishments. This ethos of collaboration and sharing creates significant economic benefits to both internal and external users, and draws in investment that may otherwise have been spent outsourcing services overseas.

24. Resource-sharing promotes interaction between the private and the public sectors which can then foster collaborative projects. Consortia with high quality equipment and facilities are also attractive to researchers outside the UK, fostering international links. Whilst the role of private industry is significant, it is important that the drive for these resources remains researcher and community-led, rather than being driven by market demand. Public spending in this area is thus crucial.

25. Public investment in R&D leads the way for private sector investment; a key factor in the health of the UK's research ecosystem. Schemes such as the UK Research Partnership Investment Fund (UKRPIF) that encourage strategic partnerships between Higher Education Institutions (HEIs) and other research organisations are welcome. Private companies investing in R&D are currently eligible for tax relief on their R&D expenditure; again this is welcome, as analysis suggests increasing levels of R&D in the UK has resulted from these tax incentives[12]. However capital expenditure is not usually eligible for tax credits as the investment results in business assets. This could be addressed to make research in the UK even more attractive to the private sector investors.

[11] The Haldane principle http://www.publications.parliament.uk/pa/cm200809/cmselect/cmdius/168/16807.htm
[12] An evaluation of Research and Development Tax Credits http://www.hmrc.gov.uk/research/report107.pdf

26. An efficient strategy for equipment sharing and collaboration is reliant on a mixed model. Hubs, innovation campuses, accessible equipment and equipment sharing between university groups can all play a part and all require consideration and investment where appropriate**. A co-ordinated database, with information about which facilities have been funded, such as the pan-European MERIL project[13], should be considered in order to streamline and maximise opportunities for researchers.** Similarly equipment sharing databases such as the EPSRC led website "equipment.data.ac.uk" could be better utilised. Across all models, skilled people and communication are imperative in making the most of available resources.

27. Institutions should be adequately supported so that the logistics of equipment sharing, including transaction costs and arrangements is straightforward. Lessening the VAT burden of high-end capital projects could further boost the effectiveness of facility sharing among research institutions and industry. **Current zero-rated VAT applies to certain equipment used for medical or veterinary research. This should also apply to research that has a direct impact on health and wellbeing, for example for research addressing food security and climate change issues.** Inclusion of equipment sharing within the HEFCE Research Excellence Framework might also provide an incentive for more HEIs to become involved.

28. Excellence for the UK research and development sector demands that people work together to share ideas, and are supported by high quality equipment and facilities. However **equipment-sharing should not be at the expense of continued local infrastructure funding** that researchers all over the UK are reliant on day to day. The recipe for successful collaboration and equipment sharing has to be investment from all sectors with good communication and clear governance at the heart, so that benefits can be felt across all areas of the R&D ecosystem from local to international level.

What factors should be considered when determining research capital requirement for higher education estate?

29. UK higher education institutions (HEIs) are recognised worldwide and attract large numbers of undergraduate and postgraduate students from home and abroad. This is crucial to recruiting the next generation of innovative researchers, and getting the best minds to the UK. There are significant economic benefits with overseas students estimated to contribute £10.2bn to the economy in 2011/12[i14]. In order to continue attracting the best students, institutions must be able to invest in the necessary research equipment and resources.

30. In recent years capital funding in HEI research in particular has been poor and institutions have suffered as a result, with facilities requiring updating and equipment needing renewal and replacement. Research capital requirements through the higher education funding bodies Quality Related (QR) framework should help to resolve this lack of funding. There is a need to prioritise the upgrading of research facilities within HEIs, ensuring that they are of an adequate standard and are properly equipped for day to day use. **Higher levels of investment at the front end of the spending period would be particularly welcome to replace and renew existing infrastructure**

[13] MERIL-Mapping of the European Research Infrastructure Landscape
http://www.esf.org/serving-science/ec-contracts-coordination/meril-mapping-of-the-european-research-infrastructure-landscape.html
[14] HM Government(2013) Industrial Strategy: government and industry in partnership,
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/229844/bis-13-1081-international-education-global-growth-and-prosperity.pdf

that has suffered in recent years. Subsequent renewal and replacement of equipment and facilities will be ongoing, and should be considered in funding calls.

