



Impact Report 2014

Executive summary

Research Councils UK (RCUK) is the strategic partnership between the seven UK Research Councils. It enables the Councils to work together more effectively to enhance the overall impact and effectiveness of their research, training and innovation activities, contributing to the delivery of the Government's objectives for science and innovation.

This report highlights the ways in which RCUK adds value to individual Research Council activities with some key activities and successes from the past year. The report also looks forward to activities that we are undertaking now, that will have impact in the future.

This year the report reflects the RCUK Executive Group's vision to ensure the UK remains the best place in the world to do research, innovate and grow business through:

- long-term investment in world-class research and innovation
- realising the full potential of the UK research and innovation ecosystem
- developing the right skills, leadership and infrastructure to fuel a sustainable economy and high quality jobs.

£3 billion in research funding per year



Looking ahead

In the next year we are going to see some exciting developments within the Research Councils. We will be fostering a closer relationship with Innovate UK, progressing new and original ways of working together, transcending joint-funding and promoting collaboration and partnership. With increased collaboration we can provide greater value for the UK economy.

The Research Councils will also be continuing to work to improve engagement between higher education institutions (HEIs) and Catapults, as recommended in the Hauser Review, to maximise the impact of funded research.

We will continue to develop closer working relationships across the Research Councils and have committed to undertake a review of the funding of both multidisciplinary research and

the Cross Council Themes in order to address barriers to innovation and ensure that we are responsive and agile in responding to emerging priorities and challenges.

2015 will see the development of the UK Intelligent Brokerage Platform with the National Centre for Universities and Business (NCUB). We will be working with NCUB to deliver a report on *Collaboration in the exchange of researchers between universities and business in the UK*.

RCUK will hold a showcase event with key stakeholders in July 2015. The event will be a unique opportunity to promote understanding and engagement with the world-leading research and innovation, which is supported by RCUK to underpin economic growth.

Research

Each year the Research Councils invest around £3 billion in research covering the full spectrum of academic disciplines from the medical and biological sciences to astronomy, physics, chemistry and engineering, social sciences, economics, environmental sciences and the arts and humanities.

We support excellent research, judged by peer review, which has an impact on the growth, prosperity and wellbeing of the UK. To maintain the UK's global research position we offer a diverse range of funding opportunities, foster international collaborations and provide access to the best facilities and infrastructure around the world. We also support the training and career development of researchers and work with them to inspire young people and engage the wider public with research.

Multidisciplinary research addressing economic and societal challenges

Research Councils invest in and support excellent research across a spectrum, from frontier and fundamental research, which can be curiosity-driven or challenge inspired, through to research motivated primarily by solving a particular problem or strategic challenge. The development of research strategies and funding programmes that are sectoral, or even cross-sectoral, present an opportunity in this context. Importantly, partners from industry, business, government and civil society engage with Research Councils across the full range of their funded portfolios of research.

The Research Councils have a long-term track record of working together to promote interdisciplinary approaches and pioneered the use of challenge-based approaches to innovation, identifying global and societal challenges around which multidisciplinary research programmes could be based. For example, the Rural Economy and Land Use (RELU) programme brought together biological, environmental and social scientists from the Natural Environment Research Council, the Biotechnology & Biological Sciences Research Council and the Economic and Social Research Council. The programme delivered numerous societal and economic impacts between 2004 and 2013¹: Its influence in the research and science policy arenas, particularly in growth of acceptance of interdisciplinarity in policy-relevant research and in a shift from a model of 'Knowledge Transfer' to two-way 'Knowledge Exchange', will continue to deliver impact in the longer term².



Novel, multidisciplinary approaches are needed to solve the big economic and societal challenges over the next 10 to 20 years. RCUK supports a culture of interdisciplinary and multidisciplinary research through all funding routes. Funding for grants, fellowships, hubs and long-term investments in infrastructure contributes to increasing capacity and realising the impact of research. The approach taken reflects the nature of the challenge and opportunities that arise.

The six RCUK Cross-Council Themes: **Digital Economy; Energy; Global Food Security; Global Uncertainties; Security for All in a Changing World; Living with Environmental Change (LWEC); and Lifelong Health and Wellbeing** are highly visible, multidisciplinary research programmes. Each Theme is outcome-focused, with knowledge generation and skills building central elements.

Knowledge and skills are central to each Theme leading to a greater potential for economic impact. Effective coordination of the programmes through RCUK has been shown to accelerate delivery of benefits and economic impact.

2014 was a year of agility and co-working for RCUK. Investments have been made to adapt to key UK needs including dementia and antimicrobial resistance (AMR). During 2015, RCUK will continue to work across a range of initiatives where there is shared interest, such as in the Cross-Council Themes, as well as in areas such as Big Data, Synthetic Biology and Connected Communities, to address prominent contemporary challenges facing both UK and global society.

We will undertake a review of the funding for multidisciplinary research with the UK funding councils, national academies and leading charities to ensure that research and innovation can be effectively supported regardless of disciplinary boundaries.

Multidisciplinary approach changes European strategy for biopesticides

Persistent chemical pesticides are being withdrawn for regulatory and safety reasons but, despite the urgent need, few biopesticides are coming to market due to regulatory barriers designed to control synthetic chemical pesticides.

RELU (2004-13) funded a ground-breaking multidisciplinary research team, led by Professor Wyn Grant at the University of Warwick, to understand the barriers to commercialising and regulating biopesticides. Biopesticides are a diverse group of pest control agents from natural sources, which can target and kill specific pests whilst being harmless to humans and beneficial insects such as crop-pollinating bees.

