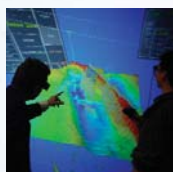




EXCELLENCE WITH IMPACT





The UK Research Councils

► The seven Research Councils are the UK's biggest public funders of cutting edge research. We support research, training and knowledge transfer in everything from architecture to zoology and support world-class large-scale research facilities. We also promote public engagement in science, engineering and technology. We work in partnership with other research investors including government departments and agencies, charities, industry and the European Commission. Our collaborations extend across disciplines, organisational boundaries and the world. We work together through Research Councils UK, the strategic partnership of the Research Councils. The Research Councils are independent public bodies funded principally through the UK Government's Science Budget, which is administered by the Department for Innovation, Universities and Skills.

The economic impact of the research base is important to the future prosperity and wellbeing of the country. The knowledge and expertise gained through our investment in people and innovation allows the UK to maintain a technological leading edge, build a strong economy and improve quality of life for its citizens.

- ARTS AND HUMANITIES RESEARCH COUNCIL (AHRC)
www.ahrc.ac.uk
- BIOTECHNOLOGY AND BIOLOGICAL SCIENCES RESEARCH COUNCIL (BBSRC)
www.bbsrc.ac.uk
- ECONOMIC AND SOCIAL RESEARCH COUNCIL (ESRC)
www.esrc.ac.uk
- ENGINEERING AND PHYSICAL SCIENCES RESEARCH COUNCIL (EPSRC)
www.epsrc.ac.uk
- MEDICAL RESEARCH COUNCIL (MRC)
www.mrc.ac.uk
- NATURAL ENVIRONMENT RESEARCH COUNCIL (NERC)
www.nerc.ac.uk
- SCIENCE AND TECHNOLOGY FACILITIES COUNCIL (STFC)
www.stfc.ac.uk

The Science and Technology Facilities Council was formed on 1 April 2007 from the merger of the Particle Physics and Astronomy Research Council (PPARC) and the Council for the Central Laboratory of the Research Councils (CCLRC).

Responding to the challenge



Professor Philip Esler

► In January 2007 Research Councils UK (RCUK) published *Increasing the Economic Impact of the Research Councils*.¹ This sets out an action plan to demonstrate and increase the economic impact of the UK Research Councils as recommended in the report of a group chaired by Peter Warr in 2006. I am now pleased to set out our progress against this plan and how we have risen to the challenge set us by the Warr report. During the last year we have delivered an integrated suite of activities which will achieve yet greater economic impact from our investments in excellent research.

The Research Councils quite rightly are proud of the excellence of the UK research community, who outperform most other nations in terms of research quality and impact. The UK represents 1% of the global population but produces 9% of the world's scientific publications and 12% of the scientific citations. In this challenging era of globalisation, the UK must be renowned for not only our excellence in quality research but also our strong ability to maximise the benefits of our research innovations. Our expertise in innovation and our deftness in strategic collaborations with global industries are principal keys to significant improvements for the UK's economy and society.

We are also proud of the success of UK researchers who convert their research outcomes into genuine improvements for UK society and the economy, and thus produce 'economic impact'. This process of identifying such uses of research outcomes is complex at best. Whilst UK researchers have been producing such impacts for decades, the last few years have witnessed a dramatic change with more academics engaged and interested than ever before in how their research helps society and the economy. The Research Councils have been highly active in this cultural transformation, vigorously encouraging researchers fund to produce both excellent research and greater economic impact.

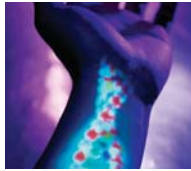
In an Economic Impact Study of unprecedented scale and depth, PA and SQW have investigated the outputs from eighteen case studies. I am particularly pleased that they have demonstrated some of the richness and diversity of impacts arising from UK research. A striking and reassuring feature of the study is that every area of investigation has demonstrated successful yet often very different impacts.

This study makes clear how our research has dramatically improved the lives of people in the UK and abroad, boosting our prosperity, health and quality of life. Research that uncovered the structure and function of DNA has since transformed the nature of forensic science. Our research has led to pioneering work on mobile communications and medical imaging. It has also achieved major advances in our knowledge of environmental change. It has worked at the molecular level to develop revolutionary new types of drugs. It has played a vital role in eradicating a disease that had wreaked havoc among cattle herds in Africa. It has profoundly shaped government policy to combat social exclusion. It has also contributed to the peace process in Northern Ireland.

Demonstrating that there is a causative link between research funded by the Research Councils and a particular innovation in a system as complex as the UK economy is a daunting task. This complexity should be viewed as a stimulus – not as a hindrance – to innovation, as the means to creating economic impacts are as varied as the research itself. We should avoid looking for tidy and narrow views of innovation. The foundations are laid. We can build on this methodology in the years ahead to create a baseline against which further progress can be measured.

The organisations that benefit from or use the research we fund, whether in the public, private or other sectors of the economy, have a vital role in the achievement of economic benefit. For this reason, the Councils will work to improve the richness and scale of interactions between their research and user communities. The rapidly evolving partnership between RCUK and the Technology Strategy Board (TSB) offers exciting opportunities to support

¹ <http://www.rcuk.ac.uk/cmsweb/downloads/rcuk/publications/tktionplan.pdf>



collaborations between research and business, particularly as the TSB expands their remit to cover new sectors of the UK economy and new forms of innovation, such as those in the creative industries and financial services.

Research Councils need to be more receptive to research users and their needs, and have commissioned an independent survey by PricewaterhouseCoopers of the experience and perceptions of those users who have worked closely with the Councils. This User Satisfaction Survey provides clear evidence of our performance and highlights a number of areas where we could usefully focus attention.

We have an obligation to the public to achieve yet greater economic, social and cultural impact from their investment in the Research Councils. We will ensure that economic impact is embedded within the strategies, delivery and organisation of the Research Councils. For example, we will enhance proposal assessment by exploring the needs and motivations of users in peer review and ensuring sufficient user-representation in decision making. We will also improve guidance to applicants and reviewers, engendering a shared understanding and value of economic impact.

A third independent study by DTZ has analysed our knowledge transfer programmes. It reveals considerable harmonisation in existing provision, but also scope to go further. It also proposes a new web-based knowledge transfer portal to improve the interface with our research and users communities.

Much remains to be done, notably the establishment of a KT Summit, bringing together the major players within UK innovation to work on matters of common interest and concern. Nonetheless, I am very pleased to report progress across our diverse but closely integrated suite of activities: demonstrating economic impact, working with users, understanding and coordinating our various knowledge transfer strategies, developing our strategic alliance with the Technology Strategy Board and ensuring that the Councils' peer review remains fit for purpose.