31. Whilst public spending in this area is crucial, HEIs should continue to leverage additional funds from other sources such as the private sector where efficient. Government has a role to play in enabling these kinds of investments. There is also a need for a co-ordinated approach within HEIs so that both Research Council and higher education funding work in synergy to enhance the capital infrastructure of the institution.

32. Models for successful collaboration and equipment-sharing within institutions should be rewarded and supported by capital funding. Supporting institutions with unique facilities and expertise in specialist areas as well as those with broad research excellence will sustain a varied UK-wide portfolio and enable research diversity and quality across the sector.

Q2: What are the priorities for large scale capital investments in the national interest, including possible international collaboration?

33. Large scale projects form part of a balanced research ecosystem along with medium and smaller scale projects and infrastructure. Within this remit large European and International collaborative projects allow the UK to be involved in innovative projects which are too expensive to be funded by the UK alone.

34. The consultation document lists a number of projects and asks respondents to identify priorities, however this process should be carried out with caution, particularly as this list is incomplete. **The allocation of large project funding must be on case by case basis according to sound criteria** that we detail later in the consultation.

35. We note relevant large projects within the document as well as key projects that are absent from the list; however individual projects should be scrutinised according to the appropriate criteria and not taken at face value.

36. Whilst international collaboration currently works well on an informal basis between researchers globally, there is scope to improve co-ordination of our involvement with large projects, such as the European Bioinformatics Institute (EBI), both within the EU and more broadly. International collaboration is particularly important in tackling global challenges such as the impact of climate change, where the resources of one country alone are insufficient.

37. .Challenges such as agriculture, food and disease vary with latitude and as such could benefit from increased levels of collaboration within Europe since we are within the same climate zone. The UK currently co-ordinates only four European infrastructure projects[15] that provide a range of benefits, economically and as a source of innovation and inspiration to the next generation, as such there is scope for greater investment in this area.

[15] High Power Laser Energy Research Facility(HIPER), Integrated Structural Biology Infrastructure (INSTRUCT), Infrastructure for Systems Biology EurpoeEurope(ISBE) and Square Kilometre Array
http://ec.europa.eu/research/infrastructures/pdf/esfri-strategy_report_and_roadmap.pdf#view=fit&pagemode=none

Are the correct priorities identified for major international collaborations and are there any potential international collaboration opportunities that have not been identified?

Informatics and Big Data

38. The House of Lords report[16] into scientific infrastructure stated that curriculum changes within schools will place greater importance on digital skills to help with the skills shortfall in this area in the UK. Bioinformatics training is particularly under-resourced, and the UK must endeavour to improve skills in the existing workforce in the short term, as well as providing training at school and apprentice level for the future, if we are to continue to excel in biological sciences. Infrastructure alone will not confer national capability.

39. The importance of data management is also increasingly recognised in this age of 'big data' and open access. Computer modelling and statistical analysis is becoming increasingly sophisticated, allowing for improved prediction and interpretation of collected data.

40. Collection and interpretation of big data sets will improve understanding across the sector, resulting in benefits including improved disease modelling across species and environmental risk management. There is a need to support this age of big data with national e-infrastructure so that data sets can be curated effectively and accessed easily and quickly, including development of greater interoperability.

41. **Data accessibility and processing power are vital.** Researchers need enhanced ability to manipulate data within their institution, as well as having access to remote, higher power computing facilities, such as the Hartree Centre[17] when required, for specific projects. In order to realise the potential of big data research, high power computing must be available regionally so that technical staff can provide advice and support. Regional centres could be networked to central facilities capable of dealing with a range of data sets across the disciplines.

42. The ability to provide data, and indeed scientific publications, in an open and transparent way is also an increasing priority; appropriate infrastructure must be in place to support this. Capital investment should be provided for open access repositories, an important part of the extended accessibility required by higher education institutions[18]. Investment in newly-emerging technology is required so that we can continue to improve our ability to work with and securely store big data sets. Accompanying the increased power of big data are concerns about privacy and security; we must continue to invest in this area to promote and secure public confidence in the use of sensitive data.

