Response from the University of Oxford.

Introduction.

The University welcomes the opportunity to make a submission to this inquiry and agrees that these are important issues to address.

We welcome the recent increase in the science budget and consider that this is a strong step towards the targets of 2.4% and then 3% of GDP to be spent on R&D to bring us in line with other developed nations. We hope that this is a sign of Government’s continued confidence in the strength of UK research in which Oxford plays a leading role.

There has been a continued and very welcome growth in Knowledge Exchange activity by universities as demonstrated by the data gathered in the Higher Education Business and Community Interaction Survey (HEBCIS). However, this activity is built on the heritage of world leading research that has been conducted over the last two or three decades, and if we wish to build a sustainable pipeline of the translation of these research results into the economy and society, then we must continue to invest in excellent research as much as building up our translational capabilities.

There is much excellence to be found across the UK’s university sector and the University considers that the UK’s investment in research, including translatable research, should be focused where such excellence occurs.

UK universities, including Oxford, have devoted much energy over the past few years into developing and improving their interactions with industry and so the Industrial Strategy will, we believe, enhance this further by providing focused opportunities for large scale collaborative research and development challenges which require universities and industry to work together.

The coherence and links between the Industrial Strategy Challenge Fund and the ‘sector deals’;

It is too early to comment on this as only the Life Sciences Industrial Strategy (designed to inform the shape of a sector deal) has so far been published; and there is no comprehensive, publicly-available list of the sectors that are currently working with Government towards possible ‘sector deals’.

However, from the respective descriptions in the Industrial Strategy Green Paper, it is not clear that there will always be a strong overlap between these two ‘pillars’ (although clearly in some cases there will be). The stated aim of the ISCF is to focus on areas where there is future potential for innovation to create a global market and the UK has the research strengths and business capacity to exploit the opportunity. The ISCF is therefore likely to have a strong emphasis on emerging technologies and markets.

In contrast, ‘sector deals’ are aimed at enhancing productivity and performance in sectors where the UK is already world-leading. In some instances, science and innovation will play an important role; but, equally, a sector deal may focus on action needed – by Government and industry in partnership – to strengthen supply chains, boost training and skills, or address regulatory or policy barriers.

Those sectors, and they ought to be the majority where Science and Innovation will play a major role in pushing forward the sector’s ambitions will clearly need strong links between any sector deal and the ISCF investments. However the two activities are different and the size of the interaction will vary, and must be clearly understood.
The quick work done by the Life Sciences Industrial Strategy team is to be applauded, and it is to be hoped that the government can incorporate it in the next iteration of the industrial strategy.

The model adopted by the Faraday Challenge and its suitability for future investments in other sectors under the Industrial Strategy Challenge Fund;

In advice¹ to the Secretary of State, dated 3 March 2017, the Government Chief Scientific Advisor (GCSA), Sir Mark Walport recommended that BEIS adopted a “programme of programmes” model for the energy storage challenge ‘with a view to testing its applicability for other industrial strategy challenges’. [Our emphasis]

We endorse many of the principles outlined by Walport and believe they should inform the design of other Industrial Strategy Challenge Fund interventions and investments. However, it is too early to tell whether the specific structures and governance arrangements that have been adopted for the Faraday Challenge will have the desired long-term effects. We would, in any case, strongly caution against any notion of a ‘one-size-fits-all’ model for large-scale ISCF investments: we must share good practice and learn from experience wherever possible, but the structures for each investment must be tailored according to the circumstances and market failures that apply to the field concerned.

We support the principle of a coordinated national programme which integrates activity across (application-inspired) fundamental research, innovation and scale-up; and which seeks to accelerate ‘pull through’ across Technology Readiness Levels, and from the science base to industry and to market.

We believe it is important that the leadership and governance of a national research programme is – and is seen to be – independent of any single university. Healthy competition between HEIs is one of the factors that has underpinned and strengthened the quality of the UK research base over the last 20 years. In this context, a ‘neutral’ setting is therefore more conducive to collaboration. In the case of the Faraday Challenge, this has been achieved by establishing the Faraday Institution HQ as an independent legal entity (not based at a university, but headquartered on the Harwell Science and Innovation Campus).