The researchers provided expert advice and training for UK and European regulators³ as well as biopesticide manufacturers and food retailers to aid the commercialisation of biopesticides.

Regulatory frameworks designed for controlling synthetic chemicals were adjusted to encourage biological control and integrated pest management⁴.

Food retailers such as Marks & Spencer used the research findings to revise their pesticide strategies⁵.

Interdisciplinary skills increase growth

The size of the creative economy sector is now estimated to be greater than the construction, manufacturing and financial services sectors.

The AHRC-funded Brighton Fuse project is based on a survey of almost 500 firms and interviews with 77 local entrepreneurs in Brighton's creative digital cluster. It provides a clear picture of recent developments in the creative economy as it is transformed by new digital technologies.

Fused businesses combine creative art and design skills with technology expertise, harnessing the competitive advantage of combining diverse skills and knowledge⁶.

The report found a significant correlation between higher levels of fusion and innovative outcomes (i.e. launching products and services ahead of competitors) after controlling for size, sector, firm age and even levels of growth.

The fused and superfused firms, that integrated creative arts and humanities skills with creative technical skills, had superior economic performance compared to firms that didn't integrate as extensively.

The findings show the economic value that comes from interdisciplinary integration, with arts and humanities skills leading to significant economic growth when fused with technical digital skills.

IMPACT

- Research informed EU and UK policy
- Smarter regulation reduced barriers to commercialisation
- New markets and exports for innovative products
- Food safer for human consumption
- Reduced environmental impact

IMPACT

- Integration of arts and humanities skills with STEM skills increased company performance
- Businesses that fused creative and digital skills showed significantly higher growth than others

Facilitating global research through international collaboration

The UK has an impressive and comprehensive range of mechanisms to aid collaborations with partners across the world. From lead agency policies, which remove the need for duplicate funding applications for joint research teams across two countries, to multilateral initiatives such as the European Strategy Forum on Research Infrastructure and the new Newton Fund.

In January 2014, RCUK published *Engaging in Europe* to coincide with the UK launch of Horizon 2020 (H2020), the European Union's flagship framework programme for research and innovation for the next seven years.

Engaging in Europe showcased the UK's contribution to research within Europe through

leadership and collaboration and celebrated the UK Research Councils' extensive range of collaborations with partners across Europe over the past 30 years. It also set out RCUK's vision for enhancing our engagement in Europe, nurturing established relationships to add value to national, European and global activities.

This year's launch of H2020 marks a significant step towards an integrated approach to research and innovation across Europe. H2020 is the biggest ever EU research and innovation programme, with nearly €80 billion of funding available between 2014 and 2020. The programme retains a strong emphasis on excellence, mobility and training. A greater focus on engaging with industry is intended to leverage



“ This report highlights the important role the UK plays in ground-breaking collaborative work with European partners. We want the UK to be the best place in the world to undertake research, develop new products and commercialise innovations. The new Horizon 2020 programme represents a huge opportunity for the UK and our research base to have an even greater impact. I have no doubt that our expertise will ensure that we are able to maintain this momentum, breaking new ground and retaining our position as a world leader for innovation.

David Willetts, former Universities and Science Minister

more private sector involvement than in previous programmes in order to achieve greater impact.

This year also saw the celebration of 30 years of the UK Research Office (UKRO), the UK's leading information and advice service on European Union funding for research and higher education, which was established by the Research Councils in 1984.

UKRO helps us to engage at all levels in Europe and beyond, ensuring that UK researchers have access to flexible funding opportunities, the best facilities and infrastructure, comprehensive training and career support.

UKRO has been instrumental in facilitating UK researchers' access to European funding. The UK received €6.64million, equivalent to 15.5% of the total available funding from the Seventh Framework Programme (FP7), the predecessor to

UKRO expertise helps secure funding

UKRO provides significant support to the FP7 European Research Council (ERC) and Marie Skłodowska-Curie Actions (MSCA) schemes through its subscriber services and National Contact Point helpdesks. The helpdesks assist applicants and grant holders from the UK to access the ERC and MSCA funding schemes.

The ERC complements other funding activities in Europe such as those of the national research funding agencies. The MSCA's objective is to support the career development and training of researchers, with a focus on innovation skills, in all scientific disciplines through worldwide and cross-sector mobility.

The UK ranks second only to Germany in winning FP7 funding.

€1.57 billion has been awarded to UK participants through the ERC and around €1.01 billion from the MSCA, equal to almost 39% of the UK's total FP7 research income.

H2020, which ran between 2007 and 2013.

The UK academic community was particularly successful, winning 10.9% of the total FP7 funds.

RCUK is one of several UK delivery partners for the Newton Fund, which is part of the UK's official development assistance. The Fund aims to develop science and innovation partnerships that promote the economic development and welfare of developing countries. It will deliver £375 million of funding over the course of five years.

RCUK will be working with partner countries to develop a series of research activities which address challenges affecting developing countries around the globe. Commitment to the partnership will be further demonstrated by matched resource from partner countries, bringing substantial added value. Additional leverage may be achieved through private foundations, multi-lateral organisations or corporate partners.

RCUK is an active member of the G8 Heads of Research Councils' (HORCs) Multilateral Research Initiative, which was established in 2010. The initiative aims to support excellent research on topics of global relevance which are best tackled by a multinational approach. The initiative also promotes inter-agency cooperation and planning, and provides an opportunity for partner organisations to gain experience in the funding of multilateral research.