As we look forward, the natural centre of gravity for RCUK is high economic impact from excellent research. While the timescales, methods and approaches to maximising economic impact will vary across the Research Councils' portfolios, the strategic intent is very clear. Our commitment to realising fully the economic impact of research is strong.

Professor Philip Esler

AHRC Chief Executive and RCUK Knowledge Transfer and Economic Impact Champion



Demonstrating economic impact

► The Research Councils have been challenged to “make strenuous efforts to demonstrate more clearly the impact they already achieve from their investments.”² The UK Research Councils collectively invest around £2.8 billion of public funding each year, therefore to be asked to provide evidence about the extent to which this revenue benefits the UK economy and society is not an unreasonable request. Understanding impact is also important, as research and associated impacts are often identified with the defining characteristics of successful “knowledge based” economies. That said, it is also widely accepted that “it is difficult to measure the economic impact of innovations which may be delayed in time and indirect in consequence.”² Indeed the consensus in the economics literature is that measuring the economic impacts of science, innovation and research funding is highly problematic.

In March 2007, RCUK commissioned PA/SQW to undertake a “baseline” economic assessment of the UK Research Councils.³ This was ground-breaking in its ambition and scope. There is an existing body of work in this area covering for example, investigations into impacts associated with discrete case studies or the macro-economic analysis of the impact of research and innovation on economies. However, to date no one has sought to develop and apply methodologies for the assessment of impact, applicable across the breadth of activities, disciplines and beneficiaries associated with all of the UK Research Councils.

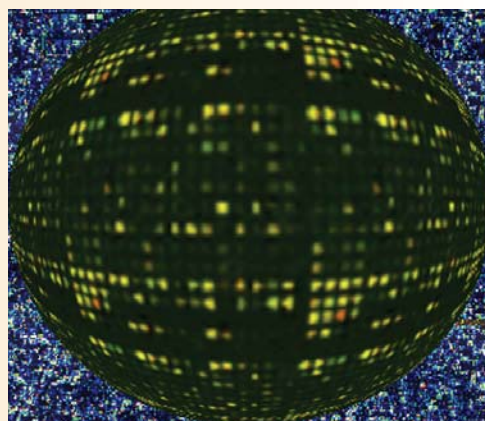
Economic impact assessment has many conceptual, methodological, and practical difficulties. It would be misleading to state that this project has successfully overcome all of these challenges. It has, however, undertaken vital empirical investigations. It has also achieved considerable progress in developing an overarching methodological framework grounded in the research evaluation literature, applying systematic economic analysis techniques to the evidence secured through the project, and identifying the capabilities that Research Councils need to achieve in order to undertake such analyses more effectively in future. The latter point will be explored in more detail in a second report, due to be submitted to RCUK in November.

The Project used a number of different approaches to identify the evidence required for the economic analysis. This included detailed case study analyses, review of Councils’ existing data sources⁴ and a consideration of published literature, including a considerable body of material compiled by the Research Councils themselves. PA sought to identify impacts in four main categories:

- **Development of human capital** (primarily through the acquisition of skills through the research process)
- **Business and commercial** (dealing with the commercial exploitation of research)
- **Policy** (the impact that research has on the creation and application of, primarily, government policy)
- **Quality of life** (diverse impacts such as improved environment, social cohesion, health and cultural advances).

DNA TECHNOLOGY

MRC has invested in DNA technology research for over five decades. Outcomes include the Southern Blot method which underpinned the sequencing of the human genome, and the development of DNA fingerprinting technology and DNA microarrays. Direct impacts include the creation of two major spin-outs, Oxford Gene Technology and Cellmark Diagnostics, one of which has a \$160 million market capitalisation. Wider benefits include a contribution to the \$2 billion global biochip market. DNA fingerprinting has revolutionized forensics and may have saved the UK £47 million per year through faster identification of serial rapists.



² Recommendation of the “Warry” Economic Impact Group to the Director General, Science and Innovation, July 2006 (<http://www.berr.gov.uk/files/file32802.pdf>)

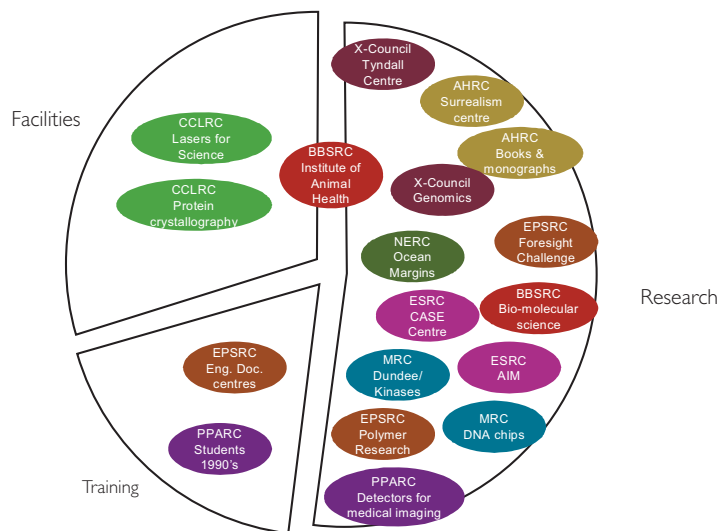
³ www.rcuk.ac.uk/innovation/impact

⁴ In particular the output data and performance metrics compiled as part of the DIUS Performance Management System (<http://www.rcuk.ac.uk/abouttrcs/operation/performance/deliveryplan/output/default.htm>)



The case study investigations probably offer the richest and most developed evidence of impact. In total 18 detailed case studies were completed as part of the project, chosen to cover the breadth of the Research Councils' portfolio - for example covering research/training/infrastructure, directive/responsive and basic/applied research characteristics.

Every case study demonstrated actual and/or potential impact, although there was considerable variation in the nature of the impacts, and even greater variety in the processes and circumstances through which the impacts became manifest. Probably the most reassuring finding was the extent to which some of the case studies demonstrated multiple types of impact. Furthermore, many of the impacts were not necessarily part of the original rationale for the specific investment, which suggests that serendipity and opportunism are important factors for the Research Councils.



Case studies mapped onto Research Council expenditure

Looking Forward

► The Research Councils now have a much richer and more systematic understanding of the impacts of research. RCUK will build upon this study, developing the capability and capacity to undertake economic analysis, and then ensuring impact considerations are integrated into the business of the Research Councils. KTEIG will continue to lead and coordinate the assessment, analysis and integration of economic impact within the Research Councils.

