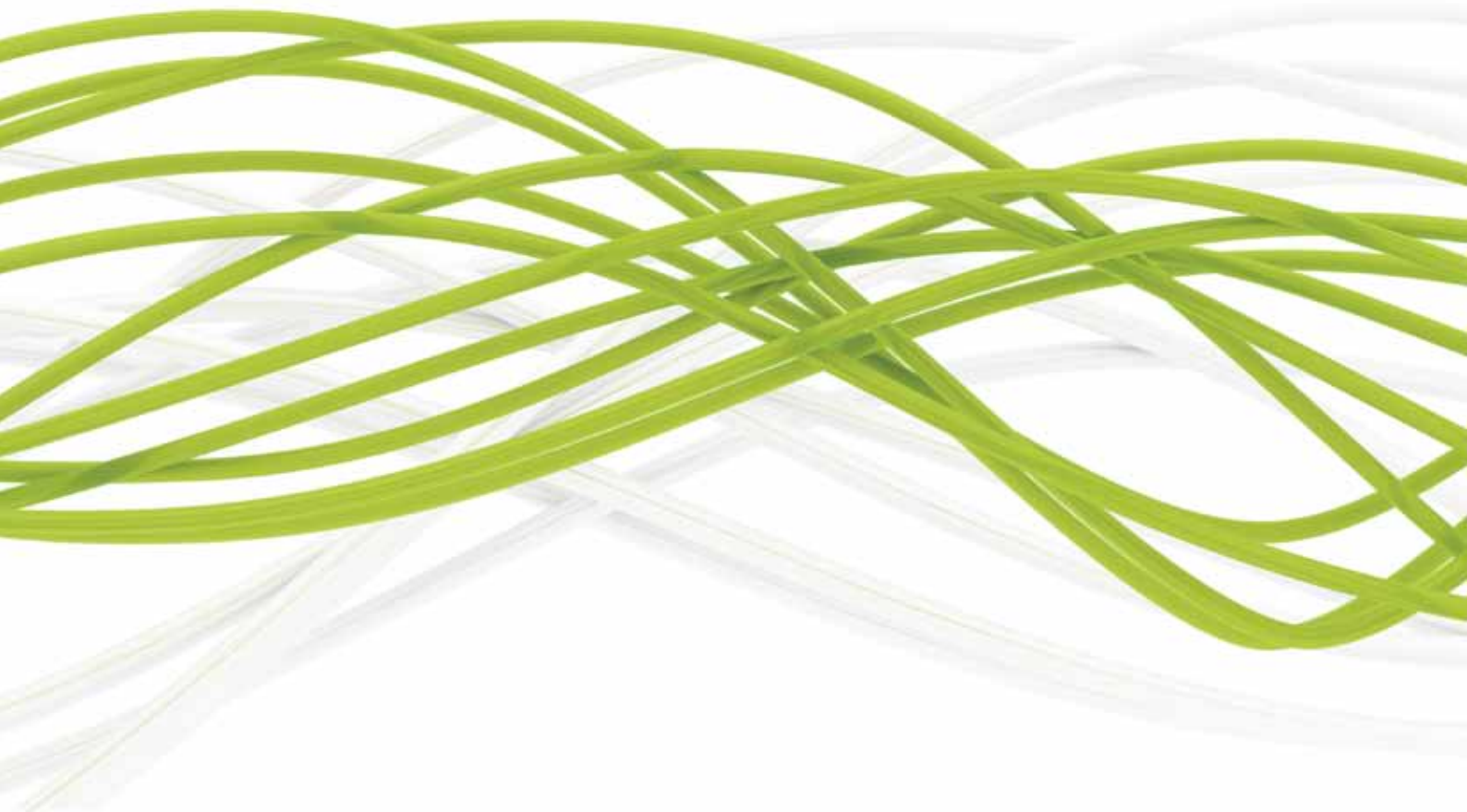
Engineering and Physical Sciences
Research Council

ANNUAL REPORT AND ACCOUNTS
2009-2010



EPSRC
Pioneering research
and skills

ENGINEERING AND PHYSICAL SCIENCES RESEARCH COUNCIL
ANNUAL REPORT AND ACCOUNTS 2009–2010

EPSRC
Pioneering research and skills

INVESTORS IN PEOPLE | Bronze

Presented to Parliament pursuant to s. 2 (2) of Schedule 1 of the Science and Technology Act 1965 (c.4)

Ordered by the House of Commons to be printed on 13th January 2011

HC 624
London: The Stationery Office
£19.75

Any enquiries regarding this publication should be sent to us at: infoline@epsrc.ac.uk.

This publication is also available on http://www.official-documents.gov.uk/

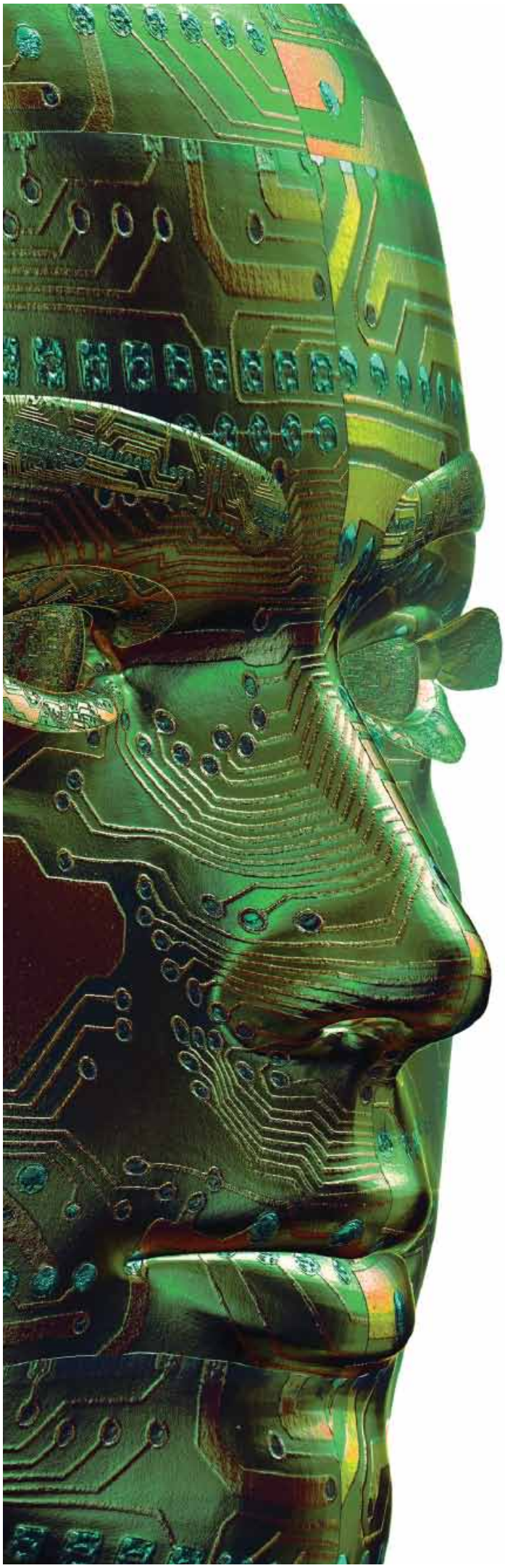
ISBN: 9780102966411

Printed in the UK for The Stationery Office Limited on behalf of the Controller of Her Majesty's Stationery Office

ID 2369098 12/10

Printed on paper containing 75% recycled fibre content minimum.

CONTENTS



OUR VISION is for the UK to be the most dynamic and stimulating environment in which to engage in research and innovation.

PIONEERING THE FUTURE
JOHN ARMITT CHAIRMAN

In accordance with Schedule 1 to the Science and Technology Act 1965, the Engineering and Physical Sciences Research Council submits the following report on its activities for the period 1 April 2009 to 31 March 2010.

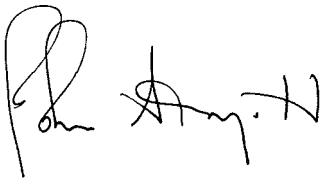
This year we have invested over £800 million in pioneering research for the future. As the Government's agency for funding world-class research, innovation and skills development in engineering and the physical sciences, our focus continues to be on the many global challenges that face the UK. A high proportion of our investment this year is making an impact on big issues that affect all of us – the future health of the economy, the need for secure and sustainable energy, the impact of climate change, the needs of healthcare and the consequences of an ageing population.

The future of the UK's economy is clearly of particular concern following the recession and the need for a more diversified and balanced economy is widely recognised. This emphasises EPSRC's pivotal role in delivering the science and engineering innovations and highly skilled people that can help stimulate economic growth. We already have much to be proud of. Around half of the PhDs we fund move straight into employment in business or the public services, many in key sectors for the UK like pharmaceuticals, aerospace, computing, telecommunications and finance. Also very positive is the recent confirmation that the research communities we fund are judged to be amongst the best in the world based on international benchmarking. And, as we showcase in this report, our portfolio of investment in research is paying off in a wide range of industry and service sectors.

EPSRC's programmes this year show how we are targeting major investment for research which will sow the seeds of potential new industries and jobs for the UK. A new generation of centres to develop innovative manufacturing in industries from healthcare to telecommunications was launched this year, for example. And the creation of a 'Digital Britain' was boosted by significant new funding for research programmes that promise to transform the way technology improves our everyday lives.

Our ambition of shaping research capability to deliver excellent research was demonstrated this year by our injection of major new funding for mould-breaking research which opens up the prospect of ground-breaking advances in areas such as sustainable energy and super-fast computers. We are underlining our commitment to supporting the flow of world leading researchers through further expansion of training centres across the UK, as well as enabling more researchers to deploy their skills in business environments to pave the way for economic benefit.

Our strategy has always been to remain responsive to the future needs of the UK. EPSRC's Strategic Plan published this year sets out how we propose to keep the UK at the leading edge of global research and innovation. It is ambitious and I am confident that we are on course to provide the knowledge and skills that are vital to a healthy, sustainable and prosperous society.



John Armitt Chairman

DELIVERING GREATER IMPACT
DAVID DELPY CHIEF EXECUTIVE

Few doubt that the UK now faces challenges on an almost unprecedented scale – economically and environmentally – and that we must deliver ever greater impact in response. EPSRC's greatest impact continues to be through the highly skilled people that we support and the fundamental knowledge they generate, both of which are essential to business, government and other research organisations. This Annual Report highlights the many investments we have made this year to support cutting edge science and engineering that will meet the needs of the economy and society.

The focus is on major challenges such as the requirement for a low carbon future for energy, digital technologies that can improve peoples' lives and create new businesses, advances in healthcare that meet the demands of an ageing population and a highly competitive manufacturing sector for a balanced economy. The report also includes telling case studies of how our past investments in basic research have borne fruit in new breakthroughs with huge potential and how spin-out companies are reaping the rewards of successful application.

Vision for the future

It has never been more important for the engineering and physical sciences community to work together to produce solutions for the future benefit of the UK. Our current Delivery Plan runs until 2011 when we will be launching its successor. This is why we published our Strategic Plan in 2010, developed following broad consultation with our partners and communities. It has been informed by government strategy, the wider international research landscape and the global economic situation. This is an ambitious high-level statement of EPSRC's long term vision and goals for the next three to five years and sets out how we will achieve them.

Achieving impact

At this year's launch of a new generation of Centres for Innovative Manufacturing with major EPSRC funding of £70 million I emphasised their importance for the future health of the UK economy. They will focus on areas of pioneering research that promise to spearhead the creation of new industries and new employment opportunities in the UK. For example, the first three we have announced will develop sustainable solutions through recycled metals, harness light to revolutionise the internet and telecommunications and help save lives through developments in regenerative medicine.

Our ongoing drive to ensure that EPSRC investment in research achieves maximum impact was given a further boost in 2009. We awarded funds of £55 million for 25 knowledge transfer awards which will help to realise our ambition that the UK is as renowned for knowledge transfer and innovation as it is for research breakthroughs. In practice these awards mean that university groups will focus on such valuable targets as facilitating the results of research engineers to be applied commercially to the health sector, or honing the skills of a new 'brand' of people equipped with the technical and business skills to succeed in an increasingly entrepreneurial environment.

One of the key measures of how EPSRC's strategy is succeeding in delivering the impact that our economy and society needs is the success of new business start-ups that emerge as a result of EPSRC supported research and training. Over the past four years 179 such spin- out companies have been reported on our grants. One spin-out, Critical Pharmaceuticals, a biotechnology company spun out from the University of Nottingham, secured an order from the Wellcome Trust to develop a nasal spray of Human Growth Hormone using its proprietary CriticalSorb technology as an alternative to injection. The drug is a leading biological treatment for growth disorders that had global sales of around $2.8 billion in 2007. Another highlight is that the giant offshore wave energy converter called Oyster began supplying power

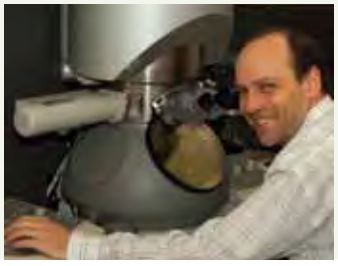
Key highlights of the year

£78 MILLION FOR NEW PROGRAMME GRANTS – FROM SUSTAINABLE ENERGY TO SUPER-FAST COMPUTERS.

THREE NEW CENTRES FOR DOCTORAL TRAINING (CDTs) IN MATHEMATICAL SCIENCES WHICH BOOST THE CDT TOTAL TO 52.

41 NEW FELLOWSHIPS AWARDED FOR NEXT GENERATION RESEARCH LEADERS.

£55 MILLION FOR NEW KNOWLEDGE TRANSFER AWARDS.



EPSRC's greatest impact continues to be through the highly skilled people that we support and the fundamental knowledge they generate, both of which are essential to business, government and other research organisations.
David Delpy, CEO EPSRC

to the national grid. Based on EPSRC funded research, this technology could make a significant contribution to the UK's requirement for more sustainable energy.

Staying world class

Further evidence that the UK research communities we support are world beaters was revealed in a newly published study, summarised in this report on page 11. Its analysis of researchers' citations in journals showed that those with EPSRC funding achieved a higher citation rate when compared to both the UK and worldwide levels. This is a clear tribute to our investment in building excellence in the UK research base as well as how competitive the research we support is across the world.

Our aim of shaping the research base to ensure it delivers high quality research for the UK was supported this year by a £78 million boost for one of our flagship schemes: Programme Grants. These seek out ambitious mould-breaking research projects that promise breakthroughs in areas of research with the potential to deliver significant impact for our economy and society. This year we invested in 16 such Programme Grants covering a range of research disciplines. One of them aims to establish a world leading programme in the assembly of tiny metal structures 100 times smaller than a human hair which could help build super-fast computers using light. Another will search for more advanced synthetic molecular machines which could be used as nano robots and to synthesise polymers.

Research which combines vision and good management depends on attracting and training the next generation of genuinely world class researchers and research leaders. We have responded with our ground-breaking investment of £304 million in Centres for Doctoral Training across the UK over the past two years. It underlines our vision for a flow of skilled people who will be crucial to shaping the UK's future research capability and delivering the benefits our society will need. Three new centres focused on creating a new generation of advanced mathematicians announced this year all have close links to industry and their students will be highly employable in commerce and industry.

Our innovative vision also includes developing a range of strategic partnerships with research intensive organisations. I was delighted when, in 2009, EPSRC and Rolls-Royce linked up in a new ten year strategic partnership worth £50 million for the development of the materials, skills and knowledge for the improved gas turbines that will power future aircraft and applications in energy generation. Our 28 strategic partners in the private and public sectors are very important to us, bringing valuable additional relevance and impact to our research portfolio and substantial extra funding.

Safeguarding peer review

As is now widely known, the pressure on the peer review system has grown in the past two decades with the number of grant proposals doubling in that time. Changes to improve the system introduced in 2010 will place limits on EPSRC grant eligibility for repeatedly unsuccessful applicants. We have worked hard to ensure that all researchers are aware of the changes and understand the need for them. Our goal is to protect peer review and I hope that the policy change will help us achieve this. Early indications are promising in the reduction in the numbers of proposals received. I want to assure the research community that we will continue to work with you to ensure that the system is achieving its aims successfully.

David Delpy Chief Executive

£70 MILLION FOR A NEW GENERATION OF CENTRES FOR INNOVATIVE MANUFACTURING.

OYSTER WAVE ENERGY CONVERTER SUPPLIES POWER TO THE NATIONAL GRID.

NEW STUDY RATES EPSRC SUPPORTED RESEARCHERS AS WORLD LEADING.

£50 MILLION ROLLS-ROYCE/EPSRC PARTNERSHIP TO IMPROVE GAS TURBINES.

HEALTHY RESEARCH BASE

EPSRC's role is to shape the research base to ensure that it delivers the highest quality research and world level researchers for the benefit of the UK, now and in the future. Our research and skills development portfolio is focused on the strategic needs of the nation, fuelling the economy with knowledge and highly trained people and delivering an essential platform for the full range of the sciences.

Skills help win gold

Rachel Blackburn and James Roche, two EPSRC funded Engineering Doctorate students from the University of Southampton, developed the technology used in the building of Amy Williams' gold medal winning skeleton sled (pictured here).

Dr Stephen Turnock, Blackburn and Roche's supervisor said that the pair *"demonstrated that engineering excellence can be delivered by a small dedicated team with a clear vision."*

Image credit: Sarah Winterflood/UK Sport

HEALTHY RESEARCH BASE

Aerial surveillance for safer war zones

New technology that enables aerial vehicles to plan missions and verify their behaviour could mean there is less need for military personnel to conduct dangerous surveillance in war zones. Developed by researchers at Cranfield University in collaboration with a team from Imperial College London with EPSRC support, the sophisticated autonomous computer framework is designed for use in multiple unmanned aerial vehicles. The first of its kind, it allows one operator to control a number of vehicles from a safe position on the ground. It would also reduce the costs of surveillance missions significantly.

Launching a fleet of vehicles in crowded or dangerous skies requires very sophisticated control and guaranteed performance. Through a series of dynamic decision making control algorithms, the system manages each vehicle's functions such as navigation, guidance, path planning and decision making and ensures that vehicles avoid colliding. Lead researcher Professor Antonios Tsourdos explains part of the benefit: *"Missions sometimes have to be abandoned due to poor weather or on safety grounds but pilotless vehicles can be used in more challenging situations and provide real-time feedback on current conditions."*

Another novel use of the technology is in environmental surveillance. Vehicles fitted with chemical sensors were able to track the movements of contaminated cloud formations and predict their movement pattern. Other potential applications range from oil exploration to marine and border inspection.

A Reaper MQ-9 UAV (Unmanned Aerial Vehicle) prepares for a training mission.
Image credit: © Crown Copyright/MOD 2010/www.defenceimages.mod.uk

SUPPORTING EXCELLENCE

17,853

Approximately 17,853 researchers and students funded by EPSRC.

THE YEAR IN CONTEXT

The crucial role of science and engineering in contributing to a well balanced modern economy has seen growing recognition this year, highlighting further the significance of EPSRC's mission.

Our vision is to shape the research base to ensure it delivers high quality research for the UK, focusing on strategic needs such as green technologies and high value manufacturing. This meets the challenge of the Government's Science and Innovation Investment Framework which requires EPSRC to deliver two key elements for supporting the UK in retaining international prominence and economic stability. These are the provision of new knowledge from research that inspires both scientific innovation and economic benefit; and a flow of highly skilled people to drive forward a thriving economy.

The impressive result of a study* of the impact of EPSRC researchers through citations in journals is a tribute to our investment in research for shaping a healthy core research base. The study revealed that EPSRC researchers achieve a higher citation rate when compared to both UK and worldwide levels.

EPSRC invested £459 million during the year to fund top quality research from pure physics to practical engineering sciences. We awarded over 1,020 research grants selected by peer review for the excellence of the proposals. During the year we have continued to build programmes focused on high ambition research for the UK, for example through a new tranche of Programme Grants which promise mould breaking developments in areas such as biosensors for healthcare, super-fast computers and synthetic molecular machines with vast potential for applications.

Our overall research investment sustains an essential platform for a strong research capability through a significant portfolio of investigator-led research with approximately 17,853 researchers and students funded by EPSRC.

Ensuring excellence in the process of funding research depends on a peer review system that is both transparent and efficient. EPSRC is introducing changes to the process in 2010 to tackle the growing pressure on the system arising from a doubling of proposals made to research councils over the past two decades. These include placing a limit on the number of proposals from repeatedly unsuccessful applicants. The changes are aimed at protecting peer review and alleviating pressure on all involved. Commenting on the changes, the journal Nature said: *"No other funding agency has dared to attempt some of the bold alternative policies that deserve a trial."*

A requirement for proposals to include plans to maximise impact from their research was introduced in 2009 to contribute to meeting the demands of the Delivery Plan.

Delivery plan for high-impact research

EPSRC's Delivery Plan for 2008 to 2011 shapes our portfolio focusing on tackling the current challenges faced by government, society and the economy. These include such pressing public policy issues as:

- The rapidly shifting economic activity;
- The acceleration of innovation and technology developments;
- Provision of a secure supply of affordable and sustainable energy;
- Living with environmental change;

**EPSRC-commissioned Citation Study 2009 prepared by Evidence (Thomson Reuters).*

The answer to compostable packaging?

Food packaging and other disposable plastic items could soon be composted at home along with organic waste thanks to a new sugar-derived polymer. The degradable polymer is made from sugars such as D-glucose and other hexoses, which can be produced by a range of crops or even from agricultural or other wastes.

Dr Charlotte Williams, Department of Chemistry, Imperial College London, who is leading the development of the material, with EPSRC support, describes the significance of the work: *"The search for greener plastics especially for packaging is the subject of significant research worldwide. It's spurred on not only from an environmental perspective, but also for economic and supply reasons. Around 7% of worldwide oil and gas resources are consumed in plastics manufacture with worldwide production exceeding 150 million tons a year. Almost all plastics are made from fossil fuels."*

One key breakthrough was finding a way to selectively transform the sugar feedstock into polymer, by developing high yielding and efficient chemical transformations. The new process took several years to develop and could be advantageous in reducing energy and water usage. The team are currently studying the scale-up and applications for the new polymers. Another potential application is as a scaffold material for tissue regeneration, which is already being investigated in collaboration with Professor Molly Stevens of Imperial College London. *"The technology could be in use within two to five years,"* says Dr Williams.

Food packaging is just one of the potential applications of the compostable sugar-based polymer.

- Demographic change including an ageing population; and
- Global uncertainty and the threat of terrorism.

For EPSRC, there are five key drivers that have shaped the Delivery Plan:

- The need to encourage innovation through transformative research;
- Increased emphasis on the economic policy and social impact of supported research;
- Greater need for an interdisciplinary approach across traditional boundaries;
- New arrangements for publicly-funded health research; and
- The dynamics of research globally, including the rapidly changing economies of India and China.

Our response to these challenges within a broader portfolio has been to focus on delivering vibrant research programmes in priority areas. EPSRC research is key to generating the fundamental knowledge and skilled people needed for advances in energy, security, living with environmental climate change, the digital economy, nanoscience through engineering to application, towards next-generation healthcare, global security and a manufacturing economy. We will build on this current Plan by launching its successor Delivery Plan in 2010-11. Work in developing the Plan is being carried out in conjunction with our community.