The RCUK Strategy Unit conducted a follow-up survey for the first two calls: Exascale Computing and Sustainable Manufacturing. According to the survey results, the initiative has had excellent impact at the researcher level. Ninety-three per cent of respondents to the applicants' survey reported that the initiative had encouraged them to consider collaborating with researchers from countries they had not previously worked with, and 79% said they have plans to partner with G8 countries in future research, either individually or multilaterally, as a direct result of this experience.



Multilateral funding helps researchers access the best resources

Exascale computing will be needed in order to push the frontiers of science and technology for future research, particularly in computing hungry applications such as healthcare, energy, and finance. Exascale computing systems will be capable of at least one exaflop: a billion, billion calculations per second. Today's most advanced computer systems are in the petaflop range, performance will need to be increased by a factor of 1,000 in order to reach the exaflop scale and address future research challenges.

Nu-FuSE, an international programme funded through the G8 Multilateral Research Initiative, was able to significantly improve computational modelling capabilities needed to address the key physics challenges of a new generation of systems in the journey towards fusion power:

"We found that the stability of the plasma in a fusion device gets better as the device gets bigger; and we showed how nanotech materials can withstand radiation for much longer than

conventional steels. These discoveries are a great boost to the future development of fusion power. The multilateral nature of the G8 funding initiative was a very high profile project that uniquely enabled international access to resources and policy/strategy forums that would otherwise not have been possible. Our research could not have been conducted in a single country or through just a bilateral agreement because this G8 Nu-FuSE project made highly productive use not only of leading multi-national supercomputing platforms (e.g., US, Japan, Germany, UK, etc) but also benefited from cross-disciplinary R&D advances enabled by this multi-national partnership. These benefits would of course have been lost in the absence of the G8-enabled multilateral High Performance Computing programme."

Professor Graeme Ackland, University of Edinburgh, NuFuSE Project Leader

IMPACT

- Collaboration enabled access to the best computing resources
- International access to expertise and skills through Knowledge Exchange

Public engagement – bringing contemporary research to life

Part of our Royal Charter is a mission to engage the public with research. RCUK believes that engaging the public with research helps empower people, broadens attitudes and ensures that the work of universities and research institutes is relevant to society and wider social concerns. The *RCUK Public Engagement with Research Strategy*⁷ seeks to have a lasting impact through creating a culture whereupon public engagement is regarded as an important and essential activity by the research community. RCUK funds a programme of work to deliver this overarching aim.

By involving and listening to the public, and encouraging our research communities to do the same, our decisions and research are informed by their views. By talking with the public about the potential outputs of our research, and their implications and applications, society will share

in the benefits of that knowledge, whether it be regarding health, wealth or culture. By encouraging researchers to interact with schools and young people, to enrich their learning experiences, we can help improve the supply of skilled people coming in to the research base and the UK economy, and encourage more to act as informed citizens.

In 2008, RCUK, the UK funding councils and the Wellcome Trust, invested in the Beacons for Public Engagement, an initiative intended to support, recognise, reward and build capacity for public engagement work across the UK and enable a step-change in recognition for public engagement across the higher education sector. There were six Beacons around the UK and one National Coordinating Centre.



By 2013, 14 of the 15 HEIs involved with the Beacons project had chosen to continue investing in the work of the Beacon – a key indicator of success. Culture change has also been evidenced at the Beacon HEIs with staff increasingly aware that a public engagement approach can benefit their careers. Key areas, in which the impact of the investment in culture change has led to long-term impacts, cluster in the following areas:

- Beacon teams have supported successful research applications by bringing a public engagement perspective to research projects and to funding applications more broadly. This has diversified funding sources, drawing funding from the voluntary sector and the wider public sector, such as the Heritage Lottery Fund.
- New forms of engaging the public with research have been developed and practised across the UK, with some evidence of influence on science communication in other countries.
- Beacon HEIs are better connected to policy-making and in projects that help to connect the public to policy-making.
- Beacon HEIs are also better connected to their local communities, with some initiatives helping to widen access to higher education.
- Staff and students are benefiting from public engagement training, evidenced by an increase in demand for the training, while students also have more volunteering opportunities.

Following on from the Beacons initiative, RCUK recognised that further support to embed public engagement in the higher education sector was required. In 2012, eight 'Catalyst' grants were awarded to continue to create a positive culture for public engagement embedded within policies, procedures and practices.

Early indicators of Catalysts' impact are very positive and they have facilitated the culture change, needed to embed public engagement with research within their institutions, more quickly than the pilot Beacon HEIs. The Catalysts have also had a substantive role in supporting researchers to include public engagement in the Pathways to Impact element of their grant

applications and are sharing their learning with the wider higher education sector.

A parallel strand of RCUK Public Engagement with Research investment has been developed in helping to support researchers and schools to work together. The RCUK School-University Partnerships Initiative (SUPI) aims to create structured and strategic mechanisms for HEIs to partner with secondary schools and further education colleges over three years. This scheme currently engages with 278 schools across the UK, via its funding for 12 HEIs, and is already impacting on the culture of all partners involved by developing a step change in the way that schools and universities work together. The schools involved reflect a diversity of backgrounds and abilities. One area where involvement in the project has had direct impact is in developing teacher confidence on topics which teachers find difficult e.g. evolution. There is already evidence that the project is raising pupil aspirations about going to university and teachers have stated that it is just what they need to inspire pupils.