Genotype to Phenotype

[16] House of Lords Science and Technology Committee report on Science Infrastructure (2013) http://www.publications.parliament.uk/pa/ld201314/ldselect/ldsctech/76/76.pdf

[17] The Hartree Centre is a facility for high performance computing supported by government and accessible to the research community to support their computing requirements: http://www.stfc.ac.uk/Hartree/default.aspx

[18] RCUK policy on Open Access (2013) http://www.rcuk.ac.uk/RCUK-prod/assets/documents/documents/RCUKOpenAccessPolicy.pdf,
HEFCE (2014) Policy for open access in the post 2014 Research Excellence Framework http://www.hefce.ac.uk/pubs/year/2014/201407/#d.en.86771

43. Bridging the 'genotype to phenotype' gap is a key project. Whilst the big data element of this project is crucial, funding for infrastructure to study the phenotype must be in place to successfully discover the effects of genetics and environment on the organism. The focus must be on the ability to study a wide range of organisms across biology, from microscopic parasites to sequoia trees and everything in between. This will require diverse facilities and equipment to cater for a vast variety of species that require investigation within the laboratory and within their natural environment. This capability has to be supported alongside data handling facilities.

Imaging

44. Imaging is a key priority across disciplines, particularly in the biosciences, as the visualisation of tissues, cells and progressively finer levels is imperative for our understanding of biological processes. Investment in analytic facilities that allow researchers to access mid-range pieces of equipment such as electron microscopes easily and on a regular basis is fundamental to ongoing excellence in research, as well as being part of the research process prior to use of more specialised equipment. Support for specialist facilities such as the Diamond Light Source, Sapphire and the Central Laser Facility is also key.

45. The development of next generation imaging technologies must be prioritised to expand capacity to image at the sub-cellular, molecular and atomic level and thus better understand organisms and how they function. In recent years levels of funding for these next generation technologies has been lower than within our European neighbours[19]. There is an opportunity to redress this within this capital investment budget and these technologies supported.

Industrial biotechnology

46. Industrial biotechnology and the derivation of material and chemicals from biological organisms have the potential to provide key energy and health solutions, including sustainable fuel production. Capital infrastructure in this area has been lagging behind project funding and as such should be prioritised. The large industrial biotechnology centres, such as Industrial Biotechnology Innovation Centre (IBiolC) in Scotland is welcome. However as these proposed centres are industry-led, it is important that regional infrastructure will support pre-commercial research in this area, and space is made for blue skies research to provide roots for future innovation.

Polar Flagship

47. The new polar flagship has been welcomed as an asset for the marine science community. Polar research has been recognised as an area of research excellence within the UK for many years and this funding will provide potential to extend and enhance the reputation and productivity of the UK in this area for years to come. It will also help researchers to respond quickly to emerging priorities within the sector.

Are there high priority projects that have not been identified within the document?

[19] RCUK Investing in Growth, Strategic Framework for Capital Investment http://www.rcuk.ac.uk/RCUK-prod/assets/documents/publications/RCUKFrameworkforCapitalInvestment2012.pdf

48. An attempt to list high priority projects comprehensively for a five year period is likely to be incomplete in the absence of determined and comprehensive cross-sector engagement in drafting. Engaging with the list post-hoc raises obvious difficulties however considering broad challenge areas, food security has not been identified within the grand challenges section and merits attention and continued funding. Secure, reliable and sustainable access to food is imperative. Currently the UK is not self-sufficient and relies on imported food to meet consumer demand. This strategy is workable under current market conditions but carries inherent risks that should be minimised. There is also great potential for economic and overseas development (including diplomatic) benefits to be derived from improvements within this sector. Whilst the UK Strategy for Agricultural Technology[20] launched in 2013 provided much-needed investment to the sector, continued capital investment is required over the next five years and beyond, to provide essential stability and an opportunity to build and develop agriculture in the UK. Time scales in this sector are long; for instance it takes ten to fifteen years to develop commercial crop varieties and that is after the initial pre-breeding stage. Sustained funding is needed if the food security challenge is to be tackled fully and this should be reflected within the "Science Capital Roadmap". Long-term data collections relating to the environment and health are also vital but this short selection of additional considerations is by no means comprehensive, and is not intended to be.

What should the criteria for prioritising projects be?