1.6

EPSRC researchers achieve a higher citation rate of 1.6 compared to the UK average of 1.4 and a world average of 1.0

GOOD CITATIONS

EPSRC funded researchers have a better impact compared to the UK average according to a new study of citation rates in journals. The three year study of over 7,000 journal articles has shown that EPSRC researchers achieve a higher citation rate of 1.6 compared to the UK average of 1.4 and a world average of 1.0. This impressive achievement reflects the level of impact that EPSRC supported researchers have and also highlights how competitive the research we fund is across the world.

Most citations proved to be for areas of engineering research, followed by chemistry and then physics. Another finding from the study was that EPSRC funded researchers publish their articles in the leading journals in their fields.

RIGOROUS REVIEW

The UK research community continues to be recognised worldwide as being highly successful based on international bibliometric comparisons. However, EPSRC has sustained its strategy of rigorous evaluation of the areas within its remit to review their performance using teams of international experts. This year the discipline based spotlight was on chemistry while the programmes review focused on e-Science via an RCUK review. An international review of the Research Council's UK Energy Programme took place in October 2010 and the findings of the Review Panel will be released at a Town Meeting planned for January 2011. An international review of Mathematical Sciences is scheduled to take place in December 2010.

The right chemistry

A panel of eminent overseas researchers who compared the strength of UK chemistry research with world competitors found that: *"Chemistry research in the UK was world leading,*

MOULD-BREAKERS

Featured here are some of the 16 new EPSRC Programme Grants to support research leaders in ambitious, mould-breaking projects that aim for breakthroughs in areas of research with the promise of high impact for the UK.

We will work together with, and listen to, our industrial partners to direct research in ways that hopefully will lead to new improved products and services that everyone can buy off the shelf.
Professor Anatoly Zayats, Queen's University Belfast

Light speed computers

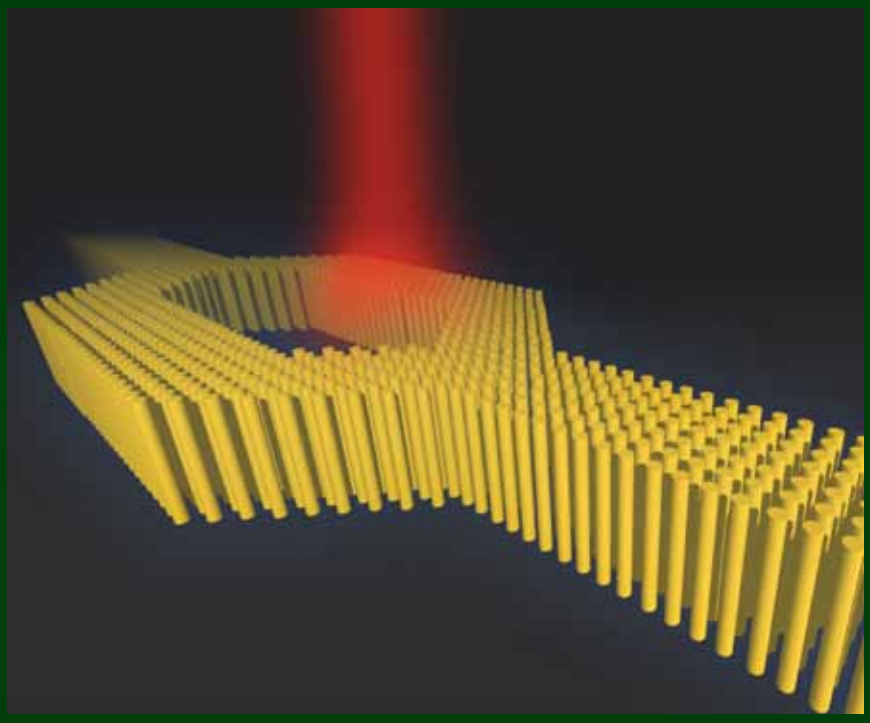
The vision of Professor Anatoly Zayats of Queen's University Belfast is that a £5.2 million Programme Grant will lead to super-fast computers which use light to process large amounts of data.

The joint research with Professor Stefan Maier's team at Imperial College London aims to establish a world-leading programme on the science of 'nanoplasmonic devices'. These tiny metal structures 100 times smaller than a human hair could help build optical computers which process information using light instead of electric current. At present the speed with which computers process information is limited by the time it takes for the information to be transferred between electronic components.

Professor Zayats who leads the project said: *"This is basic research into how light interacts with matter on the nanoscale. But we will work together with and listen to, our industrial partners to direct research in ways that hopefully will lead to new improved products and services that everyone can buy off the shelf."*

Also supporting the project are INTEL, Seagate, Ericsson, Oxonica, IMEC and the National Physical Laboratory.

Below:
An artistic impression of a possible active plasmonic device.



Getting a grip on energy efficiency

Professor Richard Vinter of Imperial College London is focusing a £5.5 million Programme Grant on getting a grip on fuel and energy efficiency across a wide range of applications.

"New technologies for clean electricity generation, fuel efficient transport and environmentally friendly waste disposal will all depend on a new generation of special purpose control systems," explains Professor Vinter. *"Current research trends in control engineering which focus on complexity and uncertainty, have a great and as yet unrealised, potential to contribute to these technologies."* The research aims to develop new control engineering techniques which can be exploited for renewable energy and vehicle fuel efficiency. For example, the clean energy research will address challenges such as the integration of wind power into a network and dealing with the intermittency of renewable energy supply. In transport, the project aims to develop new technologies such as those for improved vehicle engine management and design and aircraft management schemes to reduce fuel consumption.

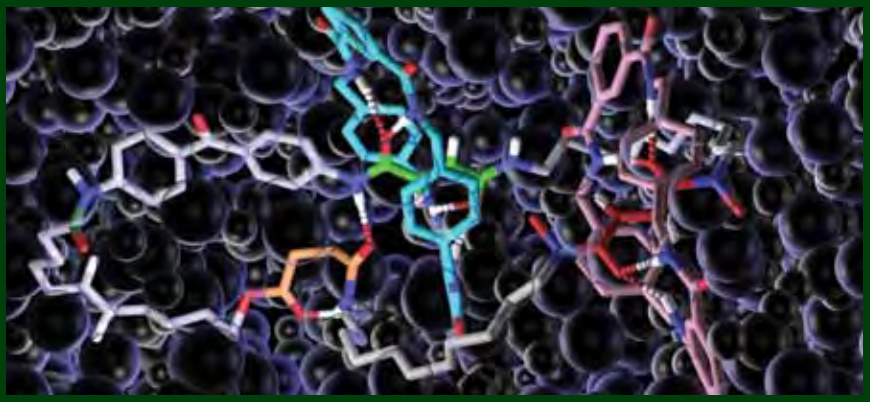
Above: This image captured with a very brief (20 ns) flash shows jets of ink ejected from an array of 11 nozzles at the top of the frame. *Credit: University of Cambridge, Inkjet Research Centre.*

Below: Unidirectional rotary molecular motor.

In search of molecular control

The search for more advanced synthetic molecular machines is the driver for the £2.7 million Programme Grant led by Professor David Leigh from the University of Edinburgh. *"At the heart of every significant biological process are nanomotors and molecular level machines developed by nature over millions of years. But none of mankind's myriad of modern technologies such as catalysts, pharmaceuticals and chemical reagents exploit such motion. They all function through static or equilibrium dynamic properties. When we learn how to build artificial structures to control molecular level motion, it will impact every aspect of functional molecular and materials design,"* explains Professor Leigh.

The University of Edinburgh research group are world leaders in the field having designed some of the first artificial molecular motors which, when fully explored and mastered, will allow scientists to drive chemical systems in a controlled way. The new research seeks to expand and exploit their understanding for applications such as molecular machines that can act as nano-robots and synthesising complex polymers.



Major player in inkjet

The UK is recognised internationally as a leader in industrial inkjet technology. Apart from its well known printing role, novel applications are beginning to be exploited commercially in manufacturing high value, high precision products like flat panel displays and photovoltaic cells for power generation.

Professor Ian Hutchings of the University of Cambridge who leads a £5 million Programme Grant in this technology explains the potential: *"By extending the existing benefits of inkjet methods to attain the speeds, coverage and material diversity of conventional printing and manufacturing systems, we can transform inkjet from its present niche technology into a mainstream process with the UK as a major player."*

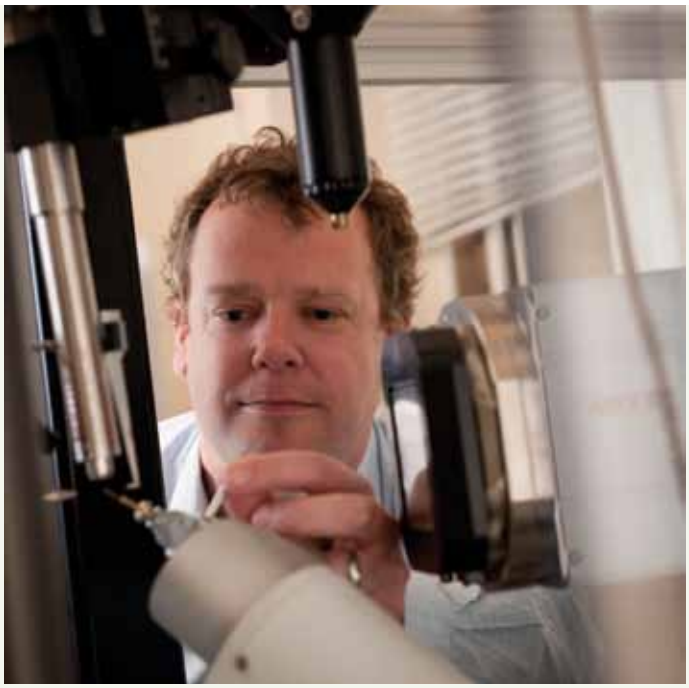
To make this happen, a much better understanding of the underlying science is needed. The cross disciplinary research with the impressive support of eight UK-based companies and three major UK universities' research groups will tackle the challenge with research into a wide range of factors that will determine the formation and ultimate fate of ink drops.

The potential scope for industry beneficiaries of the research is vast including not just printing and digital manufacturing but companies involved in pharmaceuticals, agrochemicals, combustion, coatings, materials processing and particle technology.

Metals forge new drug

Drugs made using unusual metals could form an effective treatment against colon and ovarian cancer according to new research at the universities of Warwick and Leeds. The study, funded by EPSRC and published in the Journal of Medicinal Chemistry, revealed that a range of compounds containing the transition metals Ruthenium and Osmium which are found in the same part of the periodic table as precious metals like platinum and gold, cause significant cell death in ovarian and colon cancer cells.

The compounds were also effective against ovarian cancer cells which are resistant to the drug Cisplatin, one of the most successful transition metal drugs, which contains platinum. One of the lead researchers of the study, Dr Patrick McGowan from the University of Leeds, explains the importance of the breakthrough: *"This is a significant step forward in the field of medicinal chemistry. Cisplatin is one of the most effective cancer drugs on the market, with a 95% cure rate against testicular cancer for example. Since its discovery in the 1970s chemists across the world have been trying to discover whether other transitional metal compounds could be used in cancer treatments."*



Dr Patrick McGowan using equipment to solve some of the crystal structures in the work.

£30 million

The RCUK e-Science programme has attracted industrial collaborations worth around £30 million.

internationally recognised and well placed to tackle society's greatest challenges." One of the findings of the panel was that there were numerous examples of vigorous and successful spin-out companies, with academic/industry collaboration, a positive and distinguishing feature in the UK. They also observed that facilities and equipment levels were outstanding and comparable with the best in Europe.

Chair of the review panel, Professor Michael Klein from the University of Pennsylvania, commenting on the review's conclusions said: *"There are examples of truly outstanding, world leading and world class work. The community is aggressively utilising all of the funding streams available through the Research Councils, charities, Europe and industry. Importantly, the top level research is not confined to one location – there are excellent examples of international collaboration, especially via EU programmes."*

Commenting on the economic and societal context of the review, EPSRC Chief Executive Professor David Delpy said: *"Chemistry research underpins a wide range of activities that benefit society including discoveries that lead to new industries, materials and technologies as well as helping to conquer diseases."*

Spin off from e-Science

The RCUK e-Science programme, set out to create digital infrastructure and systems to enable large scale research collaboration. This year a review of its standing by an international panel of experts judged it *'world-leading'*, citing that *"investments are already empowering significant contributions to wellbeing in the UK and the world beyond."*

Investment by the Research Councils in the programme had enabled frontier leading work in fields such as life sciences and medicine, materials and energy and sustainability. Attractive to industry from its inception, the programme has attracted industrial collaborations worth around £30 million. Its achievements include 30 licenses or patents, 14 spin off companies and 103 key results taken up by industry.

PATHWAYS TO IMPACT

Following the introduction in April 2009 of a requirement for all research council grant proposals to incorporate a 'Pathways to Impact', new best practice guidance based on proposals received is planned for the research community.

The idea behind Pathways to Impact was to help researchers identify and exploit potential benefits of their work. Quality of research remains the key criterion for funding but the impact plans give applicants an added opportunity to highlight the importance of their work and for the first time seek the resources needed to realise impact and disseminate results.

EPSRC's Susan Morrell, who is leading the work, aims to help researchers maximise the opportunities and minimise pitfalls by making available early observations on the first batch of proposals: *"We will be refreshing the guidelines in the light of these observations and would welcome comments and suggestions. We were particularly impressed by the thorough plans prepared by those applying for their first grant,"* she said.

BIG AMBITION

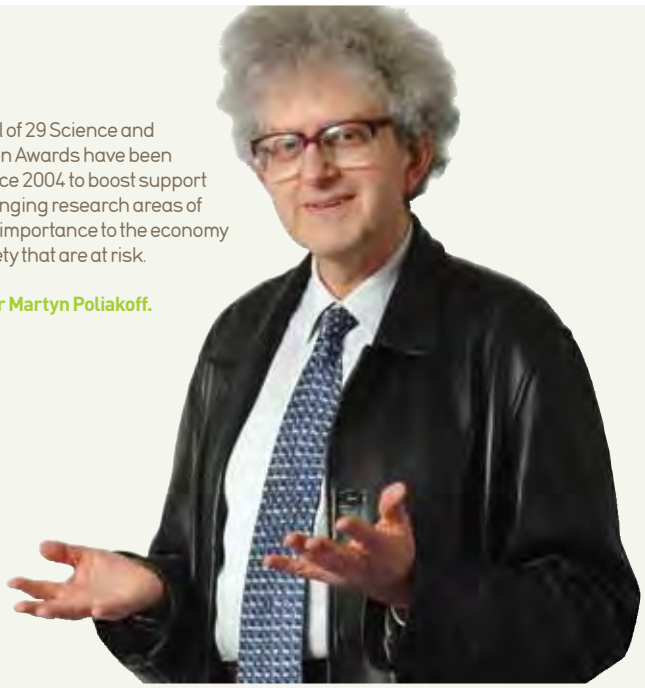
Vision, ambition, leadership and management strategy are some of the demanding requirements

Filling a chemistry gap

An EPSRC Science and Innovation Award is pulling off a 'double' in progress on chemistry. One is an exciting development that uses ultra high vacuum techniques on salts with unusual properties which could lead to new solvents for greener chemical reactions. The other is debunking a myth that chemists and chemical engineers don't mix. Professor Martyn Poliakoff, a chemist at the University of Nottingham who is leading the award, explains: *"The EPSRC funding enabled us to set up the Driving Innovation in Chemistry and Engineering (DICE) project which is helping to close the discipline 'gap'. Thanks to DICE we've been able to create six new interdisciplinary positions at Nottingham. The resulting cross-fertilisation of ideas is leading to new and exciting lines of research."*

For example, the academic post, manpower and extra equipment provided via DICE allowed Dr Pete Licence, now an EPSRC Advanced Research Fellow at the University of Nottingham, to take advantage of a flash of inspiration about the involatile nature of ionic liquids – salts that melt below room temperature. Teaming up with surface scientists led to the development of the use of ultra high vacuum (UHV) techniques to explore the properties of these unusual substances. The work is leading to a new understanding of how these liquids can be employed as solvents in greener chemical reactions. The application of UHV techniques to ionic liquids and the resulting new ideas are inspiring scientists around the world and catalysing whole new areas of fundamental studies and research into advanced materials applications.

A total of 29 Science and Innovation Awards have been made since 2004 to boost support for challenging research areas of strategic importance to the economy and society that are at risk.



Professor Martyn Poliakoff.

of EPSRC's flagship Programme Grants launched in 2009. Designed to stimulate research that promises to deliver transformation in challenging areas, 16 grants worth £78 million have been made across a range of disciplines. The grants support research leaders in mould-breaking projects in areas such as biosensors for healthcare, super-fast computers and synthetic molecular machines with vast potential for applications.

EPSRC Director, Research Base, Dr Lesley Thompson, said: *"These grants are large scale, addressing a theme or issue that need longer than four years to solve. They will play a significant role in delivering UK research that is internationally-leading. We want to ensure our best researchers have such grant support so they have the flexibility needed to tackle major research challenges."*

The new Programme Grants include:

- **Light alloys towards environmentally sustainable transport: second generation solutions for advanced metallic systems** (Professor George Thompson, The University of Manchester). Super-light materials that enable the building of 'greener' cars and aircraft are the aim of the research.
- **Molecular-metal-oxide-nanoelectronics: achieving the molecular limit** (Professor Leroy Cronin, University of Glasgow). The research involves showing that inorganic molecules could be reliable when used in fabricating nano-electronic devices.
- **Chemical synthesis of transformative extended materials** (Professor Matthew Rosseinsky, University of Liverpool). The aim is to synthesise new functional materials important to the UK in areas such as energy and healthcare.
- **Materials for fission and fusion power** (Professor Steve Roberts, University of Oxford). The project seeks to speed development of new materials essential to the realisation of fusion and new-generation fission power.

Four other Programme Grants are featured on pages 12 and 13.

£78 million

16 Programme Grants worth £78 million have been made across a range of disciplines.

TOWARDS NEXT GENERATION HEALTHCARE

We recognise the increasing challenges of an ageing population and the considerable benefits to the UK in supporting multi-disciplinary research addressing factors across the life course that influence healthy ageing and wellbeing in later life. New centres to focus on age related research themes such as quality of life, physical frailty and the ageing brain are being funded jointly by five research councils – AHRC, BBSRC, EPSRC, ESRC and MRC who lead on this cross-council 'Lifelong Health and Wellbeing' initiative.

In addition, a multidisciplinary approach to improving the health of UK citizens at all stages of their lives is the role of EPSRC's 'Towards Next Generation Healthcare' programme.

Cancer imaging is being transformed over the next five years by four new centres formed by a strategic partnership between Cancer Research UK and EPSRC. They will be focal points for world class research using a range of imaging techniques such as magnetic resonance and positron emission tomography. New imaging techniques will provide doctors with vital information on the impact of therapies and on identifying best treatments for patients. MRC and the Department of Health have also contributed to the initiative.

Medical spin-off from space shuttle fuel

A new technology which dramatically improves the sensitivity of Magnetic Resonance techniques used pervasively in chemistry and exploited in hospital scanners, has been developed by scientists at the University of York following long term funding from EPSRC.

The technique is based on manipulating parahydrogen, the fuel of the space shuttle. It is expected to allow chemists to gain greater insight into molecular processes and ultimately doctors to learn far more about a patient's condition from an MRI scan at a lower cost.

Professor John Local, Pro-Vice Chancellor of Research at the University of York, said: *"This technological advance has the potential to revolutionise the accessibility and application of high-quality medical imaging to patients. It will bring significant benefits to diagnosis and treatment in virtually all areas of medicine and surgery, ranging from cancer diagnosis to orthopaedics and trauma. It illustrates the enormous success of combining high quality basic science with clinical application."*

This cross council research, published in the journal 'Science', is supported by EPSRC, BBSRC and MRC. It is also now attracting substantial industrial attention and investment supported by an EPSRC follow-on award.

£40 million

Four new UK Centres of Excellence in Medical Engineering worth £40 million were announced in 2009 jointly with the Wellcome Trust.

We already support a strong portfolio of medical engineering, including collaborative work with key companies such as GE Healthcare and with the NHS and MRC. In 2009 our drive for new technologies to revolutionise clinical areas such as imaging, implants and genetics was boosted by the announcement of four new UK Centres of Excellence in Medical Engineering.

The Wellcome Trust and EPSRC announced these jointly funded Centres over five years for research teams at Imperial College London, King's College London, University of Leeds and the University of Oxford. The Centres will develop integrated teams of clinical researchers, biomedical scientists and world-class engineers and scientists with the capacity to invent high tech solutions to medical challenges with the potential to improve thousands of patients' lives.

The Centres' research themes are:

- **Osteoarthritis**
  (Imperial College London, £11 million funding).
- **Medical imaging**
  (King's College London, £10 million funding).
- **Ageing population**
  (University of Leeds, £11 million funding).
- **Personalised healthcare**
  (University of Oxford, £8 million funding).

Sir Mark Walport, Director of the Wellcome Trust, said: *"We strongly believe that a multidisciplinary approach stands the best chance of generating sustained innovation in healthcare. British engineers, biomedical scientists and clinical researchers understand the potential of working together to solve medical problems."*

In addition to our successful strategic partnerships with major charities such as the Wellcome Trust and Cancer Research UK, EPSRC has also piloted a new Healthcare Partnership initiative to target smaller charities and small and medium sized enterprises (SMEs). The programme has now launched an £8 million scheme to fund up to 15 collaborations between research teams and these partners.

NANOTECHNOLOGY GRAND CHALLENGE

Three new complementary research projects starting in 2010 will turn carbon from an unwanted pollutant into useful products that could help both industry and the environment. The research is part of the £26.5 million EPSRC contribution to the RCUK 'Nanotechnology Grand Challenge' programme which aims for a transformational impact in areas of importance to the economy and society, using a stage-gating approach with the Technology Strategy Board to shorten the innovation chain in key focused areas. It follows two earlier nanoscience Grand Challenges – on solar harvesting and drug delivery and diagnostics.

Warm springs inspiration: One of the Grand Challenge trio, led by University College London in collaboration with Johnson Matthey, will mimic biological systems to produce a catalytic reactor that can convert carbon dioxide into useful chemicals for applications such as fuel cells in laptop computers and mobile phones. The reactor will use novel nano-catalysts based on compounds formed in warm springs on the ocean floor that are considered to have triggered the emergence of life.

Artificial leaf concept: The production of vehicle fuels by reducing carbon dioxide with hydrogen, electrical energy or photon energy is the aim of the nanotechnology research at Imperial College London and University College London, in

NEW GENERATION WITH MATHS IMPACT

Three new Centres for Doctoral Training announced this year will focus on creating a new generation of advanced mathematicians who will be highly employable for the benefit of the UK. With EPSRC investment of £12.7 million, the new Centres all have close links to industry and are the first to be dedicated to the subject.

Right: Mathematical analysis in action: smudges in an image are cleaned up using computational differential equations. The smudges on the butterfly on the left were removed using a computational scheme based on the Cahn-Hilliard equation, devised and implemented by Carola Schoenlieb.

Below: Graduates of the STOR-i programme will be part of a new generation of highly employable researchers equipped with the skills required for effective careers in academia or industry.