The second project deliverable is expected in November 2007 and will offer advice to the Research Councils on how they might conduct economic assessment in future. This will highlight methodological issues and advise the Councils on the capabilities that they will need to develop in order to undertake these studies more effectively and efficiently. It will also address how changes in the Councils' economic impact might be tracked over time.

These investigations have helped to clarify the data requirements for economic analysis – particularly for output data. Councils have recently agreed to establish a project to gather output data collectively and in a more integrated fashion across all the Councils, replacing or augmenting existing reporting processes such as end-of-project reporting.⁵

One of the categories of economic impact highlighted in the study was Human Capital which formed the basis of two specific case studies: the career impact of PPARC PhD studentships, and the impact of the EPSRC Engineering Doctorate Centres. Knowledge transfer through people is a cornerstone of the Councils' impact strategy, of which the natural movement of trained researchers through their career is an important component. Both studies imply considerable productivity benefits, manifest through career salary premiums, but this probably understates other career impacts. The Councils recognise the need to improve their understanding of research career trajectories and associated impacts, for many reasons. RCUK are therefore scoping a long term career path study to address this issue.

⁵ the Outputs Project will be initiated in 2007 and is one of the recommendations of the RCUK Peer Review Efficiency Project.
<http://www.rcuk.ac.uk/research/peer/efficiencypr.htm>

Interactions with users

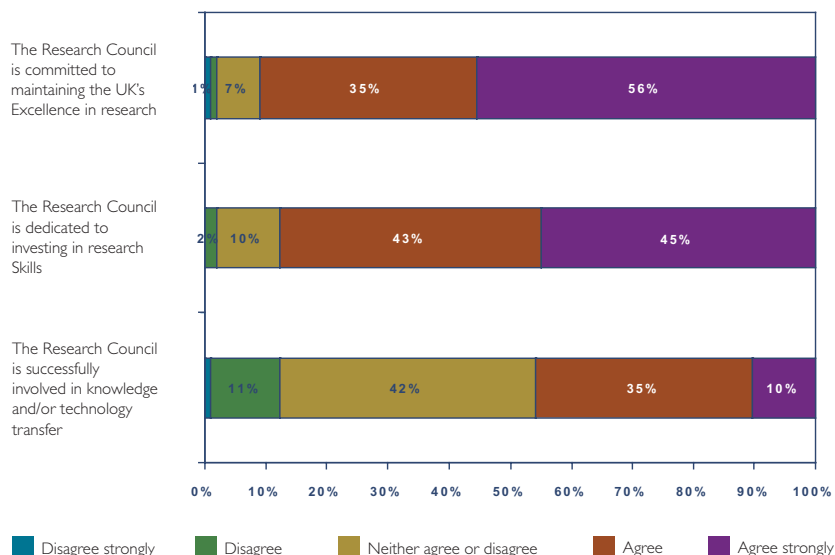
► The analysis of economic impact reveals how impacts are manifest predominantly outside the research base, and are largely dependent on the involvement of users at some stage in the innovation process. An effective interface between the research and user base is a prerequisite for high economic impact. It is therefore important that the Research Councils are themselves receptive to the needs of users, the UK economy, and wider society, and that this is reflected within Councils' strategies, investments and processes.

During the summer, RCUK commissioned PwC to undertake a User Satisfaction Survey.⁶ This sought the views of around 400 users on the expertise, delivery, communication and relationships with specific Research Councils. This was the first attempt to understand, in a systematic fashion, the expectations and experiences of those users that have worked closely with Research Councils during the previous two years.

The Research Council user base is extremely broad and the survey included individuals from the public, private and voluntary sectors that have informed knowledge of the Research Councils. Nonetheless the views expressed show considerable consensus about users' perceptions. The findings

highlight areas where the Councils can take comfort in their achievement, but perhaps more helpfully, it also identifies some areas where we need greater impetus or to adopt new approaches.

The survey contains detailed analysis of the user base for each Research Council, as well as the aggregate views of users. Some of the main findings are repeated here, particularly those that have significance to the future plans of the Councils. However, RCUK has also published the full report and encourages our stakeholders in the research base and wider society to reflect on the detailed findings.



FORESIGHT CHALLENGE

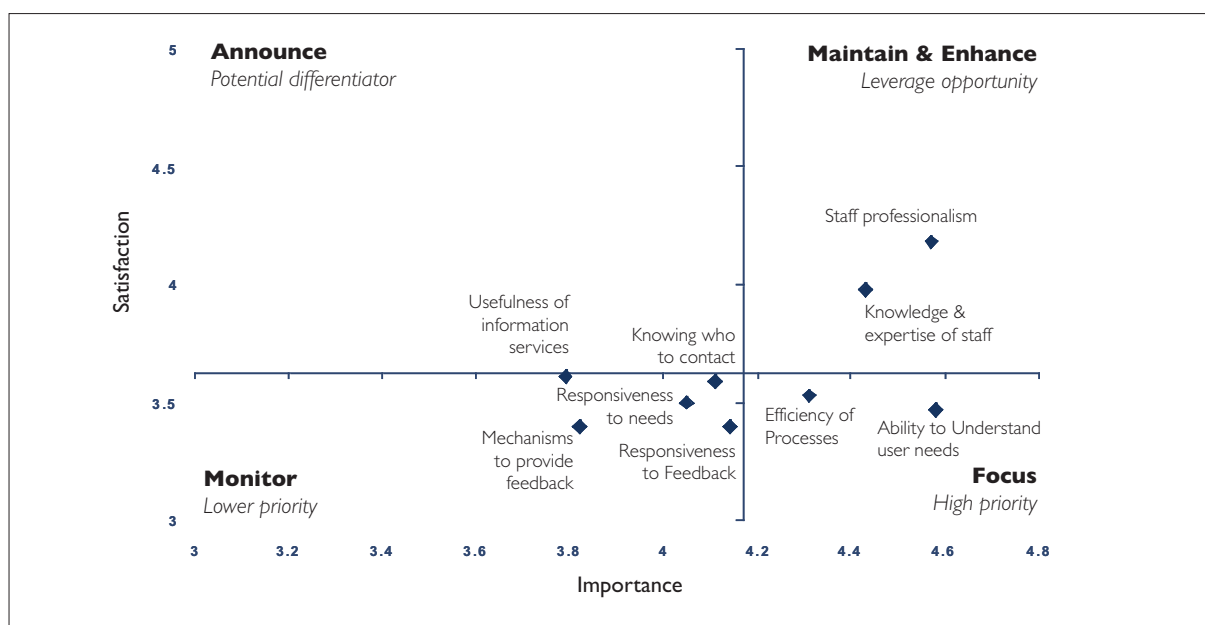
Foresight Challenge competitions supported collaborative research with businesses designed to enhance success in current and new markets, with the majority of support being in the broad area of applications of ICT. One of the outcomes is the Virtual Centre of Excellence in Mobile and Personal Communications (Mobile VCE) - a collaborative partnership involving around 20 of the world's most prominent mobile communications companies and seven UK universities. One overseas participating company has located a new R&D facility near a partner university. The programme has led to the creation of new businesses, of which one, Parc Technologies, was sold to Cisco for \$9 million in 2005.