The HQ will receive funding from BEIS (via EPSRC/UKRI) and then manage the allocation of funding to research consortia and the delivery of the associated programmes. It acts in some respects as a small, outsourced funding agency – run by a small group of specialists from the relevant technical areas, under the leadership of an independent and internationally-respected Director who is able to command the confidence of funders, industry and scientists alike. In an environment where the BEIS delivery partner (in this case EPSRC) is only one of the funder stakeholders involved (the other being Innovate UK), there may be similar benefits in having a ‘neutral’ funding entity. It is also clear that there is a strong desire to see a more agile approach to the reallocation of funding, including ‘the power to close projects which are not delivering’ (Walport, 2017), which is a very different culture and mode of operation from current Research Council approaches. However, there are significant overheads and a steep learning curve associated with establishing and running an independent funding body. Whether it will be more efficient for UKRI to take on this role for future Industrial Strategy Challenges is a question the Committee might usefully consider.

Whatever structures are adopted, it is essential they are designed in ways that allow new initiatives to leverage existing infrastructure and capabilities within HEIs, so that duplication is minimised and

¹ The Faraday Challenge: advice from Sir Mark Walport [to the BEIS Secretary of State].
we avoid replacing one set of (institutional) silos with a different silo that is detached from the wider research base.

The GCSA’s advice notes (p.3) that: ‘Energy storage is clearly a key technology for ultimately optimising intermittent renewable energy sources and balancing the grid, but in the shorter term is of particular pertinence for decarbonising transport’. Given UK research strengths in battery science and the presence of a strong automotive sector, there was a clear rationale for making the demands of electric vehicles the initial focus of the Faraday Challenge, and for the automotive sector to play a key role in governance and in defining the challenges.

But we strongly support the recommendation that the research programme should not focus solely on industry-led challenges: strategic research objectives (e.g. sodium ion energy storage, or closed loop recycling) should also be pursued to ensure that the UK science base remains at the cutting edge of next generation technologies. The science programme ‘will have much greater potential applications than the automotive industry, particularly as energy storage demand grows’; and the GCSA expected to see the overall programme encompass wider objectives (such as grid storage) within five years. To ensure we maximise the return to UK plc – not only in current sectors, but in new sectors – it is important that the governance of Industrial Strategy Challenge Fund investments strikes the right balance between short, medium and long-term benefit. But as noted above, it is too early to assess the effectiveness of the Faraday Challenge model in that respect.

The rationale and coherence for the distribution of funding:

- between the Industrial Strategy Challenge Fund (and its individual ISCF schemes) and the rest of the Science budget;

We welcome the additional funding for the ISCF, which will provide welcome impetus in those areas identified as the current national priorities, but we would urge that attention be paid to maintaining a good balance across the system. The dual support system ensures that curiosity-driven research (which is not necessarily focused on a particular challenge or sector) is in balance with that fundamental research which it is anticipated will have particular benefits, and the more applied research which elides into development activity closer to the marketplace. Tuning the engine to improve productivity and competitiveness is absolutely necessary but we must keep putting fuel in the research tank. We must always remember that world-changing discoveries frequently come from unexpected places, and nobody can really know where they will be. Increases in funding targeted to specific challenges should not be at the expense of funding curiosity-driven research and the development of young researchers, and ideally should be accompanied by a rise in such funding through QR and responsive mode grant funding. The Industrial Strategy should not prompt a further increase in “thematic” funding within the research councils or Research England, and it is to be hoped that some of the funding made available in the current round of activity will continue to be made available through these funding modes.

In the individual programmes within the ISCF, as well as specific challenge focused activity, there should be commissioning of longer term, underpinning research in the relevant fields that is not specifically directed to solving an immediate problem – A holistic approach to tackling each challenge must be undertaken so that we aim not merely to lead the market in the short term, but to create a cadre of world leading research and people that will underpin long term dominance. We note Sir Mark Walport’s support for this approach in his Faraday review, and we note that the inclusion of relevant fundamental research in such programmes is not necessarily the same as
“picking winners”, and rather more about ensuring that the research base is sustained in the long term.