Bottom right: A computed equilibrium shape of a vesicle formed by a biomembrane that involves a phase separation within the membrane surface. Such shapes are governed by an elastic bending energy that, for instance, can also describe the shape of a red blood cell. On the left the colours red and blue indicate the two phases and on the right is shown the computed triangulated surface using surface finite elements. *Credit: Elliott and Stinner, J. Comp. Phys. 2010.*

Where maths can lead

Not all maths students go on to become academic mathematicians – many enter the world of commerce and industry and use their mathematical reasoning to enhance their chosen area of work. Maths is an important subject that has both a direct and indirect impact on industry and the economy. In many cases application of mathematical theory can occur even when this was not the intention. For example insights from stochastic analysis and scientific computation, which were conceived in theoretical terms, now form the basis of the PageRank algorithm used by Google to order the results of a web search. The highly trained researchers from the Centres therefore promise to make a significant contribution to the long-term scientific, technological and economic well being of the UK.

THE NEW CENTRES

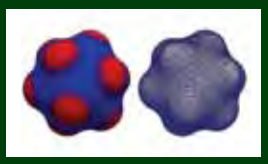
The Centres opening in 2010 will be based at Lancaster University, University of Cambridge and the University of Warwick. Each will train at least 40 students per year over seven years. In addition to developing an original research project, each PhD student will receive a formal programme of taught coursework to broaden their skills and enhance their technical and interdisciplinary knowledge.

Critical skills shortage

The **Lancaster Centre**, STOR-i, with £4.5 million funding, will focus on statistics and operational research to meet the critical UK skills shortage within these disciplines. These two complementary areas of maths underpin a wide range of industries including defence, healthcare, finance, energy and transport. Centre director Professor Jonathan Tawn said: *"I see the development of this integrated, industrially-focused doctoral training centre as key for national competitiveness. Combined with input from our Centre's industrial partners the research training we will deliver will concentrate on methodological research motivated by and applied to, real science and industrial applications."*

Analysis underpins applications

"Problems originating in science, engineering and industry typically reach mathematics by way of analysis," explains Professor Arieh Iserles, co-Director of the **Cambridge Centre for Analysis**, which will focus on advanced training in mathematical analysis. The Centre's students will develop a mix of pure, stochastic, applied and computational skills and a breadth of interest and approach will be encouraged. Engagement with the broader Cambridge research environment including research institutes and other enterprises will contribute to a strong connection between the leading edge of core analysis and diverse and important applications areas. EPSRC funding for the Centre is £3.9 million.

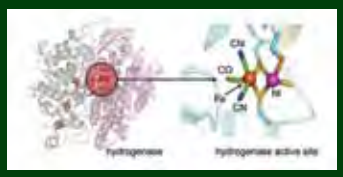


Meeting modern challenges

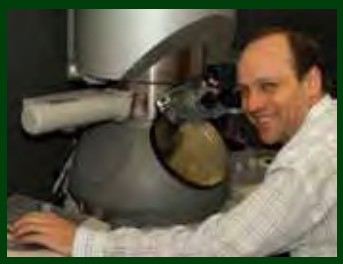
The **University of Warwick Centre** with EPSRC funding of £4.2 million will contribute to meeting major research challenges through skills development in applied maths, computation, probability and statistics. Professor Charles Elliot who will lead the Centre explains the important role of these four areas: *"They are not only major areas in the mathematical sciences but are key to developing the mathematical and statistical methodology that will be required to meet many modern challenges such as climate change, cell biology, large data sets and data assimilation, energy production, nano-sciences for technological and medical applications and molecular modelling of materials. The skills training will include research topics which emphasise problems at the interfaces of the subjects and students will also benefit from experiencing University of Warwick's international network of graduate training programmes in world leading institutions."*

AWARDS FOR THE HIGHEST POTENTIAL

A trio of talented researchers who won EPSRC Fellowship awards this year are featured here. In 2009, 41 Fellowships were awarded from a highly competitive field to those with the highest potential to become the next generation of worldwide leaders in their research fields.



Top: Dr Erwin Reisner.
Above: The enzyme active site: Nature's template for novel hydrogen production catalysts.



Above: Dr David Dye and the Titan Field Emission TEM at Imperial College London.

Above:
Looking into the past: New numerical methods and data using the electronic angle of escape makes it possible to determine the time when two electrons collided in the past.

Inspired by nature

In theory, hydrogen can be produced from water using sunlight as an energy source. But in practice the lack of low cost ways to create hydrogen gas is one of the main barriers to realising the dream of a hydrogen-based fuel economy. *"The problem"*, explains Dr Erwin Reisner, an EPSRC Career Acceleration Fellow based at the School of Chemistry at the University of Manchester, *"is that hydrogen production from water relies on the use of catalysts."* However, the catalysts commonly employed in this reaction are based on rare and expensive precious metals, work relatively inefficiently, or are susceptible to 'poisoning' by trace amounts of chemicals such as carbon monoxide and sulphides.

To develop a better catalyst, Dr Reisner and his colleagues turned to nature. *"Biological catalysts, or enzymes, present in organisms are able to perform many demanding catalytic transformations, including hydrogen production from water,"* he explains. Having already isolated a promising hydogenase enzyme and combined it with a light-harvesting dye to make a proof-of-concept hydrogen-producing system powered by sunlight, Dr Reisner and his colleagues are now working to use these enzymes as a template for constructing synthetic catalysts to do the same job. *"My Career Acceleration Fellowship is a great asset here,"* he says, *"By allowing me the freedom to concentrate on research it is helping towards the goal of making hydrogen power a practical and economical proposition for the future."*

Intelligent alloys

A flap or air duct in an aircraft that automatically reshapes itself in flight as conditions change may sound like science fiction. But, alloys – substances made up of two or more metals – that reshape themselves by altering their crystal structure in response to temperature, stress or the application of magnetic or electrical fields already exist. *"The difficulty,"* explains Dr David Dye of the Department of Materials at Imperial College London, *"is that the structure of these materials evolves as they cycle from one crystal structure to another, so their lifetimes can be insufficient for safety-critical applications. This is just one of the problems we aim to overcome by exploiting advances in our understanding of metal physics."*

Metals are the original nanomaterials. Features at the scale of 10-100nm are often the key to determining their properties. *"Thanks to advances in computing power and the understanding of electron theory, these features are becoming better understood,"* says Dr Dye *"My EPSRC Leadership Fellowship provides the freedom to pursue a broad research idea with a small team of people, all aiming to move a field forward. It's really paying off. Using physics to explore fundamental properties of metallic materials will promote a new burst of creativity in metallurgy. It's enabling us to make gigantic objects magically better than anything our grandparents could have imagined."* Quieter, more fuel efficient and less polluting aircraft, lighter yet safer cars and next generation nuclear plants that produce less nuclear waste are just a few of the possibilities.

Ultrashort and sweet

When an atom ionises or a molecule breaks up, how do the electrons behave? And what influences their behaviour? *"To explore the answers you have to carry out your investigations in real-time,"* explains Dr Agapi Emmanouilidou of the Department of Physics and Astronomy at University College London and an adjunct assistant professor in chemistry at the University of Massachusetts in the US, *"This means working at attosecond (10-18 s) timescales."* Using ultrashort intense laser pulses to trigger the break-up and then to 'photograph', or probe, the collision, she and her colleagues are collecting data and developing new numerical methods based on classical physics to allow them to interpret them. Aside from a greater understanding of atomic behaviour, their work could ultimately help to lead to advances in medical and biophysical sciences, such as X-ray imaging.

"My EPSRC Career Acceleration Fellowship has made it possible for me to focus on this unconventional and very ambitious work and bring together a team of bright people at University College London to join my vision to become world leaders in the exploration of laser-matter interactions" says Dr Emmanouilidou. *"It's fascinating to be able to zoom into the realm of the micro-world, 'see' how electrons interact with each other and the escape pathways they choose when atoms and molecules break up. And scientifically, it's immensely rewarding!"*

Virtual disaster viewer aids Haiti relief

An innovative web tool that allows earthquake experts worldwide to pool knowledge quickly and effectively is boosting action to help Haiti's earthquake victims.

The Virtual Disaster Viewer (VDV) is being used by relief agencies operating in Haiti to target emergency food and medical supplies, prioritise repairs to infrastructure to allow aid to reach where it's most needed and to plan reconstruction and recovery.

The VDV, developed with EPSRC support, is the first web portal of its kind, representing a new type of community remote sensing tool that operates in a similar way to social networking sites.

Hundreds of earthquake scientists and engineers have been working with the VDV to access high resolution 'before and after' satellite and aerial photos of the newly created Global Earth Observation Catastrophe Assessment Network (GEO-CAN). Satellite and aerial photos showing details down to the level of individual buildings, cars, vegetation and tents, taken by experts are used to assess the extent of damage and where refugees are congregating. The VDV collates this information and builds up a master map of the damage and dislocation caused across the disaster zone.

Dr Tiziana Rossetto of University College London and part of the VDV development team says: *"This is an excellent example of how research can be developed into an end product capable of delivering tangible humanitarian benefits in a real life crisis of shocking proportions."*

Damage caused by the recent earthquake in Haiti.

£640 million

This year over £640 million of EPSRC funds are invested in supporting research with international links.

collaboration with industrial partners. To achieve this, they will develop nanostructured catalysts that operate using solar or other renewable energy inputs. These will be used in a process that mimics CO_2 activation in nature – an artificial leaf concept – that effectively reverses the polluting process of burning fossil fuels.

Carbon lock-in: The universities of Bath, Bristol and the West of England are working together to produce materials that can remove CO_2 from the atmosphere and lock it into useful products. At the heart of the project is a 'one-step' process that links catalysts directly with a novel CO_2 absorber and is powered by solar energy or an alternative renewable energy source. This process which reduces the amount of energy needed with current capture and utilisation techniques could deliver 'carbon lock-in' products such as polymers, carbohydrates or fuels.

GOING GLOBAL

Scientific challenges do not respect international borders. From the environment to the economy, a global response will require high quality research with potential for global impact. EPSRC has responded by focusing greater support for world-leading UK researchers to collaborate with their equivalent partners around the world. This year over £640 million of EPSRC funds are invested in supporting research with international links – a rise of around 20% over last year. It encompasses nearly 1,000 projects focused mainly on collaborations with China, India, USA, Japan and Europe.

Going solar with India

In 2010 a major new collaboration on cheaper and more efficient solar cells was launched by the UK and Indian governments. Energy Portfolio Manager for EPSRC, Dr Neil Bateman highlights the importance of this in meeting our goal of stronger research links between UK and Indian research institutions:

"It represents a new and exciting collaboration between some of the leading photovoltaics researchers in the UK and India. The research is targeted at pushing the science of solar energy towards cheaper, more reliable and sustainable electricity production in a wide variety of settings."

Two projects focused on photovoltaics will tackle some of the main challenges in developing cost-effective, efficient and stable solar energy systems. Solar energy has been identified by both the UK and India as key to meeting future energy needs and it was highlighted in the 2007 Energy White Paper as helping the UK meet its 20% renewable target by 2020. One of the projects aims to remove known bottlenecks in materials supply and develop new device designs that are significantly cheaper and more efficient than current solar cells.

The RCUK India Office, launched in 2008, was instrumental in building relationships between funding agencies that led to the research collaborations.

Ideas born with USA

An EPSRC IDEAS Factory 'Sandpit' event resulted from a step change in the partnership between the Research Council and the United States National Science Foundation (NSF). Research funding of £6 million was awarded to five new projects in the

Skills help win gold

Rachel Blackburn and James Roche, University of Southampton EngD students who developed Amy Williams' gold medal-winning skeleton sled 'Arthur.'

Amy Williams' outstanding gold medal win in sledging at the Winter Olympics was made possible with skills contributed by two EPSRC funded Engineering Doctorate students.

When Rachel Blackburn and James Roche signed up for their four year EngD degree at the University of Southampton they knew only that they would be working with the team behind British Skeleton. Neither of the ship science graduates had any experience with sledge technology, but the Performance Director of British Skeleton recognised that taking an innovative approach to training, preparation, kit and equipment could help take on and beat the rest of the world. The two students made their mark within the research team by going for a radical rethink by introducing novel features like adjustable components and interchangeable parts. This allowed the sled – nicknamed Blackroc after their surnames – to be tailored to the athlete's size and sliding style making it more responsive to the precise control needed to descend at speeds up to 140km/h.

Blackburn and Roche's research was part of an integrated unit brought together by UK Sport and including sports engineers at Sheffield Hallam University and engineers at BAE Systems as well as coaches and elite athletes. The pair's supervisor from the University of Southampton, Dr Stephen Turnock, said that they *"demonstrated that engineering excellence can be delivered by a small dedicated team with a clear vision."*

NEXT GENERATION SKILLS

12,300

Around 12,300 of the highly-skilled postgraduates supported by EPSRC have moved on into careers in industry and the public sector in the past decade.

new field of synthetic biology as a result of this 'Sandpit'. The funding is allocated to genuinely novel and transformative research ideas which emerged from the IDEAS event.

A wide range of researchers from the UK and US will work together on synthetic biology projects including those from biological and chemical engineering, molecular and plant biology, mathematics, chemistry, sociology and the computer sciences.

NSF Director Dr Arden Bement Jr. said: *"We are especially excited by the promise that these highly innovative, interdisciplinary projects hold for advancing the emerging field of synthetic biology, while at the same time building bridges with our international colleagues in the UK."*

Clean energy and China

Carbon capture and storage technology is the subject of a joint EPSRC/Natural Science Foundation of China call for research proposals issued this year. Funding of up to £2 million from EPSRC and matching resources from China are available. This follows two previous collaborative research initiatives with China in renewables and cleaner fossil fuels with £10 million invested. Future plans for new activities include joint research in solar cells, solar generated storable fuels and fuel cells.

YEAR IN CONTEXT

EPSRC is committing greater support for the world-leading researchers who deliver high quality research to meet the needs of the UK economy and to address global priorities. Our aim is to create an environment that supports talented people throughout their research careers. As the biggest sponsor of postgraduate research training in engineering and physical sciences in the UK, we funded a population of 9,837 students during the year. And the widespread impact such students will have is indicated by how their predecessors' skills have been deployed. Around 12,300 of the highly-skilled postgraduates supported by EPSRC have moved on into careers in industry and the public sector in the past decade.

New centres

The major new tranche of training centres launched by EPSRC since 2008 with an investment of £304 million is tackling some of the biggest problems facing the UK from hi-tech crime to sustainable energy, underpinning the aims highlighted in the EPSRC Delivery Plan. This year three new centres focusing on high-level mathematics training have been announced bringing the total number of centres across the UK to 52. The new centres which have close links to industry are the first to be dedicated to mathematical sciences and will create a new generation of highly employable people trained in topics ranging from statistics and operational research to techniques which address scientific and technological challenges that face us in the modern world. Each of the centres opening in 2010 will train at least 40 students per year over seven years with each student developing an original research project.

Rocket-powered inspiration

Britain's bid to break the land speed record and inspire a new generation of scientists and engineers ignited in spectacular fashion in 2009.

The Bloodhound SSC team successfully fired the full-scale Bloodhound Falcon rocket – which will help power the car through the 1,000mph barrier – for the first time. EPSRC is a founder sponsor of Bloodhound and EPSRC supported research is playing a pivotal role in developing the car. Bloodhound's rocket expert Daniel Jubb said: *"Now that we have completed the first firing we can commence with a rigorous programme of testing to refine the way the rocket burns. This is ground-breaking science which will have applications in all areas of rocketry."*

By 2011, the team hope to be the first to break the 1,000mph barrier and in doing so inspire a generation of British engineers and scientists. More than 2,000 schools across the country are involved in the project so far.

The full scale Bloodhound Falcon rocket.

£36 million

Awards worth £36 million were made for 41 Career Acceleration and Leadership Fellows in 2009.

Inspiration

Inspiring the young to attract them into research careers is a key part of our role. EPSRC supports researchers across the UK in outreach projects which introduce younger students to the excitement of 'real science'. This year we funded such public engagement support with £9 million. We are also conducting vigorous multimedia campaigns to enhance the profile and potential of science and engineering to attract new researchers. An example is how we are giving widespread publicity to individual scientists and engineers who are making a big impact in their fields such as those featured on page 23.

DELIVERY PLAN FOR SKILLS

The key aims for securing the future supply of people, set out in the EPSRC Delivery Plan for 2008-2011 are to:

- **Support** the next generation of world class researchers and research leaders so that the UK can increase its global research impact and economic competitiveness;
- **Strengthen** strategic research areas by targeting funding to create new research teams;
- **Attract** the most talented people to research by enhancing the Doctoral experience, working with funding councils; and
- **Help** the flow of people through their research career pathways and enhance skills to meet user needs.

NEXT GENERATION OF LEADERS

EPSRC is committed to increasing its support for world-leading individuals who are delivering the highest quality research to meet UK and global priorities. Our fellowship schemes foster the ambition and adventure of such talent with high potential for the future. Awards worth £36 million were made for 41 new Fellows in 2009.

The route to international standing

Leadership Fellowships are for researchers prepared and qualified for a major challenge. They are expected to have established themselves as leading researchers of international standing in their area by the end of their award. It is also anticipated that they will demonstrate leadership within their institution and research community and contribute to the uptake of research outputs for economic and social impact.

These awards offer talented mid career researchers the opportunity to focus on research for the term of the award, as well as supporting all the costs of the associated research for the full duration of the award. In 2009, 243 outline proposals were received and 17 who competed were awarded Fellowships as a result.

Career accelerators

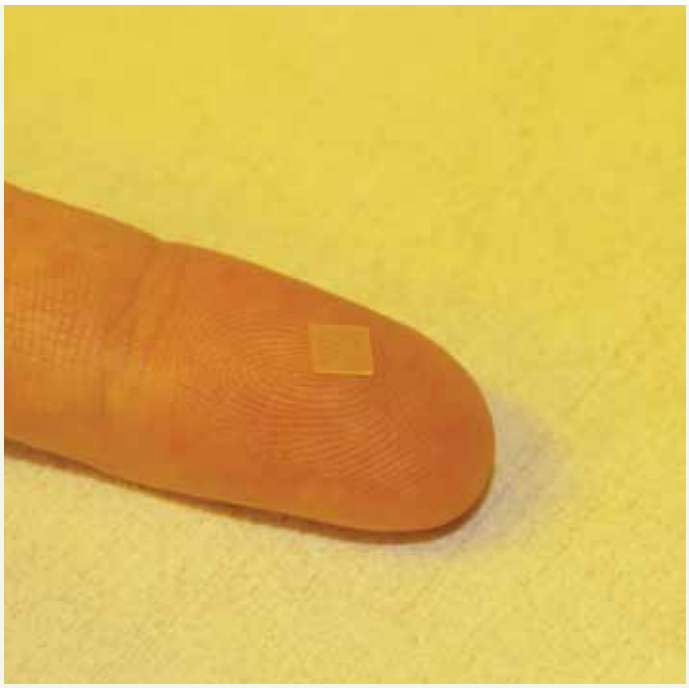
Career Acceleration Fellowships are for researchers at an early stage of their career providing an opportunity for them to focus on research for the period of the award. They are also expected to have established an independent career of international standing by the end of the award. The 2009 call for outline proposals received 430 bids and 24 were chosen from this large field to win awards.

Diamond set for safer scans

Safer medical scans and 'smart' vehicle anti-collision devices are just two of the jewels in the potential uses of the world's smallest diamond transistor. Developed by an EPSRC supported team at the University of Glasgow, the length of the transistor 'gate' is just 50 nanometres – 1,000 times smaller than the thickness of the human hair. The smaller the gate the faster the transistor works – and Glasgow's device is half the size of the previous smallest diamond transistor developed in Japan.

Diamond has been heralded as an ideal material for the next generation of nanoscale electronics and its ability to work in adverse conditions could lead to a new wave of devices. One example is safer scanning for security and medical uses. Based on the potential development of an imaging technique such as terahertz imaging, it would avoid damage to cells. Another is the use of diamond transistors to aid the development of automotive collision devices using radar technology. This would allow cars to detect imminent collisions and take evasive action – and perhaps cut insurance premiums.

Dr David Moran who led the University of Glasgow team sums up: *"These applications require very fast and ideally highly powered transistor technology that needs to operate in adverse weather and temperature conditions. This is where diamond transistor technology would excel."*



The small pure diamond sample on the end of a finger.

£15.7 million

We supported a range of facilities and services this year with funding of £15.7 million.

We intend to award up to 50 more Career Acceleration and Leadership Fellowships during the coming year.*

Fellowships for new blood

EPSRC continues to offer three-year Postdoctoral Fellowships to enable the most talented new researchers to establish an independent research career, shortly or immediately after completing a PhD. From the 187 eligible proposals received in competition, 29 awards were made during the year. They are targeted at four specified areas of our remit – theoretical physics, theoretical computer science, mathematical sciences and the life sciences interface. Ten awards were also made in engineering jointly with the Royal Academy of Engineering, with further awards planned in 2010.

**46 awards totalling £38 million have been announced in July 2010.*

ACCESS TO THE BEST FACILITIES

THE YEAR IN CONTEXT

Access to the best research facilities is a crucial factor in maximising impact from innovative ideas for the benefit of the UK economy. EPSRC supported a range of facilities and services this year with funding of £15.7 million, including the most advanced high-end computing facility in the UK – HECToR. This £113 million supercomputer, also supported by NERC and BBSRC, was upgraded in 2009 to its theoretical peak performance of 274 teraflops and is now bringing this stunning calculating power to bear on projects like the examples featured on page 24. Already being exploited by hundreds of researchers across the disciplines, its computer simulations and calculations complement theory and experiment in scientific research. The faster and more powerful the computer the larger and more complex the simulations or calculations can be. HECToR, at four times faster than its predecessor and the equivalent of 12,000 desktop systems, is proving up to its task.

Engineering and physical sciences researchers also continue to utilise neutron and photon sources for experimental studies including exploitation of the facilities supported by the Science and Technology Facilities Council. These include Diamond the synchrotron machine, best described as a series of giant microscopes, located at Harwell. A new research complex next to Diamond and the pulsed neutron source ISIS, was completed this year to enable researchers from around the UK to be located nearby to fully exploit these and other on site facilities such as the Central Laser Facility.

SOME OF THE BEST

EPSRC trains some of the best scientists and engineers in the world and they all have impact on our world. They are fuelling industry and public services with new ideas and providing answers to some of today's pressing questions.

None of this would have happened without EPSRC funding. It has given my team the flexibility to be creative and try new routes. Professor Maroto-Valer

Top: Professor Mercedes Maroto-Valer.

Below: Professor Sir John Pendry. *Image courtesy of Imperial College London / Mike Finn-Kelcey*

Bottom: Professor Tom Rodden.

Novel approach to climate change

By pioneering innovative technology, Professor Mercedes Maroto-Valer is helping the world tackle climate change. With EPSRC support, she leads the Centre for Innovation in Carbon Capture and Storage at the University of Nottingham. Carbon capture and storage (CCS) technology traps CO_2 at the source of emission and prevents it entering the atmosphere.

"CCS is an essential component in reducing CO_2 emissions and meeting environmental targets. We're bringing forward the innovation that will make it happen," says Professor Maroto-Valer who won the Leverhulme Prize for engineering in 2009. *"We need this research funding in CCS before it is too late."*

"We are looking at some really novel approaches, such as CO_2 conversion through artificial photosynthesis," says Professor Maroto-Valer. Just as plants convert CO_2 into energy, the centre hopes to do the same – converting CO_2 into usable fuel. *"That would be the perfect energy circle and we are developing the whole system from the catalysts to the reactors,"* she adds.

Another innovative approach being developed at the centre is CCS mineralisation. Mimicking a natural process by which some types of rock weather, the technique locks CO_2 into a solid product that could be used as a building material. There are plans to commercialise the technology in the Middle East and Europe.