“ RCUK investment in school-university partnerships is enhancing young people's experiences of contemporary research to improve their learning and raise their aspirations - it is exciting that this initiative is finding best practice in schools and universities that can be embedded for this and future generations.

*John Holman
Emeritus Professor of Chemistry at the
University of York and Senior Education Adviser
to the Wellcome Trust*

Maximising efficiency in UK research and innovation

In order to sustain the UK research base, funding given to HEIs and our own institutes must be efficiently used. This means driving down the costs and overheads of research whilst maintaining and safeguarding the excellent research for which we are renowned. Following the Wakeham review⁸, RCUK set out its plans to make the savings required to protect research as a vital resource for the future. All funds saved through Wakeham are re-invested in science and research.

The cumulative savings, for the first three years of the Wakeham Efficiency Programme⁹, are £283 million. RCUK is on target to deliver the total £428 million of combined savings from grants and institutes over the current spending review period.

Following the recommendations in the Wakeham review that 'greater intensity of utilisation of assets by HEIs should be encouraged, particularly the sharing of research equipment and facilities' there has been considerable activity in this area. In particular, as noted in the N8 report *Making the Best Better*¹⁰: Capital budgets are being utilised more effectively, primarily through creating clusters of excellence and sharing equipment. This is delivering state-of-the-art facilities, enabling new

science and better equipment and expertise for business.

RCUK is working with the research base to encourage more intensive utilisation of assets and equipment. Following RCUK's publication of the national guidelines for equipment funding in 2011, RCUK has supported institutions in a number of initiatives. One example is the UK HE Facilities and Equipment Sharing Network (UNIQUEIP), which was funded by the Engineering & Physical Sciences Research Council (EPSRC) to develop methods to pool resources and support the creation and exchange of standards for the description of research facilities and equipment.

Incentivised by the policy changes, UK universities have established various formal equipment and sharing groups which have catalogued several thousand items of equipment. The website www.equipment.data.ac.uk allows users to search for research equipment and facilities that are available from UK HEIs. This results in capital budgets being utilised more effectively, delivering state-of-the-art facilities, enabling new science and better access to equipment and expertise for business.



Innovate

The Research Council portfolio is a crucial part of the Government's investment in UK innovation.

RCUK supports the UK's innovation ecosystem through all stages, from excellent discovery research to business innovation and growth. Collectively, RCUK contributes to innovation through developing tools such as Gateway to Research, as well as working with key partners such as Innovate UK to invest in programmes such as the Catalysts and Catapults that translate research into business opportunities. We are building on the success of the Impact Acceleration Accounts and the research and innovation campuses to support businesses, meet societal challenges and deliver economic growth.

Making research accessible to all

RCUK is committed to ensuring the maximum exploitation of the research we support. We are leading work with key partners to make sure that information on current research projects, sources of research capability and outcomes data are fully accessible in order to achieve this.

RCUK has delivered a single system for collecting research outcomes and the *RCUK Policy on Open Access* and system tools such as Gateway to Research are making these outcomes available and accessible to businesses, the public and other researchers.

RCUK is the first research funder in Europe to implement a single system for gathering details of research outcomes across all research disciplines. RCUK is now using ResearchFish to collect structured information on the outcomes from all Research Council funded projects. Grant holders can highlight their achievements and, in turn, RCUK can use this information to better understand the impact of research funding and strengthen the evidence base for research investment strategies in the future. From 2014, all Research Councils operate under a common data model in order to improve the accessibility of information and to harmonise processes.

Gateway to Research informing decision making for business

ORCID¹¹ is an open, not for profit, independent organisation that provides a registry of unique and persistent researcher identifiers and a transparent method of linking research activities and affiliations to these identifiers. In February 2014, the ORCID organisation expanded their Researcher Identifiers to include awarded grants information.

ÜberResearch¹² is a leading provider of software solutions focused on helping funding organisations, not-for-profits, and governmental institutions make more informed decisions about science funding.

In February 2014, ÜberResearch contributed the ÜberWizard and their grants database to support ORCID. The ÜberWizard allows researchers to easily search and add awarded grants data from over 60 funders, representing over \$600 billion of historical research. One of the most prominent sources of data for ÜberWizard is supplied through Gateway to Research.

Christian Herzog, CEO of ÜberResearch explains: "The Gateway to Research initiative is an enormous benefit to the academic, private, and government funding organisations that support ORCID. These groups currently struggle to identify, track, and manage their research activities. Having better and more consistent shared information allows all organisations to make more informed decisions and to advance science. It also helps us to pair up research publication and grant awards data to assess the relationships between funding and research outputs. And this is just the beginning. With standardised and more comprehensive shared data, we can help academic organisations to identify gaps and opportunities in their research. We can help a grant funder to reduce duplication in their research efforts. We can help a government agency to ensure that they are promoting and positioning research that is truly unique and novel. And we can help private foundations and small funders to better understand the relevant research landscape and the associated players. We believe this is a fantastic new frontier of scientific research innovation."

IMPACT

- Makes research outcomes and expertise accessible to business
- Allows assessment of the relationships between funding and research outputs
- Helps organisations to make more informed decisions about research funding



Gateway to Research has been in operation for a year. It provides access to information on over 40,000 research projects and over 30,000 academic experts through a single, web-based portal funded by all seven Research Councils and Innovate UK. The portal enables exploration of the entire breadth of research across all disciplines and industry sectors.