When asked for their perceptions of the Councils' activities, (see graph on previous page) users revealed a very high consensus about the Councils' role in relation to "maintaining UK excellence in research" and also "dedication to research skills". However, when questioned about council "success in knowledge and/or technology transfer", the largest category (42%) "neither agrees nor disagrees". There is clearly a significant user audience that is not yet persuaded (or indeed dissuaded) by the Research Council achievements in knowledge transfer (KT). This further emphasises the extent to which Councils need to communicate their achievements in knowledge transfer, as well as their role in creating an enterprise culture within universities and institutes.

Users were also asked a series of questions about their expectations of, and satisfaction with, Research Council performance on delivery and communication. When these questions are combined, the resulting grid provides an indication of relative priorities, as perceived by users. The professionalism and knowledge/expertise of staff are clearly valued by users and emerge as strengths which the Councils should seek to maintain and enhance. The two priority areas for improvement are the understanding of user needs and development of more efficient processes. Other categories also show scope for improvement, although these are given much lower importance by users.



Users were asked to comment on the extent to which they would speak highly of the Research Councils. Advocacy from users is vital to encourage others to engage with both the Research Councils and the research base. The survey findings, showing around 70% advocacy and 22% ambivalence, indicates a very healthy baseline when compared with comparable surveys, albeit with scope for improvement.

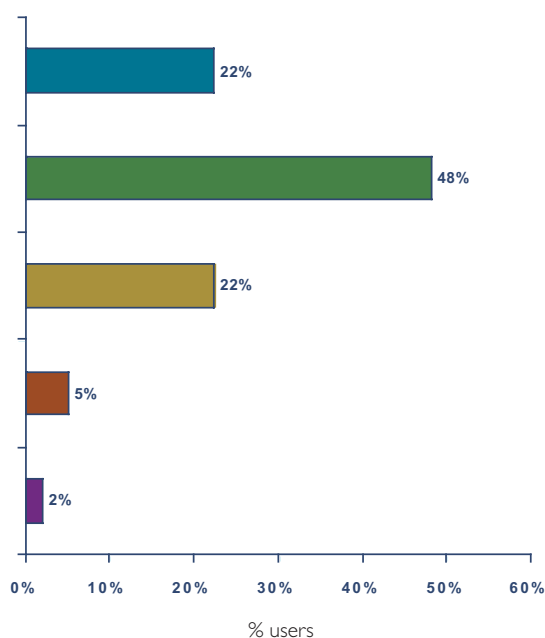
You would speak highly of it without being asked your opinion

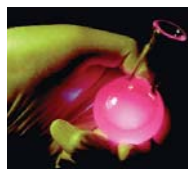
You would speak highly of it, but only if asked

Be neutral about it (i.e. equally as positive as critical)

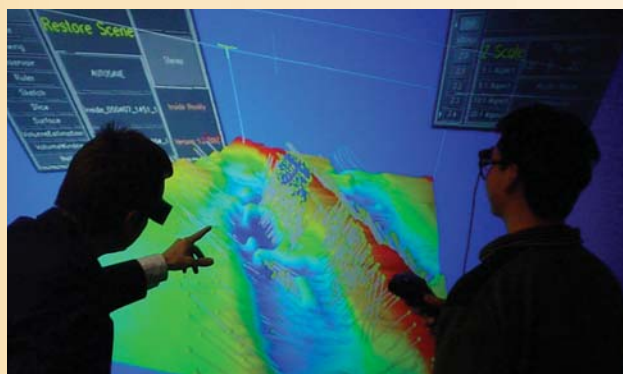
You would be critical of it if asked

You would be critical of it without being asked





OCEAN MARGINS LINK PROGRAMME



The Ocean Margins LINK programme aimed to develop a better understanding of deep water structures, sediment movement and stability. Potential impacts in the short to medium term include improved risk mitigation and site prediction in oil drilling in Atlantic margins, worth around £100 million. Wider impacts could include the application of analytical techniques to drugs testing in sport.

ADVANCED INSTITUTE OF MANAGEMENT

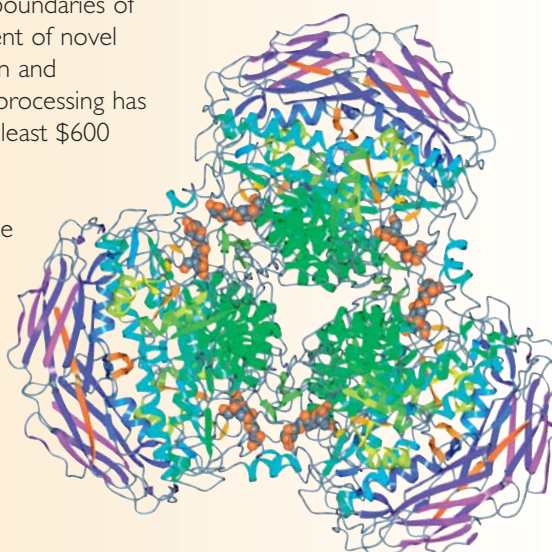


The Advanced Institute of Management is a network of research fellows designed to address key management issues and to develop relationships between business schools and businesses. AIM has the potential to increase the turnover growth in AIM-associated companies and improve the impact of management theory on industry practice.

BIOMOLECULAR SCIENCES COMMITTEE

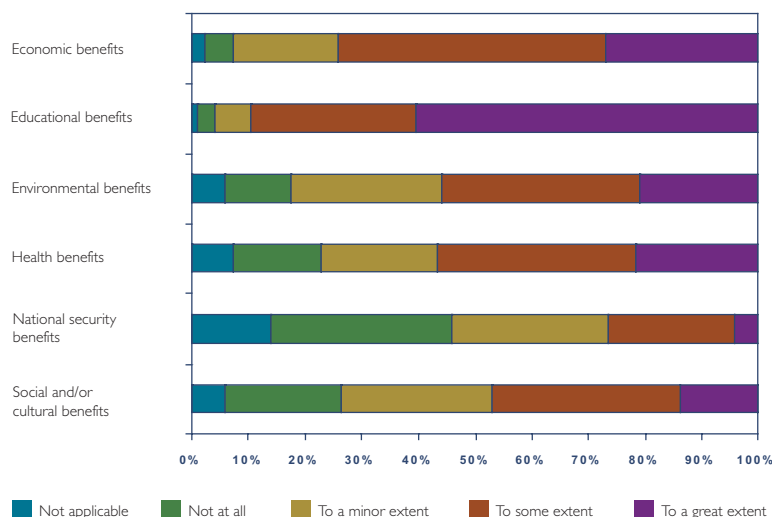
Basic research into biomolecular sciences, across the boundaries of physical and life sciences, is relevant to the development of novel bioproducts relevant to health, biotechnology, nutrition and environmental protection. Research in the area of bioprocessing has led directly to external investment in companies of at least \$600 million.