- **between the various initiatives to financially support innovation and commercialisation of research;**

Within the Science Budget, there are a variety of different mechanisms that currently support KE, innovation and commercialisation activity. Each plays a distinctive role within an overall framework that is not dissimilar to the ‘dual support’ model for research funding. These include:

- **HEIF** – flexible, core funding that supports underpinning KE infrastructure (staff, training, innovation centres, etc) and allows HEIs to address culture change and long-term strategic goals appropriate to their particular circumstances.
- **Specialist initiatives in addition to HEIF** such as the connecting capability fund designed to stimulate collaboration between HEIs.
- **Research Council Impact Acceleration Accounts (IAAs), or similar schemes** – competitive or formulaic funding linked to institutions’ portfolio of research in specific Research Council remits. Commonly supported activities include proof-of-concept, secondments or fellowships that facilitate engagement with end users of research across the research lifecycle, and other mechanisms that help to make research outputs accessible to end users.
- **Research Council Pathways to Impact funding** – available at the point of applying for research funding to support relevant activities where the likely route to impact is clear at the outset.
- **University Challenge Seed funds** – although these are historic some, such as Oxford’s continues to operate as an evergreen investment fund for pre-startup phase
- **Specialist grants with the Welcome Trust to support public engagement with research.**

These mechanisms are complementary; and together provide a funding landscape that allocates funds to HEIs based on size/relative scale of research and KE activity and the disciplinary mix of that activity. We believe that the balance is broadly right: certainly, we would not wish to see any of the funding streams disappear; nor do we think it would be an effective use of time and effort to develop an alternative allocation mechanism that balances all of the factors above.

Universities have become adept at using these funding streams to ensure that knowledge exchange is resourced across its many aspects, and it is very helpful to have the different “flavours” as they are naturally directed to different communities within universities and to different ends, encouraging a holistic approach.

The Higher Education Innovation Fund (HEIF) is particularly important in maintain the base of KE professionals who support this activity. Availability of resource for such people is one of the biggest constraints universities face in meeting the challenges of Knowledge Exchange Framework and the Industrial Strategy. Recent increases in HEIF have been very welcome and we would support a continued uplift in this strand as we seek to grow these activities.

It is vital in facilitating innovation and the impact of our research as well as promoting entrepreneurialism and engagement with businesses, including SMEs. HEIF funding has been invested by all universities in a wide range of activities from increasing public engagement with research to proof of concept investments for new technologies, to helping to secure high value new global research centres, and supporting universities to deliver entrepreneurial education to
thousands of students. Oxford is among the highest performing universities in the UK on almost all of these measures, and HEIF is a necessary ingredient for us to keep doing this.

We warmly welcome the recent easing of the cap on HEIF funding on the highest performing institutions, which allows us to do more to meet the current challenges of increasing KE. Nevertheless we recognise the value of a diverse sector in which universities with many different missions deliver KE suited to their own environments, and we continue to advocate a wide distribution of HEIF funding to enable this to happen.

We welcome the recent introduction of the Connecting Capability Fund by HEFCE to support collaboration between institutions. We are looking forward to delivering the one of the first tranches of these projects, supporting our strong collaborations in the ageing disease therapy area and we hope this fund continues. There are many successful collaborative models in existence where universities work together to generate economic benefit. Smaller and less research-intensive universities can and do access the knowledge transfer expertise and in some cases, facilities and seed/venture capital funds, within larger and more research-intensive universities.

Innovation Acceleration Accounts (IAAs) or their equivalents are managed by all the research councils. These have proved very useful in providing targeted support to specific disciplines and have a great reach into the institution, flexibly adapting to local and disciplinary needs. Academics often feel like they “belong” to a particular research council community, and so IAAs are a very good way of encouraging KE and impact generating activities by those academics who may not necessarily have engaged in them before. Although there is a good argument that conflating the IAAs would save on administration and reduce variation across the schemes, they are working well at the moment and perhaps should be retained in their current form in the next phase of the formation of UKRI.

While IAAs are unquestionably of significant value in catalysing translational activities, we would welcome ongoing review of the sectors being supported to ensure consistency of availability. For example, we have received feedback that the agri-tech sector is relatively underserved relative to medicine and physical sciences.