New field of science

An entirely new field of science - called metamaterials - has, with EPSRC support, been brought to fruition by Professor Sir John Pendry.

The new 'metamaterials' derive their properties from their structure not the material from which they are made. The result is the creation of materials with electromagnetic properties that give greater control of light itself.

"Optics, mobile phone signals, radar, MRI scanning – in all these areas, if you want to achieve something you need to control the electromagnetic field and you need a material to control it," says Pendry of Imperial College London. But the properties of naturally occurring materials are limited. *"We realised using our approach we could gain properties that were not available in nature and this made highly sought after experiments possible."*

The 'perfect lens' is an example of metamaterials world-changing potential. Using conventional materials, data storage on DVDs and CDs is limited by the wavelength of light used to write the data – the shorter the wavelength of the laser, the more data can be written on it. But Pendry's 'perfect lens' uses negative refraction to allow enormously increased data storage. And Pendry credits EPSRC funding as instrumental in helping him realise the impact of his work.

"Having great ideas doesn't involve excessive time. But working them through does. That's what EPSRC funding allowed me to do. It put a rocket under the metamaterials work." John Pendry

A seamless digital world

"My impact will be not to have an impact," says leading digital researcher Professor Tom Rodden of University of Nottingham. A strange notion perhaps but the world of ubiquitous computing is about seamlessly embedding digital technology into everyday life, allowing people to focus on the impact rather than the technology itself.

Rodden heads several EPSRC projects that blur the line between the physical and the digital worlds.

"Thirty years ago computers had a sort of awe about them. But today they are very mundane. People no longer focus on computers but on the things they want to do with them. Ultimately, ubiquitous computing allows for the provision of new services to aid and help people in their everyday lives," says Rodden.

Such new services could transform everything from entertainment to education and healthcare to horticulture. Sensors monitor the behaviour patterns of elderly people within the home and relay that information to careers or relatives. Embedding wireless technology in woodland allows children carrying mobile devices to learn by exploring both the physical environment and the biological systems that support it. Rodden emphasises that his work relies on the expertise of scientists, engineers and artists from all backgrounds and cites EPSRC as instrumental to success.

"EPSRC encourages adventure and allows you to cross boundaries. The freedom to be adventurous and to do the unusual cannot be underestimated." Professor Tom Rodden

MODELLING HEARTS AND NOISY AIRCRAFT VALVES

From advances in caring for heart patients to dealing with irritating aircraft noise HECToR's capacity for number crunching at 274 million, million calculations a second can solve challenges for researchers. Here are two examples:

Far right: Unsteady flow into a cylindrical fuel vent (streamlines from left to right) radiates noise (colour iso-levels of density perturbation).

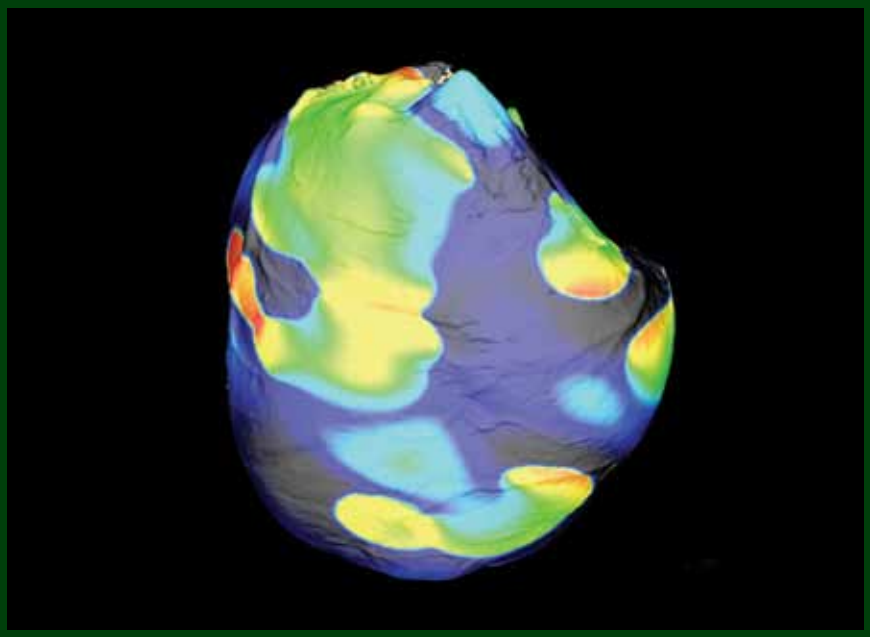
Personalised heart medicine?

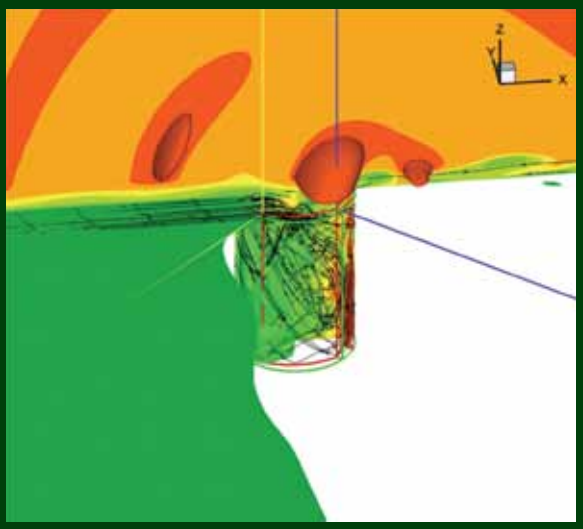
Developing software that optimises computer modelling of the human heart could ultimately result in personalised medical treatment for patients with heart conditions. Such heart modelling is an active area of research and teams at Oxford and Edinburgh universities are using HECToR's high end computing power to test models that study the mechanisms underlying the initiation of arrhythmias and also predict optimal therapeutical strategies to terminate otherwise lethal disturbances of the cardiac activation sequence.

Such models need to be highly detailed requiring several hours on current state of the art software just to simulate a single heart beat. Detailed benchmarking and numerical improvements led to substantial performance gain which allow the simulation of a human heart beat with near realtime performance on HECToR. This exciting development brings the prospect of using computational models as part of surgical workflow very much closer.

Dr Gernot Plank of the University of Oxford sums up the promise: *"The performance improvements will enable us to simulate the electrical activity of the heart in health and under pathological conditions at an unprecedented level of anatomical and functional detail which will eventually pave the way to personalised medicine."*

Below: Patterns of electrical activity during a complex arrhythmia within a high resolution computational model of the rabbit ventricles.





The silent aircraft challenge

Airbus SAS and Dr Aldo Rona, University of Leicester are working together on quiet civil aircraft operations. The company is faced with the continuing drive by the International Civil Aviation Organization (ICAO) to reduce aircraft noise. Regulations have effectively halved the permissible level of aircraft noise over the past 20 years and the pressure is still on. An analysis of the noise made by Airbus during landing revealed a distinct 'single tone' sound from the wing, at the approach speed of 102m/s (198 knots IAS). It was traced to vital but relatively small components – the pressure relief valves used to protect the aircraft fuel tanks.

"It was a tough challenge," reports Dr Aldo Rona. *"So we turned to HECToR to help us do the complex calculations needed in the very short time we had available to track down how the airflow over the vents was leading to the unwanted noise."* The noise was similar in nature to blowing across the mouth of a bottle neck but regulations would not allow a cover on the vent mouths to reduce noise. *"Our work on the super computer has enabled us to identify and model the airflow causing the unwanted sound and we now have a strategy which could lead to solutions such as changing the depth of the cavity or modifying the lip,"* says Dr Rona.

Longer lasting implants for the ageing population

We are all living longer and demanding more active lifestyles, but our bones and joints are still degenerating. Greater numbers of joint replacements are needed in the young and active population. Lower wearing and longer lasting hip and knee joints are being developed by EPSRC funded researchers in the Institute of Medical and Biological Engineering at the University of Leeds.

One of the researchers on the project, Dr Sotirios Korossis, said: *"By creating personalised implants, more closely tailored to the needs of the individual, we want to give patients the best possible chance of a more active, healthy old age – so people can enjoy their lives as actively as possible."*

The unique ceramic on the metal hip developed at the University of Leeds through EPSRC research funding, has demonstrated a ten fold reduction in wear and is now used clinically throughout the world.

In the knee, the long term wear performance of the new design solutions for both total and partial knee replacements is being investigated through the WELMEC Centre of Excellence in Medical Engineering funded by the Wellcome Trust and EPSRC.

An artificial knee joint simulator.

ACCESS TO THE BEST FACILITIES
CONTINUED

Mid range review looks to the future

During the year the less spectacular in scale but vital 'mid-range' research support that provides access to facilities such as epitaxy, microscopy and crystallographic services was reviewed by an independent cross research programme panel. The aim was to assess the type of mid range facilities it should be supporting to ensure that the suite of facilities was appropriate for future research needs. The provision of these services for the research community is being established through tendering processes to ensure that the services meet the technical requirements of the research base and provide value for money.

ECONOMIC AND SOCIAL IMPACT

We support excellent research and talented people delivering impact for the health, prosperity and sustainability of the UK. We are working with partner organisations to capitalise on our research for the benefit of our economy and society.

Getting a grip

A new vehicle suspension component born out of fundamental EPSRC research has astounded the world of Formula 1 motor sport. Called the inerter, the ingenious device can help control the oscillations of a car improving the all important mechanical grip with the road and prove a winner by reduced lap times in Formula 1.

The successful inerter is now licensed for any Formula 1 team.

ECONOMIC AND SOCIAL IMPACT

Getting a grip

Kimi Raikkonen crosses the finish line to take victory for McLaren in Barcelona 2005 in the first car to race the inerter. *Image credit: Courtesy of LAT Photographic.*

Its development was shrouded in secrecy. But now a new vehicle suspension component born out of fundamental EPSRC research has astounded the world of Formula 1 motor sport. And this revolutionary component to improve 'grip' could find a much wider range of applications throughout the transport sector.

Called the inerter, the ingenious device can help control the oscillations of a car improving the all important mechanical grip with the road and prove a winner by reduced lap times in Formula 1. Yet the idea behind inerter did not arise from R&D in Formula 1 but from EPSRC supported fundamental research at University of Cambridge. Behind this initial work was Professor Malcolm Smith who began theoretical work on 'passive' suspension when Formula 1 banned 'active' suspension systems. *"I didn't dream that a new mechanical component would emerge that would be deployed in actual Formula 1 cars,"* he explains. *"In passive suspension systems only two components are used – the spring and damper. I realised that more freedom could be gained if a third component could be added such that the force is proportional to the relative acceleration between two independent movable attachment points. At first I thought that it wouldn't be possible to make such a device, but then I realised it could – and relatively simply."*

The successful inerter is now licensed for any Formula 1 team. *"There may also be scope to use them in ordinary cars and in train suspension systems"* says Professor Smith.

IMPACT FROM EXCELLENCE

40%

Nearly 40% of the research and training we fund is directly involved in collaboration with industry.

THE YEAR IN CONTEXT

Building a healthy research base and better exploitation of research outcomes for the benefit of the UK are key requirements of the government's Science and Innovation Investment Framework 2004-14. EPSRC has continued to demonstrate its leadership in driving forward this agenda through a step change in impact from research council investments. Our strategy and programmes also recognise that a more diversified and balanced economy is crucial to the UK's global competitiveness and lasting prosperity.

To help EPSRC fulfil its important role in contributing to recovery from the current downturn, a new approach has been adopted for manufacturing research and training. An example is this year's launch by the then Prime Minister Gordon Brown of a new generation of Centres for Innovative Manufacturing, with major EPSRC funding, featured on pages 34 and 35. Professor David Delpy, Chief Executive of EPSRC, emphasised the importance of the centres for the future of the economy: *"These new centres will focus on areas of pioneering research that have the potential to create new industries and new jobs for the UK. The first three will save lives through advances in regenerative medicine, develop recyclable forms of metal which are environmentally friendly and harness light to revolutionise the internet and telecommunications."* One of the new centres has, for example, already helped reduce the weight of leading makes of cars through innovations in materials reducing costs and fuel consumption.

Another significant investment this year which will boost research outcomes that lead on to impact was the funding of 12 Knowledge Transfer Accounts totalling £44 million and 13 Knowledge Transfer Secondment Awards with a total of £11 million. EPSRC's Associate Director, Economic Impact, Vince Osgood, explained their significance: *"EPSRC wants the UK to be as renowned for knowledge transfer and innovation as it is for research discovery. This involves ensuring that there is a supported culture in universities that raises awareness of the opportunities to increase the impact, uptake and exploitation of our publicly funded investments. Our support is encouraging enhancements to the range, level and quality of interactions between businesses, other user organisations and the research base."*

These developments build on our already strong track record with nearly 40% of the research and training we fund directly involving collaboration with industry. Over 2,000 different companies have strong links with our research base, some with a significant number of collaborations. Also, we have strong relationships with the Technology Strategy Board and the Energy Technologies Institute, EPSRC commitment for 09/10 totals £38 million and includes support for collaborative R&D and industrially relevant training. And the year saw new additions to our Strategic Partnerships which cover a range of companies and other organisations. Rolls-Royce, for example, agreed this year on a major partnership with EPSRC on the development of advanced metallic systems for turbine engines of the future (see page 33).

Another strand of our support for the commercialisation of research is a two year pilot 'Collaboration Fund'. Launched this year, the £2 million fund will offer very early stage financial and practical support to researchers who wish to work in collaboration with a commercial partner.

Habit-learning device will lower energy bills

Dr Peter Boait of De Montfort University with the Wattbox – the result of a people-centred approach to energy saving. *Image credit: De Montfort University*

Smart control units that learn householders' energy habits and give immediate feedback on consumption could save up to 20% of energy in the home without sacrificing comfort. The new energy-saving 'Wattbox' is one part of an innovative approach to energy efficient home improvements supported by a £2.1 million grant funded through the EPSRC and E.ON Strategic Partnership. The grant is part of a five-year joint programme being run by E.ON and EPSRC which also forms part of the RCUK energy programme.

Studies have found that existing home heating controls such as timers and thermostats often make it difficult for people to cut costs because they are too complicated to set correctly. They also found that by designing an intelligent, automated system that takes the complexity out of the controls, energy use on heating and hot water alone could be reduced by up to 14%.

Dr Peter Boait of De Montfort University who led the development of Wattbox explains its benefits: *"The device's heating controller sets its own schedule by learning householders' habits according to the times they use hot water and switch on electrical appliances. From this it sets the thermostat to suit householders' lifestyles taking account of the outside temperature."*

"These devices work because we put people at the centre of our research," says Dr David Shipworth of University College London, who leads the overall multidisciplinary project investigating ways of reducing energy while maintaining comfort.

132

To date, 132 follow-on projects worth £11.5 million have been supported.

Managed by Finance South East, grants of up to £100 thousand will be available to eligible researchers offering the opportunity for a project team to work with an experienced entrepreneur assigned to them as an impartial and objective mentor. This will take forward the successful outputs from previous EPSRC funded research. We also, for the first time, provided joint sponsorship with the Royal Society for the 'Mercer Feasibility Awards' providing proof of concept support and entrepreneurial training for six such awards which follow on from initial EPSRC research grants.

EPSRC's follow-on fund also continues to help researchers bridge the gap between the outputs of their basic research and potential commercialisation. Demand for follow-on funding has risen significantly with over £4 million in grants offered to academics in UK research organisations in 2009. To date, 132 follow-on projects worth £11.5 million have been supported.

EPSRC's 2008-2011 Delivery Plan

The five-point plan is to:

- **Make a step change improvement** in the exploitation of research outputs for economic benefit, for example through our major strategic partnership with the Technology Strategy Board and our strategic partnerships with companies, government departments and the third sector.
- **Forge links** with companies and other users that pull research through to exploitation more rapidly and efficiently focused on the EPSRC priority themes – energy, digital economy, nanoscience and towards next generation healthcare.
- **Align** the skills base more closely to the needs of business innovation through more targeted demand led doctoral training.
- **Enhance** the flow of knowledge and people between academia and industry by facilitating strong partnerships and through focused routes to collaboration including knowledge transfer centres of excellence and post-doctoral follow-on opportunities based in industry.
- **Publicise** the opportunities for and successes of knowledge transfer so that it becomes normal business for the research communities.

DELIVERING SUCCESS

A key measure of our success in delivering impact from our investments is the new business start-ups which emerge as a result of EPSRC supported research and training. Over the past four years 179 such spin-out companies have been formed in a diverse range of areas. They include these impressive developments from the year:

Spectacular spin-offs

Detecting Chemicals: Owlstone Ltd, spun-out of the University of Cambridge by EPSRC-funded entrepreneurial students in 2004, has developed a rapid and accurate chemical detection system, one hundred times smaller and a thousand times cheaper than the existing technology at the time. The technologies developed have a wide range of applications including homeland security, industrial, automotive and personal care and have won Owlstone widespread commercial and academic recognition. Based in the Cambridge Science Park, the company now employs 35 people

Criminal gun carriers beware

Scientists have developed a prototype scanner designed to help police identify criminals carrying guns and knives without putting themselves in the line of fire. The new technology uses electromagnetic waves to pick up reflections from concealed guns, gun barrels or knives without the need to be close to the subject.

The research, funded by EPSRC, is sponsored and supported by the Metropolitan Police and the Home Office Development Branch. Catherine Coates, EPSRC Director, Business Innovation said: *"This represents a great return on public research investment. The device could save lives and free up valuable policing time taken up with gun and knife detection."*

"This is a world first and a success for British science," said Professor Nick Bowring of Manchester Metropolitan University. *"This device means UK police will be able to lead the way in accurate mobile gun and knife detection without putting themselves in the line of attack."*

If tests being carried out by the Metropolitan Police Operational Technology Department to see how the scanner could work in practice prove a success, the finished product could be available to police forces within two years. The project also involved researchers at the University of Manchester, Newcastle University and Queen Mary, University of London.

and has secured multi-million dollar contacts from the US Department of Defense and Selex Galileo.

Wave power: The generation of clean, green energy provides another example of a company, Aquamarine Power, whose product 'Oyster' is based on EPSRC funded research at Queen's University Belfast. In 2009 the company began sea trials of Oyster, a giant offshore wave energy converter. And it also began feeding green power to the national grid. In contrast to many other wave power devices it uses hydropower technology to transfer wave power to shore where it is then converted to electricity. A commercial farm of just 20 Oysters could provide clean renewable energy to a town of 6,500 homes.

Bone grafts: In 2009 ApaTech Ltd, a firm specialising in bone graft technologies, was named fastest growing company in its category by Deloitte's Technology Fast 500 for Europe, the Middle East and Asia. The company, with a major manufacturing plant in the UK and growing sales worldwide, was created from knowledge transfer arising directly from research funded by major EPSRC investment in the Interdisciplinary Research Centre at Queen Mary, University of London. ApaTech also won the 2009 Frost and Sullivan award for Device Biologics Company of the year recognising its position as a world leader in their market. It has recently been sold to Baxter for around $330 million.

Growth hormone: Critical Pharmaceuticals, a biotechnology company spun out from the University of Nottingham, secured an order from the Wellcome Trust to develop a nasal spray of Human Growth Hormone using its proprietary CriticalSorb technology as an alternative to injection. The drug is a leading biological treatment for growth disorders that had global sales of around $2.8 billion in 2007.

270

Over 270 research projects have been sponsored since the Technology Strategy Board was set up in 2004.

PARTNERING THE TECHNOLOGY STRATEGY BOARD

EPSRC is playing a key role in delivering impact through partnership with the Technology Strategy Board. We are supporting the underpinning research which is essential for the development of emerging technologies to be taken forward to business exploitation through collaboration with the Board. It involves a two way flow of ideas between business and the science base through mechanisms such as the Board's Knowledge Transfer Networks and major national social, technical and business 'challenges' set within an international context.

EPSRC is involved strongly in all three 'strands' of the Board's main funding approaches – the innovation climate, challenge led innovation and technology inspired innovation. We have sponsored over 270 research projects since the Board was set up in 2004 and now have a joint portfolio of over £250 million of aligned activities including contributions from business. Over the Delivery Plan period, we expect to have committed over £80 million of EPSRC funding aligned with the Board's priorities compared to a 'target' of £45 million set by the Department for Business, Innovation and Skills (BIS) at the start of the current Comprehensive Spending Review period. As part of our collaboration we are contributing over £11 million to a particular research and development programme that will significantly boost investment in the UK's aero industry, accelerating the introduction of low carbon engine technology. It involves high profile manufacturers, SMEs and several key universities.

IMPACT! EXHIBITION: WHERE SCIENCE MEETS DESIGN

Leading scientists and designers came together at a pioneering exhibition in March 2010 to explore the impact of developing technologies on society. In the ground-breaking new partnership, EPSRC funded research groups collaborated with British design talent to explore and visualise the implications and possibilities of scientific developments and examine the effect they might have in how we live in future Britain.

Through the eyes of design, this project offers a fresh and creative insight into how the ideas that scientists and engineers are working on today might transform our quality of life and tackle the challenges we face in the 21st century in areas like engineering, healthcare, transport, digital communications and the creative industries.
Lord Robert Winston, Professor of Science and Society, Imperial College London.

Attended by over 1,200 people, the event was a unique collaboration between EPSRC, the National Endowment for Science, Technology and the Arts and the Royal College of Art. The 16 design installations offered an alternative view of how science and engineering could influence our future. They aimed not to offer prediction but to ask questions and inspire debate into how today's research might transform our experience of the world.

Astronomical bodies

Researchers are investigating the key role that phosphorous may have played in establishing how life first appeared on earth and the intriguing possibility that the type of phosphorous needed to kick start life here may have arrived in a meteorite. The IMPACT! Exhibition looked at the possibility of creating our own meteorites to seed life on other habitable planets, possibly initiating a process of self assembly and evolution.

Top right: The 5th Dimensional Camera exhibit.

Above: Lord Robert Winston at the IMPACT! event.

Does it smell like fair trade?

New technology may soon make it easier for shoppers to make much better informed decisions when choosing products. Struggling to decipher the small print on packaging could be a thing of the past simply by pointing your mobile phone at a special barcode to reveal the 'back story' of a product. This IMPACT! project envisages an alternative to current labels and packaging. Could products inform us of their ethical credentials with a living skin translating information into patterns, smells or textures?

The 5th Dimensional Camera

Research on unimaginably powerful 'Quantum' computers may make modern supercomputers obsolete. Building them requires understanding the most fundamental properties of quantum mechanics including exploring the possibility of parallel universes. To explore the impact this mind blowing science would have on our sense of purpose in the universe, the '5th Dimensional Camera' is a fictional device that captures glimpses of the parallel universes suggested by quantum physics.