Gateway to Research will be linked to the NCUB intelligent brokerage platform in order to facilitate business access to higher education.

The UK is at the forefront of the global drive towards Open Access. The Research Councils, the Higher Education Funding Council for England (HEFCE) and the European Commission are implementing policies to expand quick and free access to the results of publicly funded research. Other countries are beginning to do the same.

The Global Research Council (GRC) has endorsed an *Action Plan on Open Access to Publications* and established an international GRC Working Group. This group has been mandated to further the analysis of the consultation results and to articulate recommendations for future actions.

Publishing enables researchers to build on the work of others, scrutinise and refine their results, contribute additional ideas and observations, and formulate new questions and theories. Publication is crucial to the modern research process but publications also contribute to business and feed into broader society where research findings are exploited in a multitude of ways. Open Access enables wide and informed feedback into research itself. As well as speeding up the search for information and ideas, Open Access can improve connections between research and innovation in policy, services, and economic growth, and thus increase the returns on the investments made in research, especially those from public funds.

As part of this process of adaptive development, RCUK is carrying out an early stage independent review of its Open Access policy to understand how implementation is progressing. The review is considering the policy's effects across different disciplines and the challenges and opportunities that have emerged from it. It is looking at the developing international policies and is inviting evidence from interested parties. It is chaired by Professor Sir Bob Burgess, Vice Chancellor of the University of Leicester.

Working for impact

As well as listening and responding to the community to review our own policies, RCUK is working with other key partners as part of the impact agenda, such as the Department for Business, Innovation and Skills (BIS), Innovate UK and HEFCE, to review the whole impact policy landscape as part of an 'impact stocktake'. This review will be the first to include the policy instruments of all partners. The first report from this exercise is planned to be published in early 2015 and will be used to inform future decisions regarding the ways in which we support impact across the landscape.

In 2014, RCUK worked with the research community to review its own approach to Pathways to Impact. RCUK requires researchers at the proposal stage to consider actively how they will achieve excellence with impact and to consider potential pathways for realising these impacts¹³.

This approach has had positive effects in the community to increase impact, encouraging researchers to think about potential impact from the outset and research organisations to reflect the impact agenda in their missions. Driven by RCUK policy, this culture change is helping to ensure that new ideas are carried through to beneficial outcomes.

The Tera Allas report, *Insights from international benchmarking of the UK science and innovation system*, found that "Research Council supported researchers are more likely to engage with commercial users and generate impact (for a number of measures)."

The RCUK review of Pathways to Impact policy and processes has focused on minimising the barriers to realising the impacts of research and reinforcing the message to the community that they should be considering the potential economic and societal impacts of their research, and identify pathways towards realising these as part of their application. The outcomes from this review will be published in early 2015.

The RCUK User Satisfaction Survey is a biennial



survey of non-academic users of research outcomes. The survey, which was first undertaken in 2007, seeks to understand the extent to which users' needs are being met and to evaluate their experiences of working with universities and the Research Councils. The 2014 survey will be published early 2015. The online survey was completed by 599 users and in-depth telephone interviews were conducted with a sub-set of 120 users. Areas for improvement are reviewed and actions taken as needed.

In 2014, the Research Councils were present, in numerous capacities, at innovation events across the UK. Attending events, speaking and exhibiting at conferences and providing sponsorship where there was an opportunity for RCUK to support our innovation partners and engage research users.

In June, we attended and supported, along with the Welsh Government, the Praxis Unico Conference in Cardiff. The conference was an excellent opportunity for commercialisation professionals to meet and exchange views and experience.

At the beginning of November, we took an active role at the Innovate 2014 Conference, with our large stand showcasing exhibitions of RCUK supported innovations, and speaker sessions attracting many people to engage with us. This was a great opportunity for RCUK to display our significant contribution to innovation in the UK. The conference, which was attended by more than 2,000 attendees on each of the two days, was a hive of networking with guests mingling with speakers, exhibitors and each other.

RCUK and Innovate UK working in partnership

RCUK is continuing to work with Innovate UK to develop our partnership, recognising the many benefits of working together in a true, strategic partnership which goes beyond joint funding.

We recognise that research and innovation is at the heart of the UK's future success and intend to build on the recommendation of Sir Andrew Witty's review, which stated that "all of the various Government organisations with innovation support roles should assess what more they can do to achieve an overarching commonality of purpose in supporting the Industrial Strategy and local growth".

While Innovate UK and the Research Councils each have their skills, expertise and objectives, there is a large area within which we have shared goals, and where we have the potential to deliver more through collaboration and partnership than we can separately. RCUK and Innovate UK have therefore developed a set of shared goals and objectives which encompass areas of common interest and activity.

In 2014 we have begun to develop a shared agenda and investment approach to address the challenges of urban living. This is a pilot programme to turn a grand challenge into business opportunities. From obesity to urban climate change, these challenges will require a truly integrated approach to research translation and commercial application.