As with all such funding, we have suffered in recent years from uncertainty, with funds being allocated for one year only with very little certainty about the future for the employees concerned, increasing staff turnover and anxiety. In many ways the most important factor for HEIs is medium-term stability of funding – e.g. over a 3-year horizon. The route to impact is often long, and not always linear. The ability to plan beyond a 9-12 month timescale, and to support the sustained ‘pull through’ of ideas is vital if we are to maximise the benefits of the investment. We are very pleased therefore that HEFCE in particular has been working hard to announce HEIF funding as far in advance as possible, and we would encourage all research funders to do the same, acknowledging the difficulties that constrain funders in the current environment.

- between the two arms of the ‘dual support’ system—funding via the research councils and funding via Research England;

The combination of stable core funding and competitively awarded grants provided through the dual support system ensures the diversity and breadth of research in the UK. Protecting the principle of dual support is important to guard against the risks of allocating the two funding streams within one organisation. Historically, the transparent approach to costing (TRAC) was introduced in part because a significant shortfall in core funding had led to a major funding deficit in universities. Part of the reason was that over the preceding decade most new funding had been devoted to project
funding through the research councils and the “block grant” through HEFCE had remained static. Research Councils only ever paid a “contribution” towards overheads. At the same time research funding from other sources, such as charities grew alongside this and so the block grant for the “well-found laboratory” became ever more inadequate. The solution was funding for universities to keep the roof on in the short term, whilst introducing activity based costing to ensure that a greater proportion of the cost of research was recovered through grants. It is still the case that the full cost of research through grants and contracts is not recovered by universities across the country, and flexible funding through QR is required to make sure that universities continue to be going concerns.

However, this is not just about two numbers on the balance sheet. The qualitative differences between the two funding streams are what makes UK Research tick so well. QR allows universities to be flexible and agile, responding to circumstances in a way that project funding generally does not.

It should also be noted that the two arms of the system lend themselves to funding research at different timescales. Project funding focuses on PhD and postdoctoral researchers where hiring and development timescales are shorter, whereas to build up stable cadres of world class researchers requires the longer term stability that QR provides.

Increasing the proportion of funding going to project-based activities (as every new initiative tends to do) risks exacerbating the current problem of the growing gap between (increasing) project funding and (level) core funding: it is vital that increases in project based funding are accompanied by a concomitant increase in QR funding via Research England.

A part of the dual support system is the Charity Research Support Fund (CRSF) element of QR. Most charities will only fund the directly incurred costs of a research project, so the CRSF is essential to support the other indirect costs incurred by universities in undertaking this work. As the charities element of QR has been essentially flat cash since the spending review in 2010 it has not kept pace with the increasing levels of charity research investment. The CRSF allows universities to bid for, and underpin, substantial amounts of research funding from the UK’s third sector organisations that might otherwise go overseas. Indeed, over a third of publicly-funded research in the UK is funded by charities and universities’ ability to continue supporting such research is coming under severe strain. We hope that a substantial sum can be made available from the new investments promised from Government to augment the CRSF.

*between innovation and research.*

Before looking at the balance between innovation and research, it is important to consider two different types of innovation – disruptive innovation (new discoveries that have the potential to transform industries and deliver significant competitive advantage to businesses) and incremental innovation (acquisition and implementation of knowledge that is new to a particular firm (but known to others) allowing them to become more productive). Whilst there is an important role for universities and their funders to work with UKTI and business groups to ensure that as many firms in the UK as possible engage in incremental innovation, it is disruptive innovation that will, if properly managed, allow the UK to compete in the long term, even though this may sometimes be difficult for incumbents. We know that Innovate UK and UKRI appreciate this distinction and are determined to make sure that they support and fund disruptive as well as incremental innovation. In fact, we hope that the creation of UKRI will be a key factor in strengthening the link between disruptive innovation and the discovery research which underpins it.

We are content broadly that there is a good balance of funding between research and innovation, but would caution again that the apparent promise of short-term reward from innovation does not undermine the necessary funding for the curiosity-driven research that underpins it.
Although it is well known that the closer you get to market the more money is required to move a particular innovation forward, it is also true that the closer you get to the market the more the market is prepared to act. Sadly, this is less true in the UK than elsewhere where the contribution of R&D spend by companies is concentrated in a few large firms. Government intervention is most sorely needed in fundamental research and we hope that this will continue to be a central plank of government policy. Nevertheless, it is to be hoped that there will be a reaction among UK businesses as the value of collaborative research becomes clear to them through the industrial strategy.