Sustainable energy animal

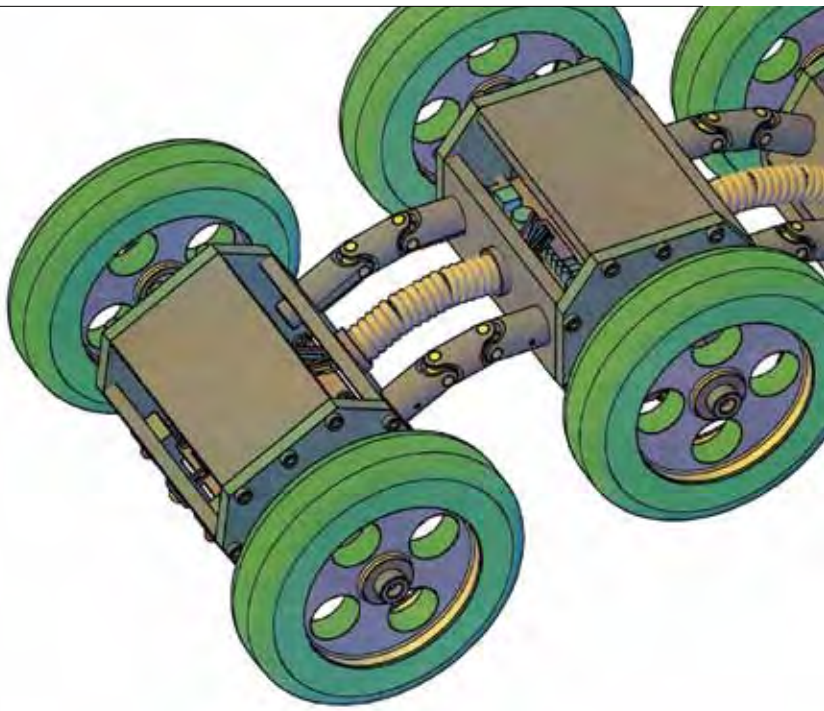
A 150 metre rubber snake designed to generate low-cost electricity from the sea is being developed by EPSRC supported researchers. The IMPACT! exhibition project explored the possibilities of combining wave, wind and sun energy in a single energy converter. But this machine is not just a renewable energy source. It also monitors the environment and aquaculture while providing safety at sea by communicating with similar connected devices. The network could form a large bio architectural super organism – an entirely new class of inhabitable ocean architecture.

Robot to ferret out crime

A new type of robot under development will help in the fight against a wide range of potential crime by 'sniffing out' drugs, weapons, explosives and illegal immigrants in cargo containers. Nicknamed the cargo screening ferret and designed for use at airports and seaports, it is being worked on at the University of Sheffield with EPSRC support.

The ferret will be the world's first cargo screening device able to pinpoint all kinds of illicit substances and the first to operate inside standard freight containers. Equipped with sensors that exploit recent advances in laser and fibre optic technology to detect tiny particles of different substances, it will be possible for the 30cm long robot to 'find' illegal contents at much lower concentrations than is now possible. When inside a steel freight container, the ferret will attach itself magnetically to the top then automatically move around and seek out any contraband sending a steady stream of information back to its controller.

Dr Tony Dodd who is leading the project said: *"It's essential we develop something which is simple to operate and which border agents can have total confidence in. Working prototypes of the device could be ready for testing within two years, with potential deployment in around five years."*



The prototype ferret will use highly flexible joints and magnetic wheels to move around the complex cargo ceiling

Though in their early stages it is already evident that the commercialisation capability provided by the funding is realising benefits for the (Innovation and Knowledge) Centres by creating a shared space for entrepreneurial activities enabling new partnering agreements to be established. Robert Heathman, EPSRC

We have also contributed funding to nine world leading, industry-driven projects in the 'Low Carbon Vehicles Innovation Platform' involving fuel cells and hydrogen technologies.

Looking ahead we will be collaborating in a Technology Strategy Board initiative aimed at helping move goods around the UK more effectively and sustainably. It will involve 12 projects with £8 million funding, in partnership with the Board, the Department for Transport and the Highways Agency.

Assisted living support

This year EPSRC contributed £1.7 million towards six new projects with the Technology Strategy Board to help those with long-term health conditions live independently. The projects with additional funding of £7 million from the Board and business partners will explore the need to develop telecare and telehealth solutions that are interoperable and can take advantage of new digital communications technologies, broadband and wireless. As part of a major initiative by the Technology Strategy Board, the 'Assisted Living Innovation Platform' projects confront the fact that the number of economically active people who can finance health and social care is falling. Today's care models are unsustainable and this is a major concern for the social care and health services in the UK.

The initiative also includes the Department of Health, the National Institute for Health Research and the Economic and Social Research Council who will invest jointly with industry in the development of technologies that will enable individuals to receive support at home.

Mix for commercial benefit

Two recently created Centres which mix business knowledge with the most up to date research to harness the full potential of emerging technologies are already having an impact on commercialisation. These 'Innovation and Knowledge Centres' (IKCs) in regenerative medicine at University of Leeds and information security at Queen's University Belfast were established in partnership with BBSRC and the Technology Strategy Board. Robert Heathman of EPSRC explains: *"Though in their early stages it is already evident that the commercialisation capability provided by the funding is realising benefits for the centres by creating a shared space for entrepreneurial activities enabling new partnering agreements to be established."* A recent evaluation of the IKCs reported many benefits such as effecting cultural changes within universities and providing resources for collaborative R&D activities, knowledge transfer and commercialisation.

An example of progress at the Queen's University Belfast Centre for Secure Information Technologies is that, to date, 20 organisations have committed their support including industrial partners such as BAE Systems and Thales UK as well as government agencies and international research institutes. A team of researchers is developing futuristic communications systems that could help protect frontline troops. This aims to use arrays of highly specialised antennas that could be worn by combat troops to give covert short range person to person battleground communications.

The Technology Strategy Board focus on emerging technologies has placed strong emphasis on IKCs and, this year, a third call for IKCs was launched at the major 'Innovate 09' event again in partnership with the BBSRC and the Board.

Software recreates 300-year-old horn

A cutting edge software development led by Dr Alistair Braden, an EPSRC funded PhD student at the University of Edinburgh, did not just herald the recreation of a 300 year old 'trumpet'. It also opened up the potential for tailor made musical instruments to suit the individual needs of musicians and even a possible way to pinpoint leaks in pipework and ducting.

The software was originally intended for optimising the design of modern brass instruments. Computer modelling is an emerging technology in instrument making, but the new software offers unprecedented accuracy by ensuring that a brass instrument's design delivers the required shape, pitch and tone. Following its use to improve trombone design, the software has been used to recreate a long lost trumpet like instrument that no one alive today has heard played or even seen illustrated. A Swiss based music body specialising in early music, the Schola Cantorum Basiliensis, had invited the University of Edinburgh to try to replicate the instrument. The two resulting 'horns' at 2.5 metres long made from pine were used successfully in a performance of a cantata written by Bach in the 1730s which specifies the particular instrument.

Apart from its potential benefits for music, similar software could be used to send acoustic signals through hard to reach pipework and ducting in power stations to reveal its condition accurately. It could aid safety and avoid costly shutdowns for inspection.

Bach's forgotten horn – the recreated instrument in action.

A further two IKCs are expected to be announced in 2010. The Centres have been identified by the Council for Science and Technology as important interfaces between 'upstream' and 'downstream' research.*

STRATEGIC PARTNERSHIPS TAKE OFF

Our development of strategic partnerships with business literally had a powerful take off in 2009. Worth £50 million, a new strategic partnership to develop the materials, skills and knowledge to support the development of future gas turbines for aircraft and other uses was agreed. The link up was the first of its kind between Rolls-Royce, EPSRC, Birmingham, Cambridge and Swansea universities.

As well as aircraft, gas turbines provide the power for many applications including ships and electricity generation. The initiative will contribute to advances in future technologies through research fellowships and postgraduate training to help create the next generation of world class materials scientists and metallurgical engineers. Over the next ten years the universities will undertake fundamental research that will develop the materials needed to improve the efficiency and environmental sustainability of gas turbines.

Ric Parker, Director Research and Technology, Rolls-Royce said: *"Materials research is a vital part of ensuring we have the technology and skills needed to deliver gas turbines that will meet our customers' future requirements. The strategic partnership with EPSRC is an important step in developing these technologies and skills. We look forward to working with our university partners and building on the excellent relationship we already share with them."*

How partnerships pay off

The gas turbine initiative brings the total of our Strategic Partnerships to 28 representing a wide range of high profile organisations from sectors such as pharmaceuticals, engineering, energy, aircraft building, charities, motor manufacture, transport and defence. In forming them our target is to bring additional relevance and potential impact to our research portfolio and deliver substantial extra funding to support research and skills development in universities. There is evidence that the link with EPSRC has allowed partner organisations to develop a greater research range and has provided them with access to more basic research. Our partnerships with public sector organisations have an impact by linking the expertise of our leading researchers with public policy and services in areas of importance to society like health, security, energy and transport. The new partnerships started during the year have raised the total of research funding across all current partnerships to £114 million from EPSRC and £77 million from the partners. The additions include:

- **The Ministry of Defence** – we jointly ran a 'sandpit' workshop on the 'Battery Free Soldier' and funded four grants as a result, worth £1.9 million.
- **EDF** – through which we have announced seven grants worth £3.7 million in people, energy and buildings demand reduction.
- **EADS** – which is an evolution of our existing partnership with Airbus and we are currently exploring overlaps between EADS priorities and our existing research portfolio.

28

EPSRCs gas turbine initiative brings the total of Strategic Partnerships to 28.

** Vision for Science: March 2010*

MAKING IT COUNT

The first three of the EPSRC Centres for Innovative Manufacturing described here are the vanguard of our £70 million boost for innovation in manufacturing announced this year. They reflect the importance of a highly skilled and competitive manufacturing sector to the UK's economic growth.

Our work could help generate billions of pounds worth of benefits for the UK economy over the next 10-20 years.
Professor Zhongyun Fan

Liquid gold

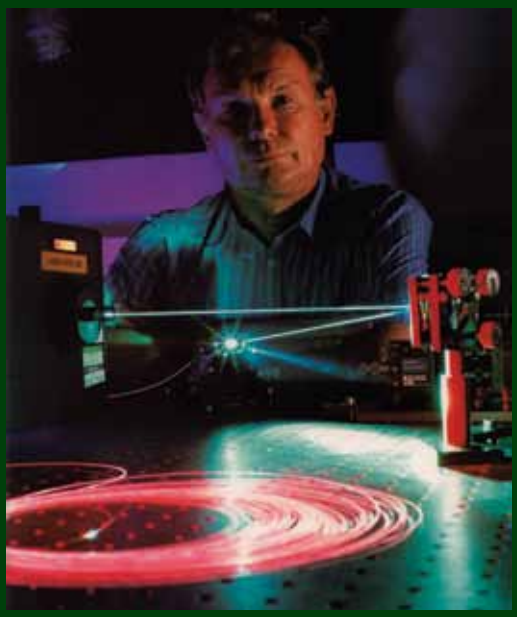
A change in innovative liquid metal engineering is the challenge for the new Centre at Brunel University. The potential for technological advances is huge with a UK industry in metal casting worth £2.6 billion a year. Continued success for the industry does not depend on just stronger, more durable and more lightweight materials. Other key factors for innovation are its ability to deliver more cost effective metals while minimising energy consumption and overall environmental impact.

Leader of the Centre Professor Zhongyun Fan highlights their ambitious approach: *"The UK metal-casting industry employs 29,000 people with 35% of output going to export. We aim to safeguard its role in wealth creation by developing manufacturing technologies that cut carbon emissions by millions of tonnes, reduce energy use by trillions of kilowatt hours and save millions of tonnes of natural resources every year."* One key goal is a step change away from resource hungry manufacturing methods towards greater reuse of metals.

There is close collaboration with 15 industry partners, industry trade bodies and world leading expertise from the Centre's partners at Oxford and Birmingham Universities.

Above right: Professor David Payne, Director of the ORC.

Right: A researcher working in the Brunel Centre for Advanced Solidification Technology (BCAST).



Light for start-ups and established firms

Developing the untapped potential of photonics – the science and application of light – for both small and large UK firms is the vision of the University of Southampton Centre. Already healthy, the photonics sector accounts for 2.3% of global production volume. But Southampton's Optoelectronics Research Centre (ORC), world renowned for its excellence, aims to enable the UK's sector to get a lot stronger in a fast developing market by advances in photonic materials and innovative yet cost cutting manufacturing processes.

The Centre sees its role as especially critical in view of the high proportion of SMEs active in the UK industry. Such smaller firms do not have the resources to invest in the leading edge R&D infrastructure vital to the ability to stay competitive and exploit new markets. But in future they will be able to harness the advanced equipment and expertise of the Centre to help them design, develop and test technologies that can keep them at the forefront of the global photonics industry. The Centre will work with companies ranging from start ups to well established firms and research centres.

"This Centre will give the UK a platform to power ahead into an incredibly exciting future where photonics impacts on almost every aspect of everyday life." Professor David Payne, Southampton Photonics Centre

Our studies will identify ways of eliminating bottlenecks that hamper translation of promising ideas for regenerative medicine treatments into products suitable for clinical use.
Professor David Williams, Loughborough University

Regenerative medicine

Highly successful EPSRC funded work in manufacturing regenerative treatments for diseases is the track record that Loughborough University will bring to the challenge of its new centre. Leader of the centre, Professor David Williams, explains: *"Without doubt regenerative medicine has massive potential – especially for tackling chronic, debilitating conditions like heart disease and arthritis that will become increasingly prevalent due to our ageing population. Yet it's not enough simply to come up with clever ideas for curing such conditions. It's about translating ideas into safe, affordable, cost-effective treatments that combine life-changing impact for patients with maximum commercial value."*

A priority for the Centre therefore is to pinpoint commercially robust practices and processes that can be introduced in critical areas such as product innovation and development, quality control, good manufacturing practice and negotiation of regulatory pathways. The Centre will work with the universities of Nottingham and Keele as well as 28 industry and public sector partners.

Below: The Automated Cell Culture Laboratory within the Centre for Biological Engineering at Loughborough University, part of the EPSRC Centre for Innovative Manufacturing in Regenerative Medicine.

MAKING THEIR MARK

Out of the thousands of talented researchers supported by EPSRC here are two of the many who are making their mark on the economy and society.

Above: Tom Waller.
Right: Professor Aimin Song.

It is vital we get support from EPSRC to create the knowledge that can be taken up by brands like Speedo. Tom Waller

Making a splash

As head of research and development for one of the biggest brands in sport, Tom Waller will have some influence on everything from Olympic finals to family beach holidays. The former EPSRC supported student and researcher is now head of Aqualab, Speedo's global research and development facility based in Nottingham. Tom moved from the world leading Sports Technology Institute at Loughborough University funded by EPSRC to become involved in the multi-billion pound swimming industry.

"I always wanted to work in the commercial sector but could see that gaining in-depth academic knowledge would make me very useful to industry," he says. *"But now on the other side, I can still see that EPSRC funded research is critical. It is sometimes difficult for companies to invest in fundamental research."*

Spin-out success

Imagine a cheap reliable mobile phone you could fold into your back pocket, a TV that just rolled up for storage or electronic paper. These are just some of the products that are being made possible by Professor Aimin Song with EPSRC support. He has also founded a company Nano ePrint Ltd to commercialise his work – and it is thriving.

Professor Song, from the University of Manchester, is at the forefront of printed or plastic electronics research – a global growth industry which will have an estimated $30 billion market by 2015. *"The key problem we want to solve is the low performance and high cost of conventional printed electronics. Our technology works at much higher speeds so we can talk about lots of applications like RFID tags, mobile phones and Wi-Fi applications,"* says Song. *"And we use a single layer device structure that can be printed in one step which reduces cost and complexity."* Among the myriad of possible uses could be electronic tickets for the Olympics.

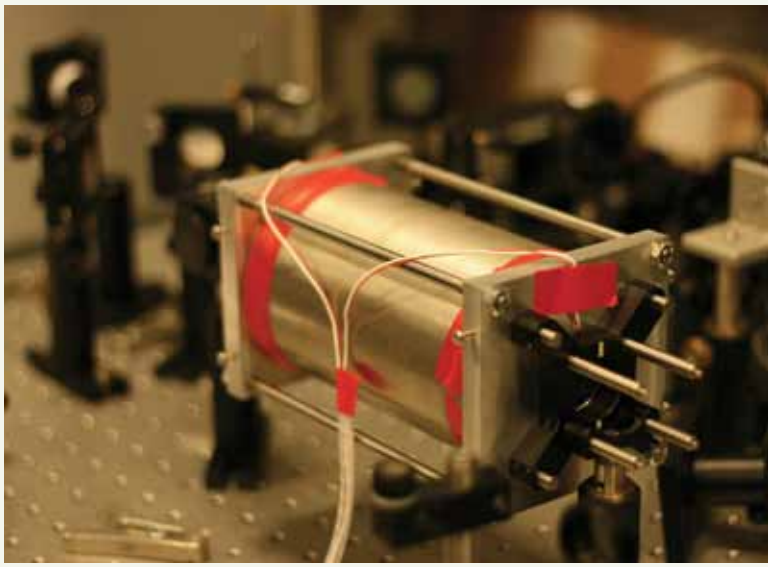
"Further EPSRC funding helped bridge the gap between the fundamental study and commercialisation." Professor Aimin Song

Breakthrough heart scanner

An innovative cardiac scanner will dramatically improve the diagnosis of heart conditions. This portable magnetometer is being developed at the University of Leeds with funding from EPSRC playing a key role.

Due to its unprecedented sensitivity to magnetic fluctuations the device will be able to detect a number of conditions, including heart problems in foetuses, earlier than currently available diagnostic techniques such as ultrasound, ECG and existing cardiac magnetometers. It will be smaller, simpler to operate, able to gather more information and significantly cheaper than other devices currently available. Another key benefit is that for the first time skilled nurses as well as doctors will be able to carry out heart scans, helping to relieve pressure on hospital waiting lists.

An EPSRC funded graduate student at the University of Leeds, Melody Blackman, is now playing a key role in developing the miniaturised version for clinical use. The breakthrough came quite unexpectedly according to Professor Ben Varcoe of the research team: *"We were undertaking quantum physics research using laser spectroscopy when we noticed some noise which we identified as a very weak magnetic field. So we developed a highly sensitive magnetometer to help us understand the noise. Later it came to my attention that it could be used for healthcare."*



The prototype magnetometer.

SKILLS FOR THE ECONOMY

- **NDEvR** – this body represents a consortium of 30 companies with an interest in non-destructive evaluation, covering the aerospace, nuclear, power generation, oil and gas and defence sectors. We are currently exploring initial activities.

Examples of successful impact from EPSRC's strategic partnerships are:

- **Award winning software** to support emergency services in the immediate aftermath of natural disasters or terrorist attacks (BAE Systems).
- **Mobile air quality sensors** revolutionising how air quality is monitored and managed in urban areas across the UK (Department of Transport).

THE YEAR IN CONTEXT

There is clear evidence of the impact of highly skilled researchers trained with EPSRC support. One study's* findings provides an important context for our skills development at a time of economic uncertainty. It reveals that the sectors with the highest dependency on engineering and the physical sciences are those with by far the fastest growth of added value per employee since the 1990s.

Many key sectors of the UK economy are heavily dependent on engineering and physical science PhDs and demand has been increasing in areas such as pharmaceuticals, aerospace, computing, telecommunications and finance. Our major contribution to the flow of skills into these sectors is that we fund 35% of all PhDs qualified in engineering and the physical sciences. In the past year over half of these will have become employed in business or public services. One telling example of their impact was recently reported in Chemistry World where David Lathbury of Astra Zeneca spoke about the numerous medicines and treatments developed by PhD holding organic chemists in the pharmaceutical industry. He concluded that: *"PhD students produced by our higher education sector (once placed in industry) create far more monetary wealth than that associated with the particular project funded in their university department."*

EPSRC ensures that its training programmes maximise impact by involving user organisations in collaborative skills development, often focused in centres. Our major investment of £304 million in Centres for Doctoral Training since 2008 is now training 320 research students in the business skills they need to turn pioneering ideas into

**Engineering and Physical Sciences in the UK', SPRU, 2003 – report commissioned by EPSRC and updated in 2009.*

Award-winning leap for animation

This year was a giant leap forward for Dr Alexandre Pechev of the University of Surrey and future users of computer games. With EPSRC support, his breakthrough is to make possible for the first time the animation of characters and user generated creatures that present truly interactive, real-time, full-body images. His new algorithm vastly reduces the time taken to calculate animation so this can now be done in real time resulting in much more organic and natural movement of characters.

Computer games will feel much more realistic and many players' characters can interact with each other and with the scenery in real time. The advantages include being applicable to any platform from mobile phones to high end gaming consoles. Its potential impact can be gauged by the scope of the computer games industry – over 28,000 employees and £1 billion contributed to the UK economy.

Winner of The Royal Academy of Engineering's ERA Foundation Entrepreneurs Award 2010 for the new technology, Dr Pechev was recognised as a role model by Professor Chris Snowden, Vice Chancellor of University of Surrey: *"I hope this will inspire others to follow a similar path. It perfectly illustrates how the university strives to support its staff in pursuing their ambitions and is a very good example of curiosity driven EPSRC funded research with wide application outside its original field."*

EPSRC enabling support for Dr Pechev's achievement included an International Doctorate and a Knowledge Transfer Account.

Dr Alexandre Pechev of the University of Surrey.

35%

EPSRC fund 35% of all PhDs qualified in engineering and the physical sciences.

products and services. This year we have invested in three further Centres for Doctoral Training, focused on mathematical sciences and its applications (see page 17). Many of the maths students will go on to deploy their skills through employment in business and other roles that benefit the UK society and economy. This brings the total of such Centres to 52.

KNOWLEDGE TRANSFER AND PEOPLE

The £55 million EPSRC initiative in 2009 to invest in grants for knowledge transfer embraces a range of elements including EPSRC funded people deploying their skills in business environments. For example, the grants enable the university recipients to employ high calibre associates to work on a project that is core to the strategic development of a company or other organisation.

The approach to be used by some of the 25 grant award winners shows how skills will be used:

- At **Durham and Newcastle universities** their grant will allow the results of research by engineers and physical scientists to be applied commercially to the healthcare sector. It aims to reduce the time taken for new materials or processes to be used in patient care. Academic clinicians will be directly involved in demonstrating the feasibility of novel technologies to potential users.
- The **University of Liverpool** award will be used to accelerate the transfer of research into industry by creating a Knowledge Exploitation Laboratory. This will seek to exploit the output of £43 million of EPSRC funded research at the university in molecular engineering, advanced manufacturing and sensors and monitoring. The researchers will share research and expertise with industrial and manufacturing organisations.
- **Loughborough University** will build on their strong links with industry through a range of activities including two-way secondments of staff and exploiting research through licensing or new business creation. Its focus will be on areas of strategic importance to the UK such as healthcare, transport and energy.
- **Queen Mary, University of London** will establish links between industrial partners and early career researchers who will undertake projects to transfer EPSRC funded research into business. As part of the process researchers will be mentored in the skills required to transfer research into economic impact leading to a new 'brand' of people equipped with both the technical and business skills to succeed.

Tiny device to predict global weather

A small filter with performance big enough to allow weather forecasters to predict the weather more accurately sounds unlikely. But EPSRC funded engineers at Queen's University Belfast's Northern Ireland Semiconductor Research Centre have developed just such a device. The wafer thin optical filters, measuring 30mm in diameter and 1/100mm thick, will be installed in European Space Agency satellites for launch between 2018 and 2020. They will be used in the measurement of temperature, humidity and gas composition which can be turned into data used to forecast weather, pollution and climate change.

Engineer Dr Raymond Dickie, who led the research at the University's Institute of Electronics, Communications and Information Technology, said: *"The filters will help to provide a much more comprehensive analysis of conditions in the Earth's atmosphere than has previously been possible."*

Dr Robert Cahill, Principal Investigator of the research team added: *"As a result of the new filter, scientists will gain access to completely new data on a range of phenomenon. It will enable more accurate global weather forecasts to be compiled and provide important new insights into climate change."*

The research has been jointly funded by EPSRC, the Centre for Earth Observation Instrumentation (CEOI), EADS Astrium and the European Space Agency. The technology has taken ten years to develop with investment of £1.5 million.