49. As funding for major projects is limited and is likely to be between £0.7 billion and £3.1 billion, the criteria for prioritising projects are hugely important. Each project should be considered on its individual merits since few criteria can be easily applied across the board to all disciplines and research areas. However there are some key factors to consider.

- Research excellence must be prioritised and projects selected on their scientific merit. International excellence and competitiveness should also be taken into account so that world leading research areas can receive the right capital funding to maintain or enhance their excellence.

- Impact (social, economic and environmental) must be considered when prioritising projects, however **blue skies research plays an important role in the research ecosystem and should have good capital infrastructure at its core**. Resource funding should also be prioritised based on researcher need. We welcome and encourage a healthy dialogue between the Research Councils and the scientific community so that needs can be identified and supported.

- Interdisciplinary research should also be supported within the capital investment framework. Bringing together different disciplines with different areas of expertise is fruitful and does not always fit within the remit of individual Research Council funding. This could be addressed.

- Accessibility of major facilities and equipment is an important factor, as these resources should support the research community hinterland as well as those working directly within it. **New facilities and equipment should be appropriately accessible to both HEIs and the private sector** in order to maximise their output, share costs and improve research capabilities for those

[20] A UK strategy for Agricultural Technologies (2013) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/227259/9643-BIS-UK_Agri_Tech_Strategy_Accessible.pdf

based outside and inside the institute or facility. Funding applications should ensure that recipients demonstrate access for all, through collaboration or hire, by a feasible and fair system. Similarly having a critical mass of people who need to use the facility will ensure that resources are used to their full capacity and with time the possibility that some facilities will become self-funding. This must be balanced with a need to support unique ventures so that specialisms can blossom. Breadth and depth of research is critical for biological sciences.

- Projects that are supported by capital funding must be sustainable. Funding should be available for maintenance and renewal so that the use of facilities and equipment can be maximised, whilst balancing the need for new technology when necessary.

- Skills and training are key to supporting a healthy research ecosystem. Funded projects should provide training either informally to staff or to the wider research community through courses and workshops.

- Planning for large projects should be considered at national level, and be considered alongside local and regional frameworks to complement existing research foci where possible or provide new innovation centres based on scientific need. It is important that this process is led by scientific community, based on priorities, need and peer review.

- Strong governance is essential for large projects. Specialist expertise should feed into the planning process from an early stage to contribute to project direction.

Should a proportion of unallocated funding be maintained to respond to emerging priorities?

50. Whilst it is likely that priorities may emerge during the spending period, we suggest that, funds should be fully allocated at the beginning of the spending period. However a degree of flexibility is required and “horizon scanning” by the research councils needs to be continued so that emerging issues are identified early and can be incorporated into ongoing plans.

The Society of Biology is pleased for this report to be publicly available. For any queries, please contact The Society of Biology Policy Team at Society of Biology, Charles Darwin House, 12 Roger Street, London, WC1N 2JU. Email: policy@societyofbiology.org

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Society for Experimental Biology
Society for General Microbiology
Society for Reproduction and Fertility
Society for the Study of Human Biology
SCI Horticulture Group
The Physiological Society
Tropical Agriculture Association
UK Environmental Mutagen Society
UK-BRC – Brassica Research Community
UK-SOL – Solanacea Research Community
University Bioscience Managers' Association
VEGIN – Vegetable Genetic Improvement Network
Wildlife Conservation Society Europe
Zoological Society of London

Supporting organisational members
Association of the British Pharmaceutical Industry (ABPI)
Association of Medical Research Charities
Astrazeneca
BASIS Registration Ltd.
Bayer
BioIndustry Association
Biotechnology and Biological Sciences Research Council (BBSRC)
The Donkey Santuary
The Ethical Medicines Industry Group
Food and Environment Research Agency (FERA)
Forest Products Research Institute
Huntingdon Life Sciences
Institute of Physics
Ipsen
Lifescan (Johnson and Johnson) Scotland Ltd
Medical Research Council (MRC)
MedImmune
Pfizer UK
Plant Bioscience Limited (PBL)
Royal Botanical Gardens Kew
Royal Society for Public Health
Select Biosciences
Syngenta
The British Library
Understanding Animal Research
Unilever UK Ltd
Wellcome Trust
Wiley Blackwell

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