Image showing the 3D structure of arabinofuranosidase from the bacterium *Clostridium thermocellum*, which has potential application for the digestion of plant material into fermentable sugars. Image produced using computer software, developed with BBSRC support, which was originally established by the former SERC, and is coordinated at the STFC Daresbury Laboratory, courtesy of York Structural Biology Laboratory.





The survey also covered the nature of user relationship/interactions, experiences of working in partnership with Councils and the subsequent benefits to their organisation. Each user was asked for his or her view on the contribution from a specific Research Council to the UK economy and society. As expected, the impact profile for each Council was very different; taken collectively it suggests that users believe that the Research Councils are making a significant contribution across the breadth of the UK economy and society.



Looking Forward

► The User Satisfaction Survey has some major implications for the Research Councils:

- The Survey contains a rich lode of information that will help Councils improve their strategies and operations. For the first time there is a significant body of evidence regarding the extent to which Research Councils, both individually and collectively, are meeting the needs of their respective user communities. This is important performance and management information which will inform RCUK, Councils and their governing stakeholders.
- The endorsement from users of the capabilities and competence of Research Council staff highlights the importance of strong interpersonal interactions with key stakeholders. This will be reflected within individual Council user engagement strategies and Delivery Plans.
- There is a strong message from users, that RCUK must improve their understanding of user needs. This is of absolute importance to the Councils in order to ensure the effective take-up of research outputs by users, and thereby maximise the economic impact of Research Council investment. We anticipate a more significant and richer user involvement in setting future directions and funding priorities – for example through greater user involvement in major strategic programmes and ensuring that user perspectives are more strongly represented in peer review. User perspectives will have much greater prominence within RCUK policies, strategies and delivery.
- There is a clear priority for RCUK to articulate more vigorously the role and contribution of Research Councils in knowledge transfer and demonstrate how this might add value to users.

Taking these forward, RCUK has identified the following specific commitments and actions:

- a) RCUK will convene a high level KT Summit during 2008, bringing together the leading organisations in knowledge transfer to unite in addressing barriers to innovation. Through this, RCUK aims to increase its profile, impact and ability to act as a positive influence within the UK innovation scene.
- b) RCUK will rerun the User Satisfaction Survey in 2 years' time, with broadly comparable questions and sample criteria, subject to any "lessons learnt" recommendations. This will allow progress to be tracked and measured. Councils plan to increase their interactions with users on a broad front.
- c) RCUK will improve the quality of its data concerning users and user organisations, as well as the utility of associated management information systems.



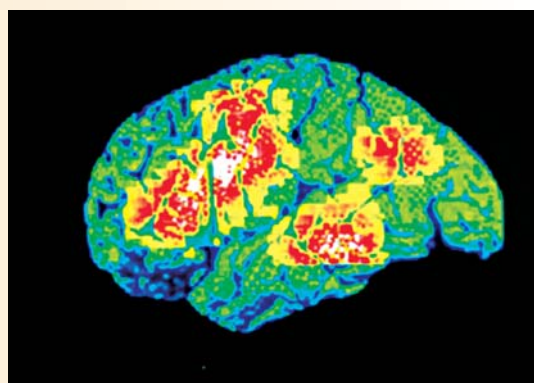
BASIC RESEARCH IN POLYMER SCIENCE



Basic research in polymer science, funded by EPSRC, has led to direct and indirect impacts amounting to around £200 million. UK research has played a significant role in developing and exploiting polymer technology for display applications. One spin-out company, CDT, recently merged with its partner Sumitomo in a deal valued at around \$285 million. Another is Plastic Logic whose flexible display, shown here, uses E Ink® Imaging Film.

DETECTORS RESEARCH AND ITS USE FOR MEDICAL IMAGING

Detectors developed with PPARC funding for use in major facilities have applications in medical imaging devices. Although it is difficult to identify direct impacts arising from PPARC funded work, leading edge detectors have the potential to contribute towards impact of improved medical applications, resulting £1-10 billion annual savings from the avoidance of premature deaths.



CENTRE FOR ANALYSIS OF SOCIAL EXCLUSION

ESRC's Centre for the Analysis of Social Exclusion has contributed sound evidence and analysis to the knowledge base directly informing the policy making process, and has been one of the key drivers supporting multi-million pound government policies to try and tackle social exclusion. For example, it contributed to the development of evidence-based policy for Sure Start programme where Government currently spends £1,000 million per year.

Partnership with the Technology Strategy Board

► The Technology Strategy Board (TSB) was established as a new executive non-departmental public body on 1 July 2007, with an arm's length relationship from Government and a much wider remit. RCUK believes the Technology Strategy Board is ideally placed to create a new national focus and sense of purpose through its investment in strategic research and innovation for UK business benefit.

The new Technology Strategy Board has inherited a strong portfolio of collaborative activity from the former DTI, much of which already involves partnership with Research Councils. Research Councils are active sponsors and partners in Knowledge Transfer Partnerships, Knowledge Transfer Networks and Collaborative R&D. Research Councils also have an increasing involvement in the TSB Innovation Platforms, which seek to enable business to take advantage of broader Government investments and objectives.

Looking Forward

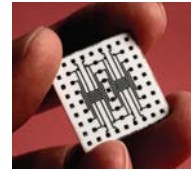
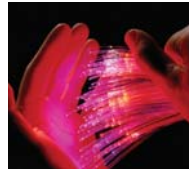
► In order to maintain momentum and build collaboration through this early formative period, the Technology Strategy Board and RCUK have established a joint Transition Group. The Transition Group comprises senior management from TSB and the Research Councils with responsibility for programme and innovation strategy. The Group aims to accelerate the development of shared investment strategies for the period of the next Government Spending Review (2008-2011). The Transition Group will also consider how the Technology Strategy Board and RCUK might work together most effectively in future.