Scientific and engineering research has already brought us fuel cells, marine, wind and solar power solutions but more investment is needed to develop the capabilities of different solutions if we are to meet our carbon emission targets by 2020 and limit the impact of climate change.
David Delpy, CEO EPSRC

CHALLENGES FOR SOCIETY AND THE ECONOMY

YEAR IN CONTEXT

The fluctuations in the global economy and the pace of change in a society living in the digital age and with an ageing population pose major challenges for research. This year EPSRC, working with other Research Councils and partners, has continued to tackle such major issues with renewed vigour through the expanding research programmes it leads on energy, the digital economy, next generation healthcare and nanoscience through engineering to application.

Our approach to developing these programmes is to actively engage the users of research in Government, business, non-governmental organisations, the public or other researchers. This maximises the potential for exploitation by business, input into policy and improvements in quality of life.

Limiting climate change

The EPSRC-led RCUK energy programme is for example investing over £560 million in research needed to contribute to the dramatic reduction in carbon emissions required to tackle climate change. EPSRC Chief Executive Professor David Delpy believes that more research is needed: *"Scientific and engineering research has already brought us fuel cells, marine, wind and solar power solutions but more investment is needed to develop the capabilities of different solutions if we are to meet our carbon emission targets by 2020 and limit the impact of climate change."*

Highlights from our programme this year include a major extension to our research partnership with E.ON UK. This will develop carbon capture and storage technologies that could drastically cut CO_2 emissions from fossil-fuel power stations with the prospect of storage under the ground or seabed. A new EPSRC 'low carbon' shipping initiative was also launched in response to concerns that by 2050 emissions from shipping could rise by 20-30%.

A boost for green energy generation during the year came with the news that the giant machine 'Oyster' which harnesses the power of the sea to generate electricity began its first offshore trials on a commercial scale. Based on research we funded, it has already begun feeding the National Grid with 'sea power'. Also, EPSRC supported research into the energy efficiency of lighting, by exploiting LEDs using gallium nitride opens up the exciting prospect of a potential cut in UK electricity used for lighting by 20% to 50% in the next five years.

Our digital future

During the period 2008-2011, the EPSRC-led digital economy programme will have invested £120 million in projects that aim to transform the way technology improves everyday life. New research 'Hubs' involving university expertise across the UK, featured on pages 40 and 41, will focus on designing digital technology that will include people from all walks of life to ensure that everyone is part of our digital future.

A key part of the programme was a step change in training the next generation of researchers in digital economy which began in 2009 with the opening of seven new Centres for Doctoral Training. Together these Centres will train over 400 highly skilled PhD students and collaborate with over 100 companies.

Public engagement

The need to engage the public in science and technology issues that concern everyone – from

TRANSFORMING HOW WE LIVE IN DIGITAL BRITAIN

The three new Digital Economy Hubs created this year promise to transform the way people live in Britain. Unique about these research hubs is their focus on designing digital technology that includes people from all walks of life – this will ensure that everyone is part of our digital future.

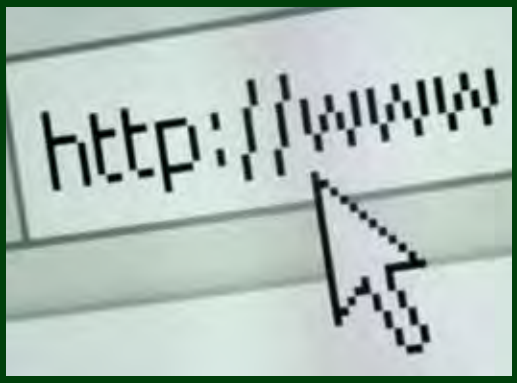
Ending rural isolation

"It can be hard for people in rural areas to access the digital economy's benefits" says 'Hub' Director Professor John Farrington at **University of Aberdeen**. He sees the huge potential for digital technologies to reduce isolation, for example by location-aware services based on GPS to facilitate remote health monitoring or to make transport like 'dial a ride' more effective. By including rural areas in our digital future, significant social and economic capital could be 'released' into the UK economy.

For **emergency healthcare**, a remote monitoring system being developed to harness sensing, mobile phone and GPS technologies, could help people with chronic health problems by gathering and transmitting data like heart rate and temperature. The wireless system will notify the emergency services automatically should treatment be needed.

Early warning systems to combat the potential dangers of flooding are also being looked at by researchers. They are seeking better flood warning systems by improved networks of sensors installed near rivers to monitor water levels and quality. Web based software could also be used to harness the 'collective intelligence' of rural communities to augment traditional sensor instrumentation.

25% of the UK population live in rural areas – so around 15 million people could benefit from new technologies that increase their quality of life.



Harnessing digital footprints

As people search the internet, access services and engage in online transactions, they leave a digital trace. Increasingly we also record interactions between people and their environment through location and embedded sensing, the resulting contextual footprint offers new opportunities for services and applications. Understanding this growing record of activity and developing socially acceptable ways to exploit it offers transformative opportunities for a future Digital Economy. This is the aim of 'Horizon' the Hub at the **University of Nottingham** which also involves the universities of Cambridge, Reading, Exeter and Brunel. It will investigate the developments needed for this information to be controlled, managed and harnessed to bring forward new products and services for society's benefit.

One of the key research themes is the potential for cutting transport costs, congestion and pollution. For example researchers plan to explore how the concept of car sharing could take a major leap forward thanks to Global Positioning System capabilities and social networking software exemplified by Facebook and Twitter. It should also be feasible to enhance GPS receivers or 'Sat-Navs' so they not only target drivers with information, such as 'least fuel' routes, but also provide games and other in-car entertainment and enable passengers to access or leave commentaries about places they are passing through.

Below: The Ambient Kitchen.

Connecting people

Social and digital 'exclusion' are closely linked and as more services go online there is real danger that those lacking easy access to technology will fall further behind. And yet there is potential for the digital economy to transform their lives. The 'Social Inclusion Through the Digital Economy' Hub, based at **University of Newcastle with University of Dundee as a key partner**, will focus on areas of high potential – connected home and community, accessibility, inclusive transport services and creative industries.

"In all these areas, digital technologies can make a huge contribution to helping vulnerable people in our society," says the hub's Director Professor Paul Watson. The direction of research will be determined by working with a group of 3,000 volunteers including people from a range of age groups and with a variety of disabilities.

An example is research on the **Ambient Kitchen**, which will focus on how digital technologies can help older people or those with dementia live independently in their homes for longer. The kitchen will be equipped with sensors to allow users to be monitored and if needed receive helpful prompts and information.

Research in creative media includes investigating how to engage excluded young people into society. Interactive music-making will teach young people the use of digital technologies, along with knowledge of the digital economy and how they can play a part in it.

New 'hearing maps' for better sound in crowded rooms

Innovative sound mapping software based on human hearing has been developed to help architects design out sound that can become irritating in crowded spaces – a situation known as the 'cocktail-party problem'.

The new software, developed with EPSRC support at Cardiff University, generates audibility 'maps' of proposed room designs. They pinpoint hotspots where conversations would not be intelligible if the room is busy. Architects can then adjust their designs to reduce reverberation until the hotspots are eliminated and audibility is maximised. The technique is specifically designed to improve the acoustic design of indoor spaces where a large number of people meet, chat and interact. It could be used for business as well as social purposes – in open-plan offices, cafés and reception areas for example.

"A lot of work has been done to understand acoustics in places used for public performances," says Professor John Culling, project leader. *"But little has been done to improve the acoustics of day-to-day meeting places, even though this would help all of us in our working and social lives."* He hopes that the software will be further developed and available for use by architects within the next 12 months.

An artistic image of Professor John Culling having difficulty hearing at a cocktail party.

global climate change to nanotechnology for healthcare – is fully recognised by EPSRC with a supporting budget of £9 million this year for our wide ranging programme. For example, the importance of the public's views on the future of nanotechnology emerged from a public dialogue exercise prompted by the EPSRC Societal Issues Panel and these are continuing to help shape research funding in this area. This year a joint EPSRC/BBSRC public dialogue exercise on the emerging and potentially important area of synthetic biology – with implications ranging from gene therapy to fuel cell technology – is being conducted. This will inform decisions about the future strategic direction of research taking into account the public's views, concerns and aspirations.

£120 million

The clear aim of the cross-council's £120 million digital economy programme is to transform the way technology improves everyday life.

OPENING DIGITAL DOORS

The clear aim of the cross-council's £120 million digital economy programme is to transform the way technology improves everyday life. EPSRC's John Hand who leads the programme says: *"It is taking technologies and using them to their full potential. We want to ensure that research is driven by needs and a real understanding of the impacts these technologies can have."* The new Digital Economy Research Hubs which started in 2009 with an investment of £38 million, over five years, will develop digital technologies to transform the lives of the elderly, disabled and people in rural communities, ensuring the research delivers valuable impact.

The three new research Hubs described on pages 40 and 41 are the biggest investment ever made by the research councils in creating a Digital Britain. Their role is to connect people with digital technology to radically improve the way we live, work, play and travel to ensure that everyone is included in our digital future. Businesses will also benefit from new ways to utilise digital technologies to help stimulate economic growth.

Seven new training centres

A step change in training the next generation of industrial and academic research leaders in the Digital Economy began in 2009 with the opening of seven new Centres for Doctoral Training. Together these Centres will train over 400 highly skilled PhD students and are collaborating with over 100 companies, many of them are new to the orbit of EPSRC research support. The centres include:

The **Healthcare Innovation Centre** at the University of Oxford will provide students with first hand experience of how the technologies they develop will have potential clinical impact. Their training includes a hospital internship developing translational research skills to accelerate clinical uptake of technologies and taking inventions through the first steps of commercialisation.

The **Media Arts Technology Programme** at Queen Mary, University of London provides innovative, inter-disciplinary training in the sciences and technologies that are transforming the creative sector. It aims to produce researchers who combine world class technical and creative skills and who have a unique vision of how digital technology transforms creative possibilities.

The **Web Science Centre** at the University of Southampton offers web scientists a multi-disciplinary understanding of the web as a global information system and an examination of the social impact of the web on human society. Training also encompasses the web's development and growth and its capacity for furthering global knowledge.

MANTRA for competitive manufacturing

An engineering and manufacturing road show on wheels began touring the UK in 2009 to bring the latest and future technologies to over 400 businesses and 30 schools over the next three years. Called MANTRA (The Manufacturing Technology Transporter) it is a specially modified HGV packed with the latest machinery and simulators. The 14 metre long truck takes to the road with a dedicated team to demonstrate the manufacturing and assembly line technology of the future and help inspire young people to take up careers in engineering.

Established by University of Sheffield's Advanced Manufacturing Research Centre with Boeing, and with funding from EPSRC and industry sponsors, MANTRA aims to introduce companies to the latest production engineering technology and techniques helping them to innovate with new products, increase productivity and keep UK manufacturing competitive.

Two highlights of advanced research which are in clear demand from industry are among its features. A way of machining more efficiently resulting from university work with Rolls-Royce allows material to be removed from the casings nearly 20 times faster than usual. Also demonstrated is machining with new ceramic cutting tools that could work better than existing ones and save the manufacturer over £1.5 million a year.

A side view of MANTRA.

CHALLENGES FOR SOCIETY AND THE ECONOMY CONTINUED

DIGITAL ECONOMY

Over 80 leading researchers, key industry representatives and the media gathered this year at the top of London's BT Tower for Digital Economy's event to debate and discuss Britain's digital future. Exhibitions included the 'Digital Hospital' a project, supported by the RCUK Digital Economy Programme and led by EPSRC, which utilises wireless broadband technology to create a new model for hospital care built on integrated patient monitoring and management.

Digital in India

A £9 million international initiative between the UK and Indian governments is set to bring online education, healthcare and early warning weather or natural disaster systems to remote areas in both countries. Part funded by Research Councils UK Digital Economy Programme and led by EPSRC, the five year collaboration will establish a virtual research centre to look for solutions to these challenges by utilising emerging and existing technologies.

ENERGY – PIONEERING A LOW CARBON FUTURE

The EPSRC led Research Councils UK energy programme aims to position the UK to meet its energy and environmental targets and policy goals through world class research and training. Over £560 million is being invested in research and skills to pioneer a low carbon future. This targets some of the key challenges facing our society – including the need to rapidly accelerate the deployment of green energy technologies that decarbonise our energy supply and increase energy efficiency in buildings, industry and transport sectors.

Highlights of this year's activities include:

Carbon Capture and Storage: Building on last years £6.9 million joint activity with E.ON UK in carbon capture and storage the energy programme has continued to invest in this critical technology through a £3 million investment in two new consortia in whole systems modelling and ecosystems impact of geological storage.

Announcing the funding, Dr Paul Golby the CEO of E.ON UK said: *"CCS is the most important technology we have in the fight against climate change – if we can get it right we can look forward to a secure, low carbon energy future."*

Transport: Another strand of our low carbon research this year was the start of new research to cut emissions from transport on the high seas. Shipping accounts for about 3.3% of CO_2 emissions in the world and needs to contribute its share in meeting the target for reducing overall emissions. The £2.4 million programme covers aspects of sea transport ranging from modelling the potential CO_2 savings from across the maritime supply chain to investigating new technologies for reducing emissions.

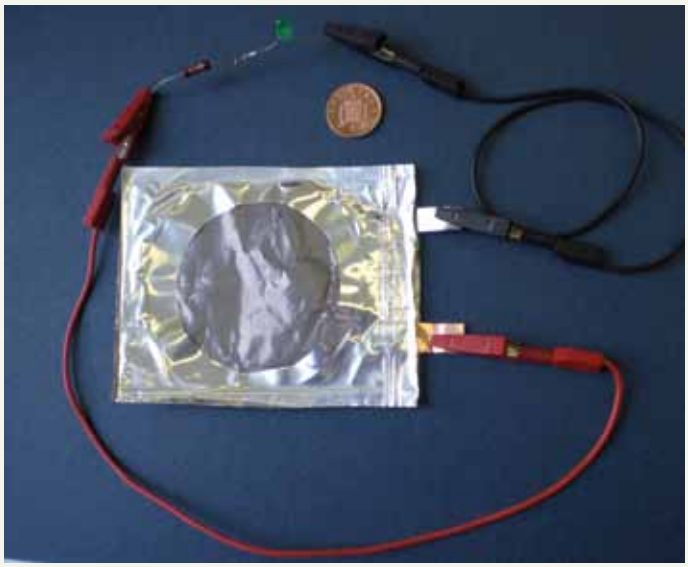
Skills in energy

Three new Centres for Doctoral Training to develop essential skills in energy research have been funded at Durham and York Universities, and Imperial College London with funding of over £1.2 million. These build on our major investment of Five energy Centres for Doctoral Training last year. Durham University for example plans enhanced, multidisciplinary training opportunities for 63 PhD students over five years, in general energy. The aim is to contribute a critical mass of versatile individuals trained in a wide range of skills that will help the UK remain competitive in the field. The University of York is offering training in fusion, and Imperial College London will focus on whole systems for energy.

Future of fusion

Fusion energy is recognised internationally as a key long term endeavour in which the UK is making a significant contribution. In 2009 EPSRC and STFC undertook a major review of their 'fusion for energy'

Air-fuelled battery could last 10 times longer



A new type of air-fuelled battery could pave the way for a new generation of 'green' electric cars, mobile phones and laptops by offering users up to ten times more life than current designs. The research, funded by EPSRC, is led by University of St Andrews with partners at Strathclyde and Newcastle universities. The new design has the potential to improve the performance of portable electronics and give a major boost to the renewable energy industry. The batteries will enable a constant electrical output from sources such as wind power or solar, which stop generating when the weather changes or night falls.

The secret behind its improved capacity is the addition of oxygen drawn from the air during discharge, replacing one chemical constituent used in rechargeable batteries today. Not having to carry the chemicals around in the battery offers more energy for the same size of battery. Developing smaller, lighter batteries with the necessary charge capacity has been a long-running battle for developers of electric cars.

The research builds on the discovery at St Andrews that the carbon component's interaction with air can be repeated, creating a cycle of charge and discharge. Professor Peter Bruce, Principal Investigator for the project said: *"Our target is to get a five to tenfold increase in storage capacity, which is beyond the horizon of current lithium batteries. Our results so far are very encouraging and have far exceeded our expectations."*

An early demonstration model of the STAIR (St Andrews Air) cell.

strategy, the results of which were published in early 2010. Key points include endorsement of EPSRC and STFC's commitment to support fusion research, EPSRC development of a long term base funding mechanism for magnetic confinement fusion as part of the energy programme (including upgrading the MAST experiment) and provision of targeted 'challenge' funding for specific fusion research when possible.

Cutting energy demand with digital innovation

The application of digital technology to reduction of energy demand is a rapidly developing area of research with the possibility of particularly high impact. 2010 saw the development of 13 new grants to a value of £9 million funding in this area through targeted activities.

Two particular highlights are:

- **Taking on the teenagers:** 40 teenagers will actively inform on mobile solution designs and contribute to research and evaluation. This will involve gathering and interpreting data from the field trial of the products they helped design.
- **Consumer awareness of carbon footprint:** The aim is to inform consumers of the impact of behaviour on their carbon footprint from energy use in the home and transport. It focuses on evolving compelling energy applications and providing the commercial platform for developments to be undertaken. China Mobile is a key partner in the project.

Nuclear fission

Nuclear fission power generation is another key area for the UK's future energy mix. Previous funding from the research councils maintained key academic capabilities at a time of little nuclear energy activity and has positioned them well to respond to these new opportunities and play a key part in delivering our fission future. Building on the 'keeping the nuclear option open' activity the research councils in collaboration with nuclear stakeholders (EDF, British Energy, National Nuclear Laboratories, Rolls-Royce and the Health and Safety Executive) have announced six research consortia with funding of over £7.5 million. These consortia will tackle research such as focusing on novel techniques for dealing with spent nuclear fuel, fundamental studies to improve the lifetime of materials in nuclear power plants and novel separation technologies.

Renewables

The EPSRC-led SUPERGEN energy research programme is an internationally recognised brand bringing together researchers and stakeholders to deliver the highest quality research and training in a wide range of renewables. As part of our continued development of SUPERGEN three consortia have been renewed this year with over £11 million funding into biological fuel cells, energy storage and wind. We have undertaken a consultation exercise to highlight the impact SUPERGEN has already achieved and to provide evidence for the future structure of the programme. This includes discussions with the Technology Strategy Board on providing a seamless transfer of funding support for technologies from fundamental research through to demonstration.

Energy efficiency in buildings

The Research Councils UK Energy Programme and EDF invested £4 million in a collaborative

What do you think about robots?
Would you take the blame if your robot went wrong?

These were some of the challenging messages to researchers from the many views expressed by young people who took part in 'Robotic Visions' an EPSRC supported public engagement dialogue project run in partnership with universities and science centres and led by the University of the West of England. Involving five 'visions conferences' – in Bristol, Newcastle, Aberystwyth, Glasgow and Oxford – it brought together students and leading robotics researchers for a unique opportunity to understand public concerns about robotics and hear the views of the young.

Each event was led by the participants themselves – around 40, 14 to 19 year olds and researchers – who worked together to identify the issues and topics of most concern to them. Sessions focused on exploring the uses and potential of robotics, identifying key priorities and producing recommendations for potential stakeholders such as government, other researchers and young people.

Many youngsters favoured use of robots for surgery: 'They could be faster and more accurate but could they deal with the unexpected and who would get the blame for mistakes?' Debate on military uses led to conclusions like 'It is better to focus on defensive rather than offensive uses, like landmine deactivation'. Messages for researchers included that the public needed to be educated about robots: 'You should remember that people are going to have to build up trust in robots before they are accepted.' Advice for policy makers cautioned that there needed to be accountability but with no one person with too much control and lots of checks including a licensing system.

Students at the 'Robotic Visions' conference in Bristol.

£9 million

Our funding of £9 million this year contributes to joint research councils' projects run by the RCUK Public Engagement team.

research programme in the general area of the social and economic sciences of energy efficiency in buildings. This initiative engaged groups of UK academics with researchers at the EDF European Centre and Laboratories for Energy Efficiency Research (ECLEER).

Review for the future

A major, wide ranging international review of the Research Councils UK energy programme involving world-leading energy researchers takes place in 2010. The review panel will visit 40 leading UK energy research institutions and their industrial collaborators and other organisations active in the field. It will inform the future direction of the RCUK programme.

ENGAGING THE PUBLIC

EPSRC continues to build on its programme focused on engaging researchers with the public to share exciting research results, inspire the young and hear peoples' views on the shape of science to come. Our funding of £9 million this year contributes to joint research councils' projects run by the RCUK Public Engagement team and EPSRC initiatives which directly support a thriving programme of public engagement by our research community. Our co-funding of RCUK led activities supports the 'Beacons' project which helps researchers overcome major barriers to becoming active in public engagement such as pressure to publish and attract funding. We also enable early stage researchers to enthuse the young about science and engineering through the RCUK Researchers in Residence scheme.

The public view

Working with many partners we have played a major role in shaping the agenda for emerging issues for society including dialogue with the public on the implications of research. Following the ground-breaking public dialogue on nanotechnology for healthcare last year, the spotlight is on the emerging area of synthetic biology in 2009-10. This joint EPSRC/BBSRC dialogue tackles an area of science at an embryonic stage where scientists are only just beginning to apply the principles of engineering to bioscience. Synthetic biology has breathtaking potential for novel applications that raise important social and ethical questions. The myriad of possible applications include new diagnostic techniques and vaccines, biosensors, hydrogen fuel cells, microbial environmental clean-up techniques, new biomaterials and programmable cells for use in gene therapy. So the need for early interaction with the public is clear. Due for completion in 2010, the outcomes will help the Research Councils and others to ensure that future policies better reflect the views, concerns and aspirations of the public on this exciting and challenging field of research.

Professor Lord Robert Winston, Chairman of the EPSRC Societal Issue Panel which prompted the synthetic biology project said: *"We hope that through this exercise we can begin to define a generic template for dialogue around emerging and burgeoning areas of science."*

Partnerships for public engagement

Our Partnerships for Public Engagement awards have led to many innovative public engagement activities inspired and carried out by EPSRC supported researchers across the UK. This year

Does it rain more at weekends?

'Does it rain more at weekends?' is the intriguing question posed by weather expert Andrew Russell to engage the public in science. Andrew of the University of Manchester is one of the EPSRC supported 'NOISEmakers' who aim to stimulate interest in science amongst teenagers and gain experience of how to engage with the public. Part of his outreach activity in 2009 was to call on school students around his region to help unlock the answer to his weekend rain quest by making their own rain collectors to measure rainfall for him to analyse. He also got the public to take part in the experiment at the Manchester Science Festival where his project achieved no less than 48% of the media coverage generated during the period of the Festival.

The data he collected was analysed and compared to rain data that had been captured from the city over the past hundred years. And had the weekend climate apparently changed? The answer is on the NOISE website, www.noisemakers.org.uk.

Demonstrating how raindrops stay suspended in clouds (the Bernoulli effect) using a hair dryer and a ping pong ball at a school in Accrington.

we have made sixteen Partnerships for Public Engagement awards with £1.4 million funding. They include:

Building acoustics engagement is a project by the University of Salford which will use an eye catching sculpture by a noted artist, backed up by information and educational resources, to inspire interest in the link between the art of sound and the science of acoustics.