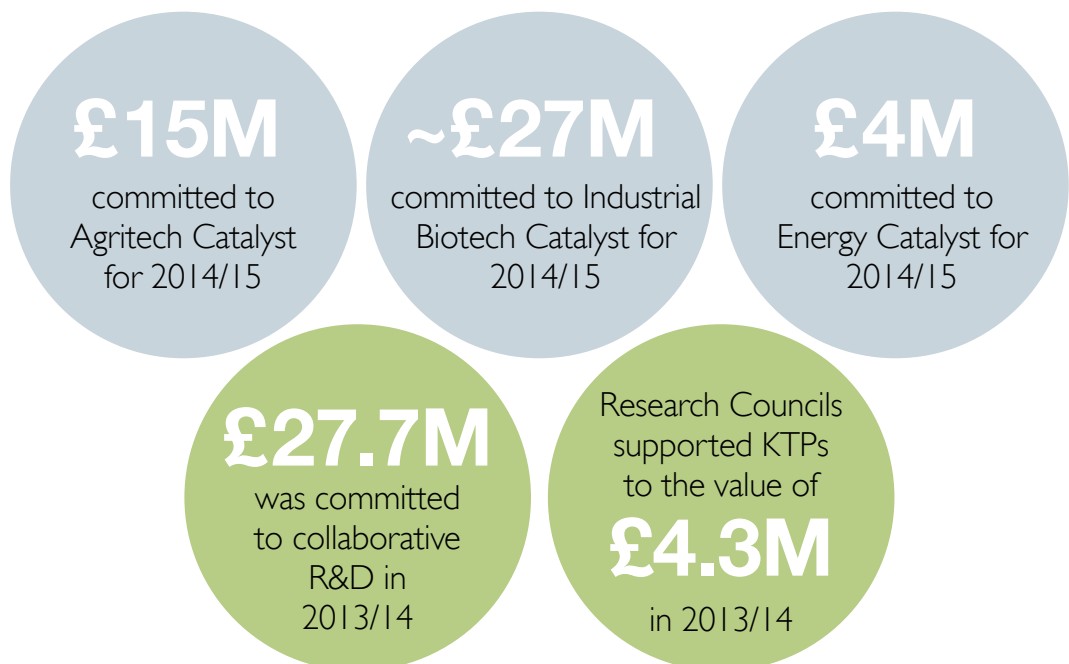
RCUK and Innovate UK will deliver UK economic growth by enabling an innovative, high value, knowledge-based economy with high productivity.

Our shared objectives are:

- rapid commercialisation of ideas arising from research
- developing a well-educated and absorptive workforce
- growing an innovative and absorptive business community
- turning grand challenges into business opportunities.

RCUK contributions to joint programmes with Innovate UK

Three new Catalysts, Industrial Biotech, Energy and Agritech were launched during 2014.



Grow

To maximise the impact of research on economic growth and societal wellbeing, we work in partnership with other research funders including Innovate UK, the UK higher education funding councils, business, government, and charitable organisations.

We engage with business, industry and other users in order to enable their involvement with the research base and to ensure that outputs and outcomes from investment in excellent research and skills are being taken up.

Working across all sectors, the Research Councils broker business access to the research base and to research knowledge. Over 2,500 businesses, at least 1,000 of which are SMEs, are collaborating with researchers on RCUK grants at any one time.

We support business-partnered research, innovation and translation programmes in both responsive and strategic mode. We broker access to scientists, data and skills to translate existing knowledge into the development of new policies, products and services.

Researchers' skills helping businesses grow



A new report soon to be published by RCUK shows the vital importance of doctoral graduates to the business sector.

The Impact of Doctoral Careers is an in-depth report which confirms the crucial role doctoral graduates play in UK businesses. The report states that over three quarters of employers believe that the loss of doctoral graduates would have a major impact on their business and one in five seeing doctoral graduates as 'business critical'.

Doctoral graduates also improve the effectiveness of their colleagues, with the vast majority having contributed to improving problem solving and creative-thinking in others.

The report, funded by RCUK and HEFCE, was based on a study commissioned with the social research company CFE Research. It aimed to understand the economic, social and cultural impact that doctoral graduates had on the organisations they worked in. The study also investigated the types of careers graduates pursued over a seven to nine year period. The report extends our understanding of the contribution of doctoral graduates to innovation and the wider economy.

For example:

- A large majority of the doctoral graduates surveyed (93%) have been involved in developing new knowledge or understanding (which underpins innovation); most of these (92%) said their doctorate was vital or important to their contribution.
- Their specialist knowledge supports the creation of new or improved products, especially in research and development, and manufacturing and engineering sectors.
- Doctoral graduates contribute to the absorptive capacity of their employers by enabling links between knowledge generation and application as they have the contacts and credibility to forge effective links with higher education; three quarters of the graduates surveyed had been involved in collaborative projects between universities and industry.

“ At RCUK we are fully aware of the positive influence that doctoral graduates can have on any organisation and this report demonstrates extremely well the beneficial impact that people with such talent and acumen are having on UK businesses.

Professor Rick Rylance
Chair of RCUK

Investing for growth in the UK

In 2012, RCUK published *Investing for Growth: Capital Infrastructure for the 21st Century*, a framework addressing the UK's research investment needs to develop an underpinning national infrastructure and guide capital investment.

The framework has ensured that RCUK supports the UK's capability for excellent research and technology development and supports the UK in maximising its innovation potential and driving economic growth.

Additional funding has been received in order to underpin the key areas for capital and infrastructure investment identified in the framework:

- £600 million funding for research and innovation was announced in the 2012 Autumn Statement
- Capital investment for science and research was also increased to £1.1 billion for 2015/16.

We will shortly publish *Investing for Growth II* which articulates the RCUK vision for skills needs. RCUK plays a critical role in the development of a highly innovative, excellent UK research workforce as part of a dynamic system. *Investing for Growth II* will highlight how the Research Councils' investment in skills is pivotal to the UK's future growth. The framework makes the case that, without investment in talent, the UK will not be able to foster growth and innovation essential to our success in a 21st Century economy.