RCUK strongly supports the broader remit and ambition of the new Technology Strategy Board. In particular it welcomes the intention to cover all sectors of the UK economy, including the greater attention given to new opportunities within agriculture, food, retail, service sector and creative industries. New forms of innovation are likely to require new multidisciplinary partnerships, reaching beyond core technology disciplines to involve for example social sciences, humanities, natural sciences and medical researchers. Every Research Council now has an interest and interface with the Technology Strategy Board and has identified promising areas for partnership, which will now be explored and developed together. Detailed plans for both complementary and collaborative activity will be included within the Research Council Delivery Plans, which will be published in early 2008.

During the period covered by the Comprehensive Spending Review (2008/9 – 2010/11), Research Councils will collectively invest at least £120 million in partnership with the Technology Strategy Board. Through this investment in complementary and collaborative activity, RCUK aims to increase the economic impact of its research portfolio. RCUK believes that this can be achieved in part using successful and proven collaborative models. However, the ambition to move into new sectors and areas, and engage new business partners means that more flexible funding approaches will be required.

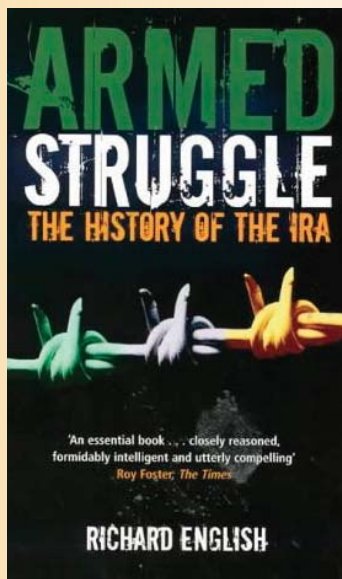
RCUK shares the Technology Strategy Board vision, that the emerging technologies of today should become the growth sectors of the future. By "emerging technologies" we mean those technologies that are based upon recent scientific breakthroughs, and are thus at an early stage of development and well upstream of current UK technology priorities. This represents a very natural and fertile area for partnership between RCUK and the Technology Strategy Board, and we will strongly support the development of a national strategy for emergent technologies.

There is a strong coincidence of purpose between the Technology Strategy Board, the Regional Development Agencies (RDA) and their devolved equivalents, and the Research Councils. A workshop will be held in October 2007, which brings together these parties to explore how we might achieve common purpose and action. RCUK sees considerable scope for both Technology Strategy Board and RDAs in helping to encourage new business interactions with the research base, in particular small-to-medium-sized enterprises.



BOOKS AND MONOGRAPHS

Humanities research can help to understand the causes and consequences of conflict. Communicated in the right way at the right time, this can shape the attitudes and beliefs of those who shape events, as well as the wider community.

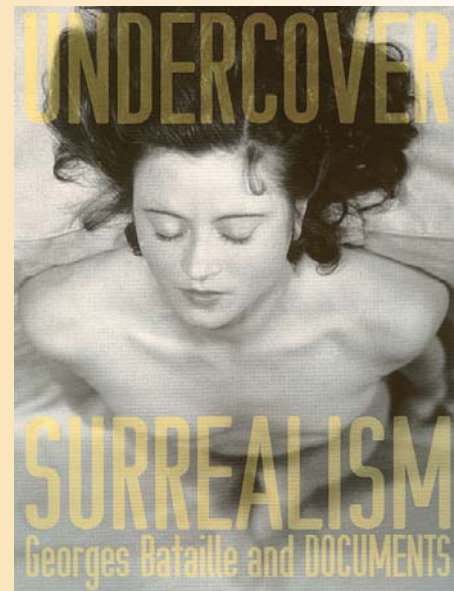


One publication on the history of the IRA by Professor English, supported under the AHRC Research leave Scheme, is credited with influencing the Northern Ireland peace process.

The economic impact of conflict and conflict resolution can be considerable. By way of example, the pathway to peace in Northern

Ireland has seen a dramatic reduction in the cost of security from £200 million annually. It has also seen an increase in inward investment of £150 million from the USA alone.

CENTRE FOR SURREALISM



Research from AHRC's Centre for Surrealism led directly to the 'Undercover Surrealism' exhibition at London's Haywood Gallery which generated economic impact of at least £1 million. The research has also restored the credibility of surrealism research. The creative legacy of the Undercover Surrealism exhibition is unlikely to be identifiable for several years to come. DEMOS have recently suggested that publicly subsidised art is likely to play an important part in the cultural and creative industries of the UK.

LASERS FOR SCIENCE FACILITY

The Lasers for Science Facility at STFC's Rutherford Appleton Laboratory provides state-of-the-art resources to researchers. It has led to £0.25 million funding for an early stage spin out called LiteThru and £1 million total investment leveraged from EU and private sector sources.



Improving knowledge transfer

► In 2006 RCUK invited a panel of users to review each Research Council's knowledge transfer (KT) activities – the “External Challenge”.⁷ This made a number of helpful recommendations and urged Councils to improve coordination of knowledge transfer activities within RCUK, with greater adoption of best practice. Subsequently the House of Commons Science and Technology Committee completed an inquiry into Research Council support for knowledge transfer.⁸ The inquiry also emphasised the need to improve KT coordination and urged Councils to simplify the presentation of their knowledge transfer schemes.

The report of the User Satisfaction Survey provides additional context and suggests that the role of Research Councils in knowledge transfer is not fully understood by users. The Councils and RCUK clearly need to articulate their role more vigorously and coherently.

The Research Councils have a common understanding of knowledge transfer:

“The UK Research Councils seek to accelerate the two-way flow of people and ideas between the research environment and wider economy, and thereby contribute to national prosperity, the quality of life of UK citizens, and cultural enrichment of our society. Knowledge Transfer encompasses the systems and processes by which knowledge, expertise and skilled people transfer between the research environment (universities, centres and institutes) and its user communities in the private, public and other sectors.”⁹

Nonetheless, each Council pursues its knowledge transfer objectives in slightly different ways, including different approaches to KT schemes. In part this diversity reflects the characteristics of each Council's research and user communities. It also reflects other intrinsic complexities, for example Councils take active responsibility for the management of intellectual property within their own institutes and units, but normally delegate this responsibility to universities and other higher education institutions.

During 2007 RCUK invited DTZ to undertake an independent comparative review of the Research Councils' portfolio of KT schemes. This involved a high level study into how Councils organise themselves to

deliver knowledge transfer, combined with an analysis of the defining characteristics of each KT scheme. The purpose of the review was to determine the scope for harmonisation, rationalisation, changes to scheme operation and branding and/or improvements to the presentation of knowledge transfer schemes; the review considered these issues both from the perspective of individual Councils and also RCUK collectively. DTZ covered “core schemes” that have an explicit KT objective in detail, and also considered other activities, for example collaborative research and postgraduate training, which have multiple objectives. Schemes and activities limited to Research Council institutes were excluded.