Beautiful games is a Sheffield Hallam University inspired exhibition which will explore the role of science and engineering in sport for display at local museums and the V&A Museum of Childhood.

The EPSRC 'New Outlooks in Science and Engineering (NOISE)' campaign which aims to stimulate interest in science amongst the teenage audience by recruiting early career researchers who act as role models called 'NOISEmakers', has been refocused this year. While our core objective remains, the provision of training and media opportunities for the early stage career individuals will get high priority. The idea is that NOISEmakers' experiences bring greater understanding of how to engage with the public and recognition of its importance as part of their career.

High profile champions

The EPSRC Senior Media Fellowship scheme seeks to redress the shortage of 'high-profile' explainers with the gift of being able to communicate research topics to millions of the wider public through the media and major public events. Professor Alan Winfield of the University of the West of England, with his proven track record of public engagement achievements, has been awarded a Fellowship this year. Professor Winfield's burgeoning programme of public engagement arose from him leading the highly successful 'Walking with Robots' project which took the UK's intelligent robotics research to the public, reaching close to 80,000 people over three years. It inspired the UK's first festival of robotics in 2009. He is increasingly in demand for public lectures in the UK and overseas including a recent series of lectures in Japan to schools and professionals.

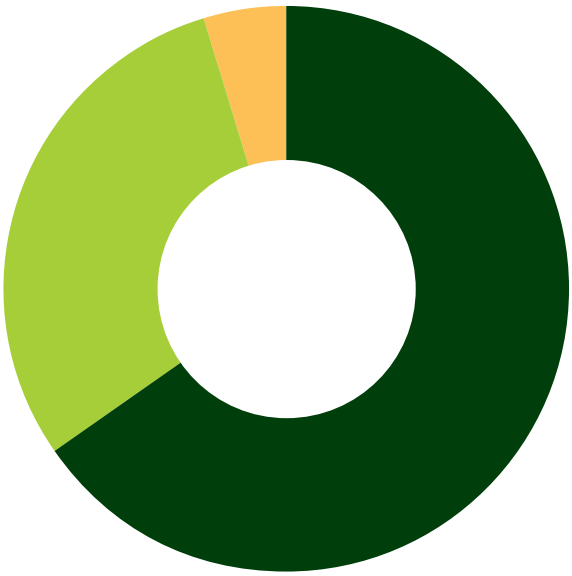
Two of our other prominent Senior Media Fellows, Professor Jim Al-Khalili and Professor Trevor Cox, have been awarded two year extensions to their fellowships. Professor Al-Khalili has continued with his successes including books, press articles and major BBC TV series such as *'Chemistry: a volatile history'* and *'Atom'*. Professor Cox's major impact on BBC Radio 4 and World Service in 2009 includes presenting seven documentaries.

FACTS AND FIGURES

FACTS AND FIGURES

EPSRC expenditure by category (%)

	%
Research grants	65.3
Postgraduate training and fellowship awards	30.0
Administration and restructuring	4.7



Research grant investment by programme
Research grant proposals considered and funded

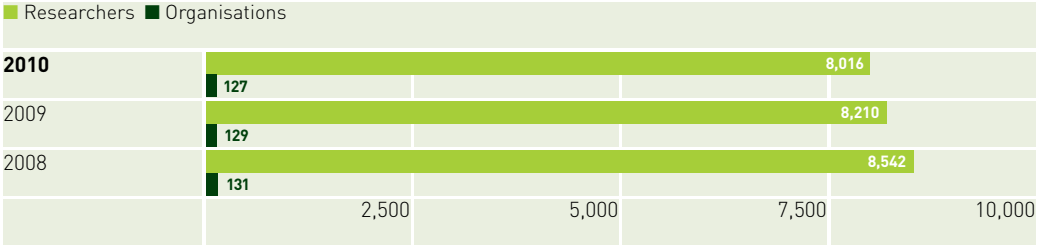
Financial year 2009/10	Proposals considered [1]		Proposals funded		% funded	% funded
	Number	Value (£m)	Number	Value (£m)	Number	Value
Cross-Disciplinary Interfaces	154	128.3	63	41.0	41%	32%
Digital Economy	69	35.7	37	19.9	53%	56%
Energy Multidisciplinary Applications	94	50.5	47	19.3	50%	38%
Energy Research Capacity	37	36.3	20	24.5	55%	67%
Information and Communications Technology	715	275.0	163	72.0	23%	26%
Mathematical Sciences	238	43.0	91	12.0	38%	28%
Materials, Mechanical and Medical Engineering	492	194.6	122	63.0	25%	32%
Nanoscience through Engineering to Application	15	15.2	6	5.6	39%	36%
Physical Sciences	800	339.1	217	88.0	27%	26%
Process, Environment and Sustainability	425	161.8	90	30.6	21%	19%
Research Infrastructure and International	30	20.5	20	8.1	67%	40%
Towards Next-Generation Healthcare [2]	28	20.4	8	7.0	28%	34%
User-Led Research	283	103.0	143	68.0	51%	66%
Total	**3,379**	**1,423.4**	**1,026**	**459.0**	**30%**	**32%**

1 ie on which a final decision was made between 1st April 2009 and 31st March 2010.
2 The vast majority of proposals under Towards Next-Generation Healthcare were considered and funded through partner organisations such as The Wellcome Trust and Cancer Research UK.

Gross research grant expenditure by programme

Programme	2007/08 £m	2008/09 £m	2009/10 £m
Nanoscience through Engineering to Application	–	2.8	**8.5**
Towards Next-Generation Healthcare	–	3.7	**4.5**
Digital Economy	–	4.0	**7.8**
Energy Multidisciplinary Applications	–	1.0	**7.3**
Energy Research Capacity	42.2	63.9	**57.2**
Knowledge Transfer	4.3	13.5	**33.7**
Research Infrastructure and International	44.6	49.4	**51.4**
Mathematical Sciences and Public Engagement	14.2	15.7	**27.3**
Cross-Disciplinary Interfaces	63.9	49.3	**39.4**
Materials, Mechanical and Medical Engineering	72.3	73.6	**70.7**
Information and Communications Technology	83.0	84.1	**83.2**
Physical Sciences	101.6	97.8	**94.7**
Process, Environment and Sustainability	33.2	28.2	**27.2**
User-Led Knowledge and Skills	26.5	20.3	**17.1**
Total	**485.8**	**507.3**	**530.0**

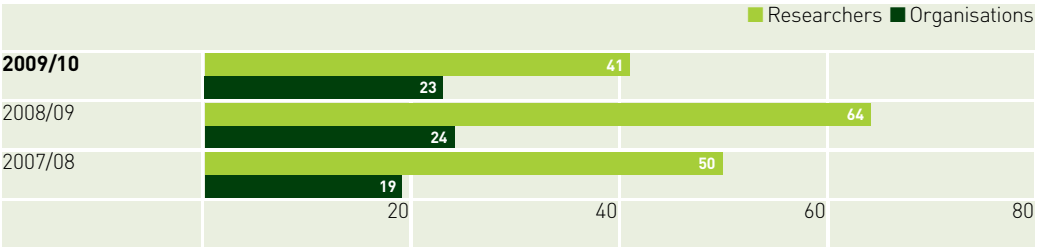
Total number of researchers (Principal and Co-investigators) and organisations with current funding on 1st April of each year



Public Engagement with Research – proposals considered and funded

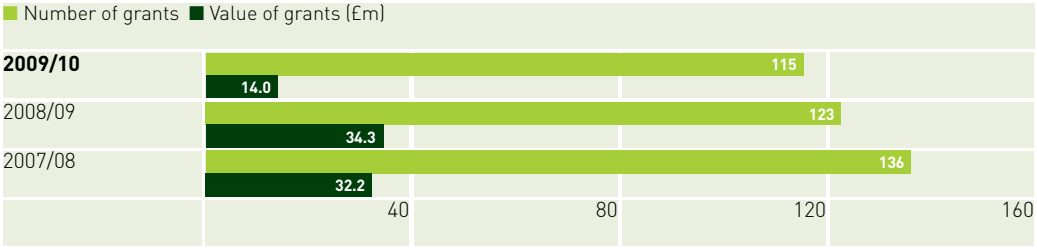
	PROPOSALS CONSIDERED					
	2007/2008		2008/2009		2009/2010	
	Number	Value (£m)	Number	Value (£m)	Number	Value (£m)
Partnerships for Public Engagement	69	9.1	119	12.6	53	4.7
Senior Media Fellowship	6	0.5	8	1.1	5	0.6
	PROPOSALS FUNDED					
	2007/2008		2008/2009		2009/2010	
	Number	Value (£m)	Number	Value (£m)	Number	Value (£m)
Partnerships for Public Engagement	22	2.3	29	2.8	21	1.5
Senior Media Fellowship	1	0.1	3	0.5	3	0.3

Number of researchers and organisations funded by the Public Engagement Programme



As a result of changes to the way in which EPSRC funds its public engagement activities, no PPE call was issued in Spring 2010. Further details can be found at: www.epsrc.ac.uk/newsevents/news/2010/Pages/publicengagementagenda.aspx.

Number and value of First Grant Scheme research grants announced



The value per grant in 2009/2010 has reduced as the First Grant Scheme was revised in 2009 and has been capped at £125,000 (FEC). Further details can be found at: www.epsrc.ac.uk/funding/grants/newac/firstgrant/Pages/default.aspx.

EPSRC Fellowships current at 31st March 2008, 2009 and 2010 by Scheme

			Calendar year
Scheme	**2008**	**2009**	**2010**
Advanced Fellowships	216	188	**150**
Career Acceleration Fellowships	–	23	**46**
EURYI [5]	5	4	**3**
Leadership Fellowships	–	22	**35**
Postdoctoral Research Fellowships [1]	49	56	**68**
Overseas Postdoctoral Fellowships [2]	32	32	**18**
Senior Fellowships	20	21	**17**
Senior Media Fellowships [4]	7	8	**7**
Springboard Fellowships [3]	6	1	**–**
Statistics Mobility Fellowships	5	6	**1**
Grand total	**340**	**361**	**345**

1 Postdoctoral Research Fellowships are available in mathematical sciences, theoretical computer science, theoretical physics and at the life sciences interface.
2 Overseas Postdoctoral Fellowships support research in appropriate physical sciences and engineering disciplines outreaching to the Life Sciences. Fellows may spend up to half of their 3 year fellowships working in overseas laboratories.
3 Springboard Fellowships provide short-term support (12 months in duration) to enable researchers in the mathematical sciences to work at the interface with another discipline, with business or industry or on an innovative project.
4 EPSRC awards Senior Media Fellowships through its Public Engagement Programme.
5 The European Young Investigator (EURYI) Awards Programme is a European scheme that EPSRC makes a financial contribution to (in 2004/05 EPSRC contributed 360k Euros and 2005/06 EPSRC contributed 720k Euros). Funds are awarded from a central resource comprising contributions from 20 participating organisations across Europe. From 2006/07 onwards EPSRC has not contributed to any new EURYI Awards but continues to fund the current Fellows until 2010/11.
6 In addition to the activities shown in the table, EPSRC is involved with the following fellowship schemes:
— Administering the Academic Fellowships Scheme on behalf of RCUK.
— Jointly administrating the Engineering Postdoctoral Fellowships in collaboration with Royal Academy of Engineering.
— Contributing to Royal Society Industrial Fellowships (£640k in 2009/10).
— Contributing to the Daphne Jackson Memorial Fellowship Trust (£109k in 2009/10).

EPSRC Fellowships current at 31st March 2010 by Scheme and Discipline

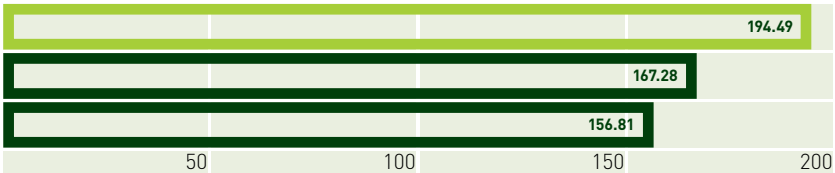
	Scheme									
Discipline	**Advanced**	**Career Acceleration**	**EURYI**	**Leadership**	**Post-doctoral Research**	**Overseas P'doctoral Research**	**Senior**	**Senior Media**	**Spring-board**	**Grand total**
Chemical Engineering	4	1	–	–	–	–	–	–	–	**5**
Chemistry	31	9	2	10	4	5	6	1	–	**68**
Civil Engineering	2	2	–	–	–	–	–	–	–	**4**
Computer Science	18	1	–	5	15	2	3	1	–	**45**
Electrical & Electronic Engineering	6	1	–	3	–	–	–	–	–	**10**
General Engineering	8	–	–	1	4	2	–	–	–	**15**
Life Sciences	1	2	–	–	2	2	–	1	–	**8**
Mathematics	32	5	–	9	29	–	3	1	1	**80**
Mechanical, Aeronautical & Manufacturing Engineering	8	–	–	–	–	–	–	1	–	**9**
Medicine	3	1	–	1	–	3	–	–	–	**8**
Metallurgy & Materials	3	1	–	–	1	–	–	–	–	**5**
Physics	31	22	–	5	13	4	4	1	–	**80**
Other	3	1	1	1	–	–	1	1	–	**8**
Grand Total	**150**	**46**	**3**	**35**	**68**	**18**	**17**	**7**	**1**	**345**

Net training expenditure (£m)

	2007/08	2008/09	2009/10
Doctoral Training Accounts	78.07	76.23	**81.08**
Centres for Doctoral Training	6.92	11.25	**36.57**
Collaborative Training Accounts	49.29	52.79	**57.82**
Graduate Schools	1.46	1.25	**–**
International Doctoral Scholarships	1.72	1.46	**0.97**
Dorothy Hodgkin Awards (EPSRC only)	2.14	2.23	**2.47**
Roberts Skills Payments	12.84	13.70	**13.64**
Other Training	4.37	8.37	**1.93**
Total	**156.81**	**167.28**	**194.49**

In the above table training expenditure is shown on a net basis (i.e. after deducting receipts).
The Annual Accounts show training expenditure on a gross basis (i.e. before deducting receipts).

Net training expenditure (£m)

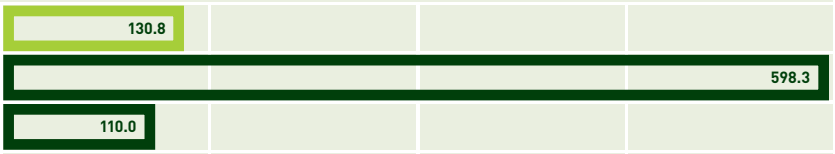


Training commitment (£m)

	2007/08	2008/09	2009/10
Doctoral Training Accounts	86.0	167.0	**78.6**
Industrial Case Accounts	–	18.8	**19.5**
Collaborative Training Accounts	21.3	26.8	**–**
Centres for Doctoral Training	–	329.1	**19.8**
Knowledge Transfer Accounts	–	49.8	**11.0**
Dorothy Hodgkins Awards (EPSRC only)	2.7	2.8	**1.9**
Engineering Doctorates	–	4.1	**–**
Total	**110.0**	**598.3**	**130.8**

Commitment is made on a biennial basis.

Training commitment (£m)



PhD students by discipline (not including collaborative students)

	Doctoral students [1,3]			Project students [2]		
	2008	2009	2010	2008	2009	2010
Core e-Science	–	–	–			
Basic Technology	–	–	–	111	102	79
Total	**–**	**–**	**–**	**111**	**102**	**79**
Chemical Engineering	156	171	194	141	186	197
Chemistry	1131	1156	1114	376	363	422
Civil Engineering	162	151	181	84	81	106
Computer Science	510	461	462	280	297	321
Electrical & Electronic Engineering	505	470	486	284	326	338
General Engineering	375	361	352	150	173	235
Life Sciences	174	169	161	41	53	72
Mathematics	754	770	715	105	116	131
Mechanical, Aeronautical & Manufacturing Engineering	192	179	188	167	175	207
Medicine	99	104	94	44	45	55
Metallurgy & Materials	276	238	270	142	153	169
Physics	760	729	729	309	336	368
Other	272	245	199	111	145	197
Unknown	340	359	413	1	1	–
Total	**5,706**	**5,563**	**5,558**	**2,235**	**2,450**	**2,818**
Grand Total	**5,706**	**5,563**	**5,558**	**2,346**	**2,552**	**2,897**

PhD Students by Scheme and Discipline 2010 (including collaborative students)

	Chemical Engnrng	Chmstry	Civil Engnrng	Comptr Science	Elctrcl & Elctronc Engnrng	General Engnrng	Life Sciences	Maths	Mechncl Aerontcl & Manfctrng Engnrng	Medicine	Metallrgy & Materls	Other	Physics	Unknown	Total
CASE for New Academics (CNA)	5	7	13	10	10	31	5	4	9	2	2	1	4	21	124
Centre for Doctoral Training Student (CDT)	19	36	41	34	40	14	14	1	11	2	25	9	32	42	320
Collaborative Research Student (CTA)	4	34	2	3	21	23	6	7	5	1	4	4	2	31	147
Dorothy Hodgkin Overseas Scholar (DHPA grant)	10	17	9	5	29	17	14	4	8	14	14	20	7	27	195
Earmarked Awards:															
Analytical Science (DTG)	–	17	–	–	1	–	8	1	–	–	1	–	–	–	28
Mathematics CASE (DTG)	–	–	–	1	1	–	–	19	–	–	1	3	–	1	26
Engineering Doctorate – Research Engineer	32	16	67	21	65	81	26	2	40	–	43	40	9	42	484
EPSRC / ESRC Studentship	3	4	6	12	7	1	7	6	–	1	1	3	3	5	59
Industrial CASE Student	26	136	25	34	50	114	31	11	49	15	30	19	42	45	627
International Doctoral Scholars (IDS grant)	–	8	–	2	19	–	–	–	3	–	6	–	16	–	54
Life Sciences Interface Student (DTC grant)	46	90	–	41	4	–	36	9	12	25	–	–	34	133	430
Standard Research Student (DTG)	116	942	125	367	385	320	82	675	154	52	222	164	637	205	4446
Distinct Totals	**261**	**1307**	**288**	**530**	**632**	**601**	**229**	**739**	**291**	**112**	**349**	**263**	**786**	**552**	**6,940**

	2008	2009	2010
Number of organisations with funding from Collaborative Training Accounts	92	89	**81**
Number of organisations with funding from Doctoral Training Accounts	74	71	**64**
Number of institutions with Studentship support (this reflects the no. of organisations that have received funding from either or both schemes)	96	93	**87**

Project students are not included.

1 In October 2001 EPSRC introduced Doctoral Training Grants to universities to replace individual studentships. Student data had previously been estimated while data was being collected from the universities. Numbers of students are now actual figures but show a decline towards the present year due to the length of time needed to gather full datasets.
2 Project studentship posts are at doctoral level and supported through research grants.
3 Typically approx 5% of standard DTA studentships and 20% of CDT studentships are associated with collaborative partners. This is in addition to the specific collaborative schemes shown below.
4 As institutions may receive funding for both Collaborative Training Accounts and Doctoral Training Accounts this figure reflects the total number of organisations that have received funding from either or both schemes.
5 EPSRC acts as a scheme sponsor and administers the Dorothy Hodgkin Postgraduate Award (DHPA) Scheme on behalf of the Department for Business, Innovation and Skills (23 core in 2009/10). In addition during 2004 the International Doctoral Scholarship scheme was introduced to allow leading research teams to recruit students from anywhere in the world. Universities with EPSRC supported Portfolio Partnerships or Interdisciplinary Research Collaborations (IRCs) have been given the flexibility to transfer up to 10% of their Doctoral Training Grants into the new scheme.

Number of PhD Students supported by Collaborative Schemes as at 31 March 2008, 2009 and 2010

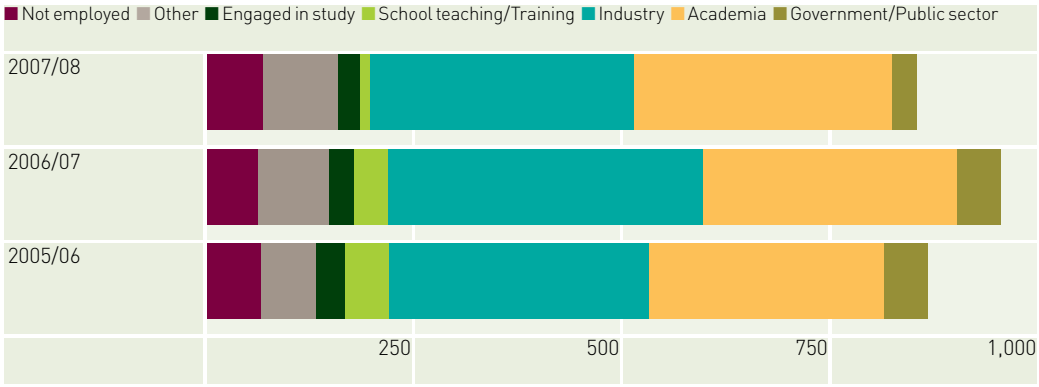
	2008	2009	2010
Collaborative Research Student (CTA)	223	225	**147**
CASE for New Academics (CNA)	247	202	**124**
Engineering Doctorate – Research Engineer	567	560	**484**
Industrial CASE Student	645	651	**627**
Total	**1,682**	**1,638**	**1,382**

First Destination of EPSRC PhD Students

RC Reporting Category	2005/06	%	2006/07	%	2007/08	%
Government and Public Sector	52	6.0%	53	5.5%	29	3.4%
Academia	284	32.6%	307	32.0%	312	36.4%
Industry	315	36.2%	380	39.6%	319	37.2%
School Teaching/Training	53	6.1%	41	4.3%	12	1.4%
Engaged in study	35	4.0%	31	3.2%	27	3.1%
Other	66	7.6%	85	8.9%	91	10.6%
Not employed	66	7.6%	62	6.5%	68	7.9%
Grand total	**871**		**959**		**858**	

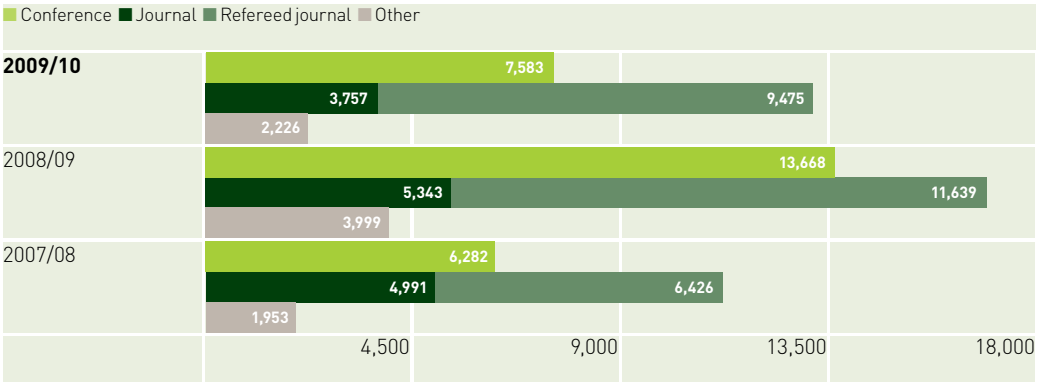
1 Data source is the HESA Destinations of Leavers from Higher Education (DLHE) Survey.
2 'Not knowns' have been removed from the tables above.
3 Other employment includes 'Self employed, voluntary and unpaid work'.