Innovation improves health and safety performance

An RCUK-funded doctoral graduate, along with other colleagues, has helped develop a software tool to measure safety culture in organisations.

The tool was compulsory on the Olympic Park as part of the legacy programme to ensure that construction companies were operating to the highest possible health and safety standards.

The tool has now been developed into a commercial product that is sold around the world.

The graduate was described by the government agency who employed them as the 'intellectual engine' behind the innovation. This example shows the way an immediate benefit for an employer, in this case a revenue stream, can have knock on benefits for other organisations and wider society, in this case improved health and safety.

Working with business

RCUK engages with business, industry and other users to ensure that the outputs of the research and training we support are fully exploited, maximising the impact on economic growth and societal wellbeing.

We facilitate business involvement with the research base and broker access to scientists, data and skills to translate existing knowledge into the development of new policies, products and services.

The Research Councils recognise the need for a simple interface to enable businesses to work with us. This year RCUK has published *Research & Business: a productive partnership*, which highlights why business should work with the Research Councils and why we are committed to engaging

with business. We have agreed a set of principles, for working together across the Councils, to help us engage with business where a collective approach will be beneficial.

“ This exciting partnership between academic researchers and industry is a valuable asset for the UK. It provides skills that can develop careers and drive ideas into products, and offers early career researchers a real advantage in a business environment.

Malcolm Skingle
GSK Director

Enterprise Research Centre

The Enterprise Research Centre was established in 2013 to answer the central question 'What drives SME growth?' Co-funded by ESRC, BIS, Innovate UK and the British Bankers Association, the centre, led by Steve Roper from Warwick Business School is a collaboration between a number of universities.

The Centre aims to bring together the evidence base on SMEs and enterprise, working with both policy makers and practitioners. The benefits of the co-

funded partnership mean that the centre is linked directly into both the policy world, through BIS as well as business and industry, through Innovate UK and the British Bankers Association, enhancing the potential for impact.

The added value of ESRC funding ensures that the centre has a strong reputation for high quality academic research. An exemplar output from the centre is the Local Economic Partnership Growth dashboard, a comprehensive document that aims to provide each Local Enterprise Partnership (LEP) with a set of simple metrics on the growth of existing firms and start-ups in the LEP area¹⁴.

IMPACT

- Links policy evidence and industry to help inform decision making
- Dashboard provides metrics to monitor growth

RCUK engages with and funds multiple vehicles for the translation of knowledge and skills into products and services which have the potential for economic and societal impact.

A key part of the Government's Industrial Strategy is supporting technologies which the UK has the depth of research, expertise and the business capability to develop and exploit commercially. In 2012, the government announced the investment of £600 million to support the Eight Great Technologies: big data, space, robotics and autonomous systems, synthetic biology, regenerative medicine, agri-science, advanced materials and energy. Investment in these technologies is intended to provide a stimulus which will accelerate their commercialisation.

RCUK has made a long-term commitment to the funding of the four research and innovation campuses at Babraham, Daresbury, Harwell and Norwich¹⁵ which play an essential role in the UK Government's Innovation Strategy; co-locating internationally leading research capability with business incubation and support. These campuses deliver research innovation and growth for the UK by fostering significant business and commercial activity, attracted by the substantial research capabilities, facilities and technical expertise on the campus. These resources act as focal points for national innovation in their fields, for example AstraZeneca recently re-located its headquarters to Cambridge in order bring researchers closer to the globally recognised bioscience cluster:

From the work of IBM on the STFC Hartree super-computer to enable Unilever access to sophisticated modelling of next generation detergents through an iPad, to the seven stages of business accommodation required to accommodate the growth of Eagle Genomics, a start-up nurtured through Babraham, the campuses are enabling business growth from the micro, to the global and multinational brands.

Campus creates business opportunities and jobs

A joint venture between STFC, Halton Borough Council and property development specialists Langtree, Sci-Tech Daresbury enables even the smallest start-ups to work side-by-side with successful and influential international companies.

Sci-Tech Daresbury is home to over 120 science/research organisations and high-tech businesses employing over 500 people. The companies vary from start-ups to more mature SMEs to international corporates such as IBM and Perkin Elmer.

The campus has developed strong clusters in several fields including:

Advanced engineering and materials
Biomedicine
Digital/ICT
Energy
Environment
Security

The location on campus alongside world-class science facilities and organisations is playing a key part in helping companies to thrive. The facilities and capabilities based at STFC's Daresbury Laboratory are a vital component of the campus, enabling companies to create jobs, gain investment and develop new, innovative products.

IMPACT

- **Creating jobs**
- **Co-locating businesses with research facilities to promote innovation and growth**



Long-term commitment delivering innovative products

The Research Councils invest in research in the UK for the widest possible economic and societal benefit¹⁶. A 14-year partnership between The Babraham Institute and AstraZeneca has contributed to the development of new drugs to treat cancer and new clinical practices in the use of anti-cancer drug combinations.

Researchers at The Babraham Institute, which receives strategic funding from BBSRC, have used their expertise in the signalling pathways that control cell survival and cell division to help AstraZeneca (AZ) develop anticancer drugs targeting these pathways. This was made possible by BBSRC's award of a rolling programme of grants to Babraham for fundamental biology research and infrastructure.