The full DTZ report has been published alongside this report;¹⁰ some of its main findings include:

- There was no evidence for an excessive number of competing knowledge transfer schemes – either within or across Research Councils. Where divergences were found between the schemes offered by different Councils these were mainly to meet specific user needs.
- There are a number of successful examples of harmonisation between Councils, for example the RCUK Business Plan Competition (a single joint activity), as well as the Follow-on Fund (common characteristics and policies).
- There was evidence of rationalisation of knowledge transfer activities within Councils, consistent with the recommendations of the Select Committee to reduce complexity, for example the STFC PIPS fund, NERC KT Call, and the planned introduction of Knowledge Transfer Accounts by EPSRC.
- Where appropriate, Councils sponsor external organisations rather than establish their own distinct schemes. For example, Knowledge Transfer Partnerships (TSB), Industry Fellowships (Royal Society), Enterprise Fellowships (Royal Society of Edinburgh).
- Most of the Councils' KT schemes could be described using a relatively simple taxonomy. This taxonomy could then be used to simplify the presentation and communication of the portfolio of KT schemes.

⁷ <http://www.rcuk.ac.uk/aboutrcuk/publications/policy/exchallenge.htm>

⁸ <http://www.publications.parliament.uk/pa/cm200506/cmselect/cmsctech/995/995i.pdf>

⁹ Adding Value, How the Research Councils Benefit the Economy.

<http://www.rcuk.ac.uk/cmsweb/downloads/rcuk/publications/addingvalue.pdf>.

¹⁰ www.rcuk.ac.uk/innovation/impact



Looking Forward

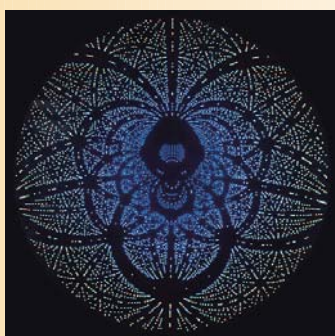
► The Councils have agreed to:

- Improve the presentation of knowledge transfer schemes. This will be built around an easily accessible knowledge transfer taxonomy and the creation of an RCUK-hosted KT web portal, providing a simple point of access for all users to information about Research Council knowledge transfer schemes and case studies of successful knowledge transfer and economic impact.
- Introduce harmonisation and rationalisation of specific knowledge transfer schemes such as the Follow-on Fund, collaborative Ph.D. studentships, and secondment opportunities to Parliament (POST).
- Strengthen the role of the RCUK KT team, for example for the coordination of KT operations, harmonisation and communications.

In August 2007, a small working group drawn from universities and business, led by Peter Saraga, reported to the Research Base Funders Forum on the issue of university / business collaborative negotiations.¹¹ They found that whilst the system was generally working well, there were some problems that, if addressed, could improve negotiations, and they made a number of recommendations aimed at universities, business, government and RCUK. The report does not suggest changes to RCUK policies on intellectual property, but does highlight areas where the clarity of RCUK guidance could be improved. These will be published in the RCUK and individual Councils' KT web sites.

The RCUK Knowledge Transfer and Economic Impact Group will have responsibility for monitoring progress against these actions.

PROTEIN CRYSTALLOGRAPHY



Protein crystallography is a tool pioneered at STFC's Daresbury Laboratory Synchrotron Radiation Source to study the structure of proteins. The SRS is used by academics and businesses. One user, Astex, has raised more than £50 million investment and has external collaborations worth over \$1 billion. Software developed from SRS (and BBSRC funding) generates licensing revenue of around £1 million annually.

PROTEIN PHOSPHORYLATION UNIT

MRC's Protein Phosphorylation Unit at the University of Dundee was founded in 1990 to study cell regulation and human disease. The research has led directly to 22 licences signed between MRC/university and collaborating companies. Royalties from a separate agreement provides an annual income of \$1.1 million. The current global market for kinase therapeutics is \$12.7 billion and expected to rise.



¹¹ <http://www.berr.gov.uk/files/file41123.pdf>

Economic impact and peer review

► In 2006 RCUK initiated a project to review the efficiency and value for money of Research Council peer review processes.¹² One strand of this project considered the extent to which peer review assessment can, or indeed should, reflect economic impact considerations. The feedback from the research community on this particular issue was extremely helpful, and very wide ranging in the ideas proposed. It highlighted a need for the Councils to ensure there is clarity about what the Research Councils expect from the research and peer review communities, and also identified scope to build upon best practice approaches within the Councils.

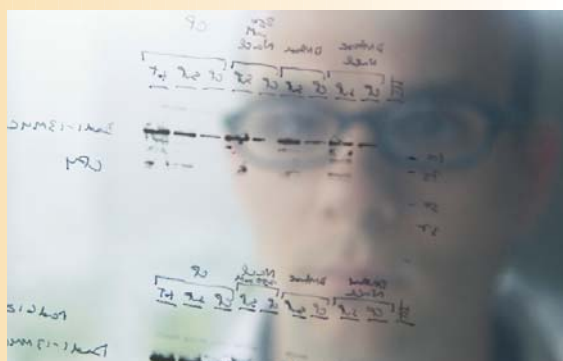
The survey revealed uncertainty about how economic impact might be judged, and concerns against an overly narrow interpretation of impact. RCUK endorses a broad definition of economic impact, recognising the diverse ways in which research can contribute to the UK economy, including social, environmental, cultural, health and policy benefits as well as more obvious economic benefits.

RCUK believes that supporting high quality research and ensuring better impact from research are mutual objectives that can be pursued in tandem. Within the peer review process the concept of quality embraces the potential significance or value of the knowledge that could be generated. The challenges are to ensure that flexible processes are in place to maximise the likelihood that research outputs are exploited, and to demonstrate the economic impact of this research over time. This does not imply a move away from basic research to applied research or vice versa. High quality research, whether basic or applied, has major impacts beyond creating new knowledge.

It is vital that the UK research community is fully engaged in maximising the impact of research. Encouraging investigators to consider the potential use and impact of their research at the application stage is one way of addressing this. This is important since potential use may influence the way in which the research is managed, how collaborations are forged, and the urgency and methods by which subsequent outputs are communicated and knowledge transferred. Provision of incentives and rewards to encourage researchers to develop the opportunities that often materialise unexpectedly during research, or afterwards, is another approach that will also be considered by RCUK.