The balance between different parts of the country in Government funding of research/innovation, the effectiveness of such place-based financial support, and how planned place-based funding might affect that balance in future;

Oxford has for several years been closely engaged with other organisations locally to drive our innovation ecosystem and find ways to enhance research and innovation activities. Many of the most innovative companies in Oxfordshire were originally spinouts from the University, and the creation of another 22 new companies last year with a combined investment up £72m shows that we are doing it on a larger scale than ever. We have led, with our local collaborators, the Oxfordshire Science and Innovation Audit and the writing of the Oxfordshire Innovation strategy. Money from Oxfordshire’s City Deal and Local Growth funds has been committed to innovation in every round and we (collectively) intend this to continue.

We are pleased, therefore to see the government taking seriously the importance of place in innovation and recognising that all universities are significant players in their local economies – even those, like Oxford, that have a significant national and international reach and brand. Of course, all regions are not equally strong and we recognise the challenge that government has of how to invest in excellence to maintain the strength of those local economies that contribute to the exchequer, whilst raising productivity across the less advantaged regions.

We welcome HEFCE’s Connecting Capability Fund which supports universities working together across the country, and we believe that such projects are potential “vectors” along which the benefits of innovation may travel. Oxford University’s work with our local authorities, Local Enterprise Partnership, local business groups and other universities and research facilities is an important part of our innovation strategy and we would welcome further resources directed at place-based collaborations. This should include both helping universities engage with their own locality, and working to connect with other localities through existing and to-be-developed collaborations.

What further measures the Government should take to use its spending and facilities to strengthen innovation, research and associated ‘place’-based growth.

For the reasons articulated above, we would welcome the continuation and expansion of the Connecting Capability Fund as an instrument to raise the tide of expertise and outputs across multiple institutions and regions, but with the focal point of a specific area of translational research and commercialisation. Such funding should allow different regions to leverage the broader KE infrastructure, while generating significant local benefits and growth.

While patented IP arising from hard science research remains the backbone for much of the UK’s HEI commercialisation activities, other forms of IP such as copyright and design rights, often from social sciences and humanities research activity are growing rapidly and can make valuable contributions
to economic growth. It is important that government develops mechanisms able to support all such activities, and that also encourage the application of, for example, social sciences, to the “hard” technology areas in the Industrial Strategy.

Oxford is, like many UK HEIs, witnessing growing entrepreneurial activity amongst the student population, both undergraduate and postgraduate, and we are responding by increasing our support via initiatives such as Enterprising Oxford (https://www.eship.ox.ac.uk/) and innovation centres for entrepreneurs and young companies such as the Foundry, launched in 2017 and the BioEscalator to open in 2018. We aim to enhance student employability through entrepreneurship, as well as create an ecosystem to support the starting and scaling of ventures that will have valuable social impact on our world. We are also developing new funding mechanisms aimed at students and early career researchers (ECRs), such as the EIT Health PhD Transition Fellowship scheme co-hosted with Imperial College, which provides pre-seed funding to PhD students in their 3rd or 4th year to pursue a commercial project based on their research. However, the amount of funding available to such ECRs remains very small, and there is huge potential to enable this highly entrepreneurial cohort to pursue commercial ideas and maximise the potential impact of their research.

Further downstream in terms of the commercialisation process is continued support for incentive mechanisms (e.g. patent box, R&D tax credits) to attract to the UK companies who are potential consumers of innovation outputs. These could be consumers of new IP, academic consultancies and/or sponsors of research. If we are to build technology clusters to rival those on the East and West Coasts of the US then we need inward investment to develop critical mass in our own ecosystems. Further potential exists to enhance “pull” from investors for technology innovations from UK universities. Although Oxford leads the UK in terms of available spinout seed capital focused on a single academic institution, there remains a challenge in accessing the large scale capital required to scale such spinouts in timeframes comparable to the US. While there will always be a disparity in scale in terms of available capital in the UK versus the US, measures to improve the attractiveness of early stage spinouts to larger generalist investors would undoubtedly help the UK build the types of mid to large scale, sustainable businesses that have in recent years been few and far between. To this end, we broadly support the recommendations of the “Financing growth in innovative firms” consultation document issued as part of the Treasury’s Patient Capital Review.