By testing the efficacy and selectivity of potential drugs, Dr Simon Cook and his team at Babraham have saved AZ valuable time and money. This has supported the development of Selumetinib, an anti-cancer drug which is now in phase III clinical trials.

Collaboration with Babraham has been of significant strategic value to AZ in increasing their competitiveness in this market. In 2011 AZ contributed £3.8 billion total Gross Value Added to the UK economy, and in 2012 accounted for 1.8% of total UK goods exports.

IMPACT

- Informed clinical practice regarding anti-cancer drug combinations
- Increased AstraZeneca's competitiveness in the £46.7billion (\$77.4billion) global anti cancer treatment market
- Secured substantial industry funding for health research.
- Trained project managers for UK industry

Catapults are physical centres where businesses, scientists and engineers work side-by-side on late-stage research and development, transforming high potential ideas into new products and services. The first seven Catapults funded by Innovate UK and supported by RCUK are now open for business. These are in the areas of High Value Manufacturing; Cell Therapy; Offshore Renewable Energy; Satellite Applications; Connected Digital Economy; Future Cities; and Transport Systems. Total public and private investment has exceeded £1.4 billion in their first five years of operation. We are already seeing the emergence of joint projects e.g. between the Connected Digital Economy, Future Cities and Transport Systems Catapults relating to Big Data. Following the recommendations of Herman Hauser's review, RCUK will continue to work with the catapults to improve engagement between HEIs and the Catapults, to maximise the impact of funded research.

Innovation and Knowledge Centres (IKCs) are another key component of the UK's approach to the commercialisation of emerging technologies, through creating early stage critical mass in an area of disruptive technology. They are able to achieve this through their international quality research capability and access to companion technologies needed to commercialise research. Based in a university, IKCs are led by an expert entrepreneurial team. While continuing to advance the research agenda, they work with industry to achieve significant economic impact, generate wealth for the companies, produce skilled workers and create jobs.

Catalysts are another area of fruitful collaboration between Innovate UK and the Research Councils. The Catalyst model supports projects in priority areas where the UK research base has a leading position and where there is clear commercial potential. The goal is to take projects from research to as close to commercial viability as possible. Three new catalysts have been launched this year in partnership between Innovate UK and the Research Councils with a total budget of £46 million for FY 14/15.

Integrating university and industry based research for innovation

Synthetic Biology is one of the eight Great Technologies. Many researchers, policy makers and governments are anticipating that it will provide a range of benefits to society in sectors such as human health; agriculture and food production; environmental protection and remediation; bioenergy and chemical production.

SynbiCITE is a new £10 million Innovation and Knowledge Centre (IKC) based at Imperial College London that will act as an Industrial Translation Engine, integrating university and industry based research in synthetic biology into industrial process and products.

The Centre will be a national resource involving researchers from a further 17 universities and academic institutions across the UK, as well as 13 industrial partners, including the research arms of Microsoft, Shell and GlaxoSmithKline.

SynBICITE is funded by EPSRC, BBSRC and Innovate UK. It has received grant funding of £7.5 million, with a further £2.5 million to be awarded over the next year.

Professor Richard Kitney, co-director of SynBICITE from the Department of Bioengineering at Imperial, said:

“Synthetic Biology could be the next ‘industrial revolution’ for the UK, where tiny devices manufactured from cells are used by us to improve many facets of our lives. From producing new, more sustainable fuels to developing devices that can monitor or improve our health, the applications in this field are limitless.”

Catalyst funding helping projects bridge the valley of death

A new device being developed with the help of funding from the Biomedical Catalyst could help to prevent the pain and discomfort experienced by thousands of amputees as a result of poorly fitting replacement lower limbs.

Researchers at the University of Southampton are developing a prototype of the world's first prosthetic 'intelligent' liner with integrated pressure sensors. The technology, which is being developed initially for amputees who suffer rubbing against their artificial limbs, could be available to NHS patients in as little as three years.

The sensors for the device, invented by Dr Liudi Jiang and her colleagues, measure the pressure and pulling forces at the interface of a patient's stump and the socket of their prosthesis. Unlike existing technology the sensor can detect rubbing as well as downward pressure. The information gathered from the sensor will allow adjustments to be made to prostheses preventing the development of sores resulting from excess pressure.

The team are working with leading British prosthetics firm Chas A Blatchford & Sons to help fine-tune the design and develop the

sensor into a range of prosthetic liners to fit sockets of any shape or size.

Many innovative technologies and products fail to bridge the funding and resource gap known as the 'valley of death' between basic biomedical research and clinical development. The Biomedical Catalyst, run in partnership between the Medical Research Council (MRC) and Innovate UK, supports the development of innovative medical therapies and technologies in academia and small and medium-sized enterprises. The Biomedical Catalyst and Blatchford & Sons have jointly committed over £1 million to the project.

Dr David Moser, Head of Research at Chas A Blatchford & Son Ltd, who are partners of the research project, said: "This is a tremendously exciting project which has the potential to transform socket technology as a whole in lower limb prosthetics. We anticipate that from the development of this technology we will reach a new level of understanding and uncover the as yet unclear 'dynamic' qualities of limb loading and socket fit. This step is crucial for the development of the next generation of socket technology products and future artificial limb controls."



IMPACT

- Catalyst funding leveraged private investment
- Helping innovative projects to reach the market

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Research Councils UK

Polaris House
North Star Avenue
Swindon, Wiltshire, SN2 1ET

communications@rcuk.ac.uk

www.rcuk.ac.uk