In terms of the peer review of applications for research funding, RCUK wishes to emphasise that research quality is, and will remain, the primary determinant for Research Council funding. RCUK has reviewed the approaches currently used within the Councils to ensure that assessment and funding decisions effectively reflect economic impact considerations; this formed the topic of a Research Council workshop in July 2007. Different approaches are used to reflect the nature of specific research domains, characteristics of the user community or other strategic considerations. For example assessment criteria for medical research reflect healthcare priorities, practice-based subjects give particular attention to the involvement of practitioners, and individual schemes and directed programmes tend to have bespoke assessment criteria, which are usually explicit in any guidance and/or call for proposals documentation. It is reasonable to anticipate variation in these assessment criteria in future – both within and between Councils. Nonetheless, there are considerable opportunities for the spread of best practice, and the adoption of common processes.

APPLIED GENOMICS LINK PROGRAMME



The Applied Genomics LINK programme, sponsored by BBSRC, MRC and DTI, aimed to encourage collaboration between industry and academia to explore the potential of genome sequences and genetic data for the healthcare sector. New products have been developed as a result of the programme and 21 patents filed to date. The market for functional genomics was estimated to be over £1 billion in 2007.

¹² <http://www.rcuk.ac.uk/research/peer/efficiencypr.htm>



Looking Forward

► Looking Forward:

RCUK has identified the following principles that define, in broad terms, the future approach and expectations of the Councils:

- Excellent research with high economic impact is central to RCUK activities.
- The onus rests with research applicants to demonstrate how they would achieve excellence and high impact.
- Research Council guidance and assessment procedures need to be tuned to:
 - maximise both excellence and impact, and
 - ensure user perspectives are strongly represented.

The following actions will reflect these principles:

- a) Councils will jointly review and improve guidance to applicants and peer reviewers to ensure there is a shared understanding concerning the value of addressing potential economic impact, and of realistic and effective ways of doing so. This will be supported in electronic application systems and guidelines. **Completed Spring 2008.**
- b) Councils will jointly review and implement changes to their assessment criteria to ensure that economic impact considerations are properly reflected in funding decisions. It is anticipated that criteria will vary both within and across Research Councils. **Completed Spring 2008.**
- c) RCUK will initiate a project to understand the motivations, incentives and experiences of non-academic peer-reviewers. This will help Research Councils ensure that the perspectives of research users are effectively represented in funding decisions. **Completed Autumn 2008.**
- d) Councils will ensure sufficient non-academic peer reviewers with appropriate expertise. **Completed Summer 2008.**
- e) RCUK will review whether there are sufficient incentives and rewards for researchers and institutions that have demonstrated successful economic impact. This will consider the role and impact of other agencies such as the Funding Councils, Regional Development Agencies and the Devolved Administrations and others. **Completed Autumn 2008.**

The RCUK Knowledge Transfer and Economic Impact Group will have responsibility for monitoring progress against these actions.

ENGINEERING DOCTORATES

EPSRC's Engineering Doctorate (EngD) programme is designed to produce engineers with management skills. One company (ITM Power) that was co-founded by an EngD student during his studies now has a market capitalisation of over £100 million. Innovations from EngD students include a novel engine management technique that yields significant fuel savings, with consequent reduced costs and implications for climate change. Industrial sponsors include major companies such as Rolls Royce.



Increasing economic impact

► The Economic Impact Study has clearly demonstrated that every Research Council makes a significant contribution to wealth creation and quality of life within the UK. It has shown that the impacts can be manifest in very different ways for different research domains. This suggests that the challenges associated with delivering a significant increase in economic impact are likely to be significantly different for each Council, reflecting the characteristics of its particular research portfolio, and associated user and research communities.

Each Research Council is currently developing a Delivery Plan that will describe its investment plans and ambitions for the period covered by the Government Comprehensive Spending Review (CSR), i.e. 2008/9 – 2010/11. The Delivery Plans will outline Research Council strategies, giving particular attention to the economic impact considerations outlined in this report, and are due to be published in early 2008 shortly after the Government allocations are confirmed.

There are many areas where Councils face common issues, or can achieve more through working in concert. Within the last year the Councils, working in partnership as RCUK, have achieved a dramatic increase in their joint activity. Working together gives economies and flexibilities of scale, but of greater significance is the associated spread of better practice within the Councils, and the greater authority and influence this creates with external stakeholders.

Looking Forward

► Future activities for 2008 include:

- Implement peer review changes.
- Implement KT harmonisation programme.
- Establish a KT Summit, drawing together some of the main organisations in the innovation sector to work on matters of common interest.
- Convene an Impacts reception at the Treasury in London in early 2008, to highlight the successful impacts arising from Research Council investment.
- Improve guidance on Councils' knowledge transfer schemes. Develop the case and scope for a KT Portal.
- To continue to develop methodologies for the assessment of economic impact.

Some of the key milestones in the last year include:

- Professor Philip Esler (Chief Executive AHRC) appointed as RCUK KT Champion.
- RCUK Knowledge Transfer and Economic Impact Group established as a strategic coordinating group between the Councils.
- RCUK Economic Impact Action Plan agreed and published, January 2007
- RCUK "Impacts" brochure developed jointly with Universities UK and UNICO and launched at House of Commons, July 2007. This highlighted many examples of successful economic impacts across the remit of the Councils.
- User Satisfaction Survey and Economic Impact Projects successfully initiated, delivered and completed on a collective basis.
- A coordinated approach agreed and now published, for reflecting economic impact considerations in peer review.
- KT Coordination Project initiated. This has a number of strands that will be completed during 2007/8:
 - a) an independent review of Councils' KT schemes has been completed. This identifies scope for rationalisation, harmonisation, branding and adoption of best practice.
 - b) RCUK will develop a common set of guidance on intellectual property issues, reflecting the recommendations of the "Saraga" report to the Funders Forum.
- Coordinated approach to engagement with the TSB and formation of the RCUK-TSB Transition Group (summer 2007)

TYNDALL CENTRE

The interdisciplinary Tyndall Centre for climate change research is funded by three Research Councils. The research aims to influence policy both in the UK and worldwide

to address the £310 billion global warming challenge identified by the Stern Review and now being considered by the Intergovernmental Panel on Climate Change.





PPARC PhD STUDENTS

A typical PPARC qualified PhD will realise a salary benefit of around £70,000 compared to an equivalent individual with a first degree only. Around 20% achieve substantially higher salaries working in the financial services industry, where individuals with a PPARC-like PhD with no sector experience may earn £40k plus bonuses, progressing rapidly to £150k.



INSTITUTE OF ANIMAL HEALTH

The Institute for Animal Health, sponsored by BBSRC, undertakes research and acts as a reference laboratory for several major viral diseases of livestock, providing around-the-clock surveillance and diagnostic services. IAH research has contributed towards the global eradication of Rinderpest, which is estimated to benefit to Africa by over \$1 billion annually.





If you would like more information on any of the issues raised in the brochure, please contact:

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