First Destination of EPSRC PhD students whose funding finished or who qualified in 2005/06, 2006/07 and 2007/08



Trends in publications

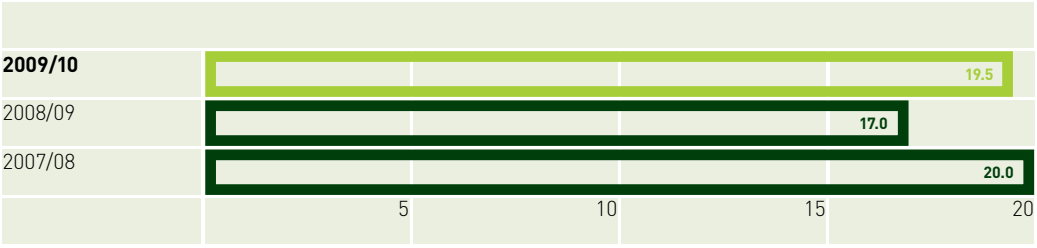
Numbers of publications reported on completed Final Reports



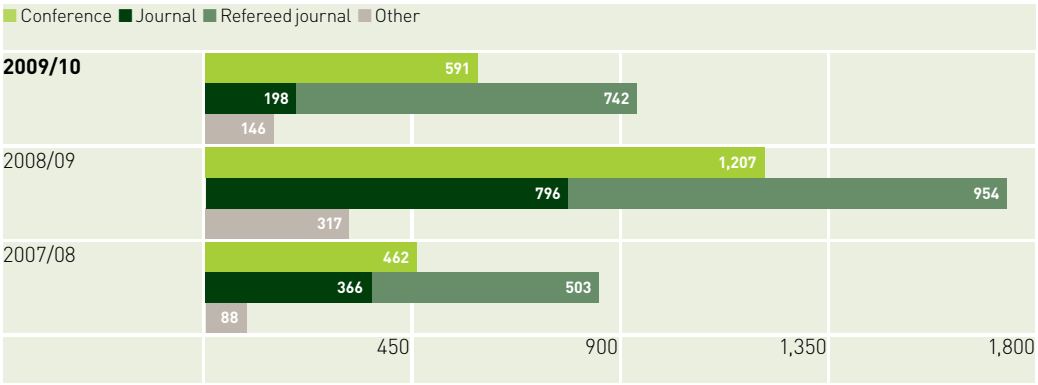
Other includes books, patents and software.

	2007/08	2008/09	2009/10
All completed Final Reports	1,225	2,353	**1,386**
Percentage of final reports reporting publications	81%	87%	**86%**

Average number of publications per completed Final Report

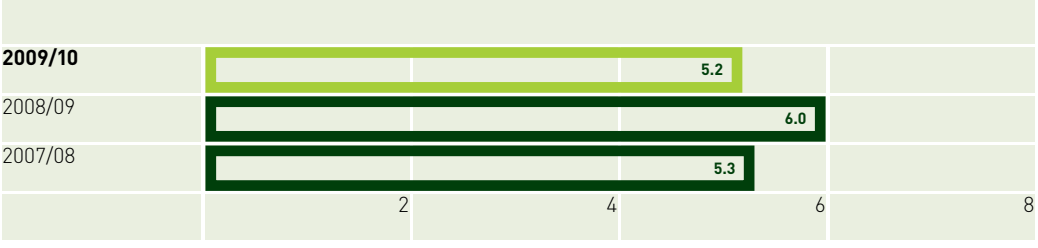


Number of publications with an industrial co-author reported on completed Final Reports



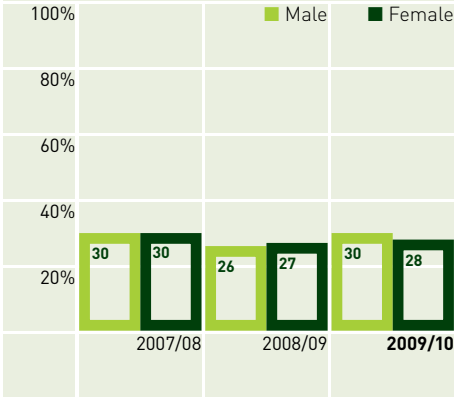
	2007/08	2008/09	2009/10
Final reports completed in year	1,225	2,353	**1,386**
Percentage of final reports reporting publications with Industrial Co-authors	22%	23%	**23%**
Percentage of final reports reporting publications	81%	87%	**86%**

Average number of publications with an industrial co-author per completed Final Report

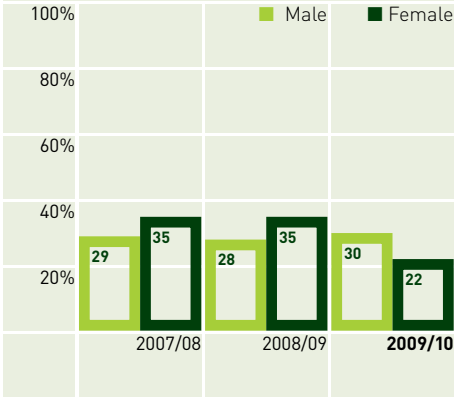


Funding rates (%) by gender

Standard research grants awarded (%)

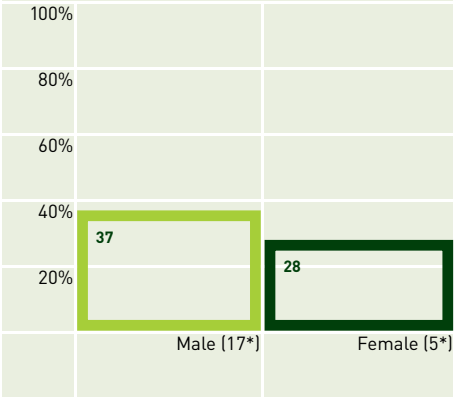


Research grants awarded to young researchers (under 35 years)

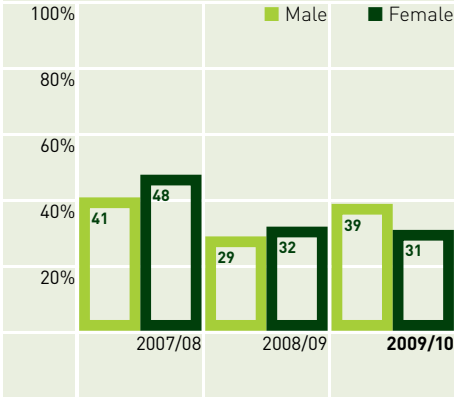


Career Acceleration Fellowships awarded in 2009/10 [2]

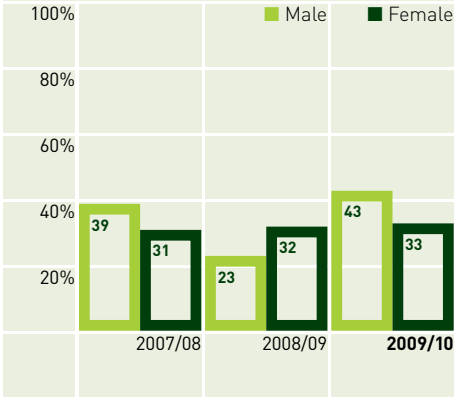
* The figures in brackets below are the number of Fellowships awarded.



First Grant Scheme grants awarded [1]

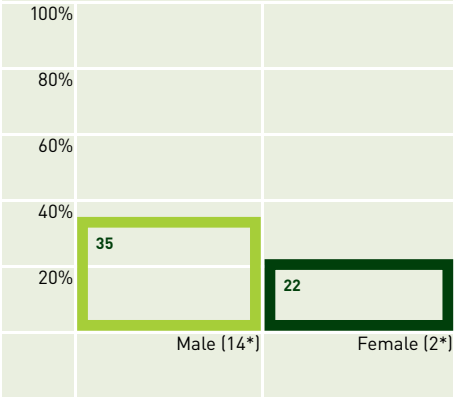


Public Engagement with Research (PPE) Awards[3]



Leadership Fellowships awarded in 2009/10 [4]

* The figures in brackets below are the number of Fellowships awarded.



1 The first grant scheme is to help new academics apply for research funding at the start of their careers. Proposals are considered in competition with other first grant proposals at responsive mode prioritisation panels.
2 Career Acceleration Fellowships provide support for talented researchers at an early stage of their career. Application for these is through calls for proposals.
3 PPE awards aim to communicate the excitement of fundamental and applied research in science and engineering to the public.
4 Leadership Fellowships provide support for talented researchers with the most potential to develop into the UK's international research leaders. Application for these is through calls for proposals.
5 The funding rate percentages are calculated by dividing the number of grants announced by the number of proposals considered.

Gender of Current award holders as at 01/04/10 – where known (%)

	Male	Female
Students	74%	26%
Early career	80%	20%
Grant Holders over 35 years old	90%	10%
Senior and Leadership Fellows	93%	7%

Ethnic origin of research grant Principal Investigators (%)

	2007	2008	2009
Asian & Asian British	2.8%	4.2%	3.1%
Black & Black British	0.2%	0.4%	0.4%
Chinese	5.3%	6.6%	6.1%
Mixed	0.5%	0.7%	0.6%
Not Disclosed	7.2%	6.1%	7.5%
Unknown	0.9%	0.2%	1.1%
White	83.1%	81.9%	81.2%

CORPORATE ACTIVITIES

The Engineering and Physical Sciences Research Council (EPSRC) was established by Royal Charter on 16 December 1993 and began operations on 1st April 1994. EPSRC inherited part of the programme previously funded by the Science and Engineering Research Council (SERC).

EPSRC receives its principal funding through the Grant in Aid from the Department for Business, Innovation and Skills (BIS). The amount received in 2009/10 was £799m (2008/09 £785m). Income was also received from other Research Councils, Government Departments and other bodies.

The Accounts have been prepared in accordance with the Science and Technology Act 1965 and the Secretary of State for the Department for Business, Innovation and Skills directions made thereunder.

Mission

The mission of EPSRC as set out in the 1993 Government White Paper on Science, Engineering and Technology 'Realising our Potential' is:

"to promote and support high quality basic, strategic and applied research and related postgraduate training in engineering and the physical sciences (Chemistry, Physics and Mathematics), placing special emphasis on meeting the needs of the users of its research and training outputs, thereby enhancing the United Kingdom's industrial competitiveness and quality of life."

EPSRC's objectives, as defined in its Charter, are:

a) to promote and support high quality basic, strategic and applied research and related post-graduate training in engineering and the physical sciences;
b) to advance knowledge and technology and provide trained scientists and engineers to meet the needs of users and beneficiaries (including the chemical, communications, construction, electrical, electronic engineering, information technology, pharmaceutical, process and other industries), thereby contributing to the economic competitiveness of the United Kingdom and the quality of life of its citizens; and
c) to provide advice, disseminate knowledge and promote public understanding in the fields of engineering and the physical sciences.

Review of the year

The Operating Cost Statement records net expenditure after reversal of cost of capital for the year of £854m (2008/09 £793m). There was an increase in expenditure on research grants, with annual expenditure totalling £530m (2008/09 £507m) and an increase in expenditure on postgraduate and fellowship awards, with annual expenditure of £257m (2008/09 £228m).

During the year EPSRC made no payments to the Consolidated Fund (2008/09 £12k).

Transfers to and from reserves are shown in the Statement of Taxpayer's Equity.

Full details of the activities in the year and future plans are shown in the Annual Report.

We report on the extent we are exposed to financial risks in Note 27 to the Financial Statements.

Research and development

As an organisation wholly engaged in research, EPSRC does not classify research and development separately in the Accounts.

Shared Services Centre

The seven Research Councils are establishing a Shared Services Centre (SSC), to be based in Swindon. The SSC will provide finance, grants, human resources, information systems, procurement and payroll operational services to each of the Councils and their Institutes. The Councils are setting up the SSC with the aim of achieving procurement benefits through sharing and standardising processes. The SSC has been incorporated as RCUK Shared Services Centre Limited and is currently providing some services to all Councils. EPSRC migrated the Human Resources, Payroll, Finance and Operational Procurement functions in 2009. There is a phased implementation plan for transferring the Councils' remaining services during 2010/11.

EPSRC previously acted as 'host' for the Shared Services Centre project on behalf of all Councils and had contracted for the development and establishment of the Shared Services Centre. During 2009 the responsibility for the project was novated to RCUK Shared Services Centre Limited. For legal reasons one contract with Oracle remains with EPSRC and the costs subsequently recharged to the project. The Councils have agreed to share all these costs and EPSRC's agreed share is 8.24%. The costs have been accounted for in EPSRC's books as £234k as provisions for redundancy and system termination costs in 2009-10 and £3.9m as assets in the course of construction to 31 March 2010.

EPSRC has acquired B shares to the value of £651k to reflect its Joint Venture investment in the Shared Services Centre. B shares convey ownership rights to the holder, including any distribution or proceeds from sale of the Shared Services Centre. The value of these shares was impaired by £154k during 2009/10 and now stands at £497k.

The transition to a Shared Services Centre is regarded as a business critical project and is referred to in our Statement of Internal Control.

Payment policy

In accordance with Government guidelines, it was the policy of the EPSRC in 2009/10 to seek to comply with the CBI Prompt Payers' Guide that states that commercial invoices should be paid within 30 days of the presentation of a valid demand for payment. EPSRC is now moving towards reducing the time taken to make payment to 10 days in line with revised Government policy.

During 2009/10 the majority of payments by EPSRC were made to predetermined scheduled dates. Payment of commercial invoices, as defined by the CBI, was monitored throughout the year. 86% of all invoices were paid within 30 days of receipt and 56% of those within 10 days of receipt.

The remittance advice, which accompanies payable orders, gives a point of contact within Finance for queries or complaints from suppliers on payment performance. No complaints, under the terms of the CBI code, were received during the reporting year.

In November 1998, the Late Payment of Commercial Debts (Interest) Act came into force, providing small businesses with a statutory right to claim interest from large businesses (and all public sector bodies) on payments that are more than 30 days overdue. Amended legislation (the Late Payment of Commercial Debts Regulations 2002) came into force on 7th August 2002 providing all businesses, irrespective of size, with the right to claim statutory interest for the late payment of commercial debts. No such claims were received during the reporting year.

Details of the Prompt Payers' Guide can be found at www.payontime.co.uk.

Holding of Public Sector Information

EPSRC have complied with the cost allocation and charging requirements set out in HM Treasury and Office of Public Sector Information guidance, where they are appropriate. However, the information EPSRC holds is exempt from the requirements of *'The Re-use of Public Sector Information Regulations 2005'* as specified in para 5 (3) of the regulations.

Personal Data

There has been one personal data related incident in 2009/10. A full Information Security report was raised and its conclusions and recommendations were acted upon. No personal data was lost and the affected person was apprised of the incident and informed of the recommendations highlighted in the report. EPSRC will continue to monitor and assess its information risks in order to identify and address any weaknesses and ensure continuous improvement of its systems.

Resource Audit Committee

The Resource Audit Committee (RAC) includes three members of Council together with other members from the commercial and academic communities. RAC meets three times a year to review corporate governance, risk management, internal and external audit matters, efficiency and the Council's Accounts.

Financial Risk Management and Going Concern

Accounting policies in respect of financial risks and going concern are considered in notes 1(p) and 1(b) respectively.

Following a change in government in May 2010 a comprehensive spending review was signalled, and initial outcomes announced on 20 October 2010. The Science Budget programme funding has been maintained in cash terms although the impact on individual Research Councils is being determined.

However, EPSRC is working with its fellow councils through Research Councils UK (RCUK) to develop a RCUK Spending Review framework. This framework will help develop individual Research Council inputs. We remain satisfied that the preparation of accounts on a going concern basis remains appropriate.

Equality of opportunity

EPSRC has a policy of non-discrimination against people on the grounds of gender, age, religion, religious beliefs, disability, race or sexual orientation. This applies in recruitment, training, promotion and to all aspects of employment within EPSRC.

EPSRC has published its Race, Disability and Gender Equality Schemes. An Equality Group has been formed to monitor progress against its published Action Plan.

EPSRC gained accreditation as a Disability Symbol user in 2004 approved under the scheme operated by the Employment Service.

EPSRC continues to be a member of the Research Councils' Equality and Diversity Advisory Group.

Learning and Development (L&D)

Investors in People

EPSRC sought reaccreditation for Investors in People in November 2009 and was recognised as meeting the Standard at Bronze level. The assessor reported: *"Following the last two years in retaining recognition the assessor feels significant progress has been made to bring them back on standard and recommends that they now be recognised as EPSRC fully meets the requirements of the Investors in People Standard at Bronze level as 68 indicators have been met. I am pleased to confirm that there are no actions required to meet the Standard, following this successful review visit."*

EPSRC's next review will be due in November 2012.

Sunday Times 'Best Places to Work in The Public Sector' – EPSRC also entered the first annual Sunday Times 'Best Places to Work in The Public Sector' employee engagement survey, the results of which were published in the Sunday Times on 14 March 2010. 234 out of 318 employees surveyed (74%) completed an on-line survey in November 2009 and EPSRC also completed an organisational questionnaire. The results of the survey covered eight categories, including 'My Manager', 'Fair Deal', 'My Team' and 'Leadership'. Overall EPSRC was ranked 31st in the top 75, out of a total of 207 public sector organisations and was rated as 'One to Watch'.
The Sunday Times reported: *"Ensuring that Britain remains at the vanguard of engineering and the sciences is a daunting task. The 330 employees at the Engineering and Physical Sciences Research Council in Swindon believe they are helping to keep the country out in front, saying the organisation makes a real difference to the world (81% positive and the top score for this question among the medium-sized entries on our list).....People feel they can make a difference at work (71%) and they have the support they need to provide a great service (63%). Managers are open and honest with staff (74%) and regularly express their appreciation when they do a good job (69%)."*

The Making a Difference Team

Following the end of the EPSRC Change programme in 2009, a new team has been established, the Making a Difference Team (MaDT) to build on the success of the Change Champions. MaDT is an autonomous, self directed team of employees which determines its own agenda based on input from colleagues. The team has direct access to the CEO. The team's purpose is *"Giving everyone the opportunity to engage with and contribute to initiatives that change the organisation for the better"*, leading to *"An organisation where good change is welcomed, people enjoy coming to work and feel valued for the contribution they make"*.

Mindful Employer

EPSRC has signed the Mindful Employer charter indicating that the organisation is positive about mental health. This is a voluntary charter and indicates EPSRC's commitment to improving the working lives of its employees.

Staff Sick Absences

During 2009/10 a total of 1,593 days were lost due to staff sickness absences, representing 2.5% of total full time equivalent working days. EPSRC's sick absence data is as follows:

Total number of staff at 31 March 2010	328
Total days lost to sickness	1,593
Average working days lost	4.9

The most common causes of absence are shown below:

Cause	Number of days lost
Cold/Flu	409
Gastrointestinal	141
Post-Operative Recovery	103
Headache/Migraine/Concussion	94
Total	747

Employee involvement

Employee involvement in management and policy matters has continued through ongoing dialogue between management, staff and Trade Unions. The Embedding Change Group (ECG) has played a major role in this dialogue, with conversations taking place in the form of focus groups as well as more traditional meetings. Change Champions have also contributed significantly to employee involvement through giving a voice to people who would not often find themselves in a meeting room. The Champions are currently re-grouping and reviewing their role within the organisation, with a view to engaging more as corporate citizens and championing worthwhile workplace causes. The HR Business Partner group has taken over the lead on much of the scope of activities carried out by the ECG and will continue to engage with all staff on an ongoing basis.

Environmental policy

The Research Councils are committed, both individually and collectively, to adopting and promoting environmental good practice in all their operations. We have identified a number of operational areas where environmental good practice is important to us. To achieve those objectives, the Research Councils recognise that they must have a good understanding of the environmental impacts of their operations and must develop realistic objectives and targets for the reduction of any adverse impacts.

Auditors

The Accounts of the EPSRC are audited by the Comptroller and Auditor General under the terms of Paragraph 3(3) of Schedule 1 of the Science and Technology Act 1965. The cost of the statutory audit in 2009/10 was estimated to be £111k (2008/09 £93k), comprising of £102k relating to the audit of the year end accounts and £9k for audit work relating to the introduction of International Financial Reporting Standards.

So far as the Accounting Officer is aware, there is no relevant audit information of which EPSRC's auditors are unaware. The Accounting Officer has taken all the steps that he ought to have taken to make himself aware of any relevant audit information and to establish that EPSRC's auditors are aware of that information.

COUNCIL AND ADVISORY PANEL MEMBERSHIP 2009/10

Council Membership
The following were members of the EPSRC Council in 2009/10:

Mr J Armitt, CBE, FREng, **Chair**	Olympic Delivery Authority
Professor D Delpy, FREng, FRS **Chief Executive**	Engineering and Physical Sciences Research Council
Professor A Anderson, OBE	University of Glasgow
Mr M Carr, FREng	Independent
Professor B Collins, FREng *from 11 November 2009*	Department for Transport/ Department for Business, Innovation and Skills
Professor L F Gladden, CBE, FRS, FREng	University of Cambridge
Mr D Hendon *until 31 October 2009*	Department for Business, Innovation and Skills
Dr A Herbert, OBE, FREng	Microsoft Research Ltd
Dame Sue Ion, OBE, FREng	Independent
Professor T Pedley, FRS	University of Cambridge
Dr M Roberts	Guidance Ltd
Professor J R Sambles, FRS	University of Exeter
Professor C M Snowden, FRS, FREng	University of Surrey
Professor P-L Viollet	EDF R&D
Professor Sir William Wakeham, FREng	Independent
Dr D Watson	IBM UK Labs Ltd
Professor M Welland, FRS, FREng	Ministry of Defence
Professor Lord Robert Winston	Imperial College London

In attendance: Representative from Department for Business, Innovation and Skills: Mr J Neilson.

Technical Opportunites Panel (TOP) Membership:

Professor L F Gladden, CBE, FRS, FREng, **Chair**	University of Cambridge
Professor M Anderson	University of Bristol
Professor M Calder, FRSE	University of Glasgow
Professor B Collins, FREng *until 31 October 2009*	Department for Transport/ Department for Business, Innovation and Skills
Professor J Fisher	University of Leeds
Professor N Halliwell, FREng	Loughborough University
Professor D Hand	Imperial College London
Professor D MacKay, FRS *from 1 November 2009*	Department for Energy and Climate Change
Professor S Price	University College London
Professor W M Rainforth	University of Sheffield
Professor R Silva	University of Surrey
Mrs A Starr	GE Aviation
Professor R Wallace, FRSE	University of Edinburgh
Professor I Walmsley	University of Oxford

User Panel (UP) Membership:

Professor C M Snowden, FRS, FREng, **Chair** *until 31 August 2009*	University of Surrey
Dr D Watson, **Chair** *from 1 September 2009*	IBM UK Labs Ltd
Ms J Bevis	British Retail Consortium
Mr J Boyer	Independent
Dr J Cooper	National Grid
Ms L Deeming	Corus Group Plc
Dr M Farrimond	UK Water Industry Research
Professor N Jackson	Ricardo plc
Professor P Nelson, FREng	University of Southampton
Dr L O'Toole	Arthritis Research UK
Mr I Risk	EADS Innovation Works UK
Mr M Sadler	HP Systems Security Lab
Mrs J Wilbraham	AstraZeneca
Dr D York, FREng	Procter and Gamble Ltd

Societal Issues Panel (SIP) Membership:

Professor Lord Robert Winston, **Chair**	Imperial College London
Professor R A L Jones, FRS	University of Sheffield
Mr D Jordan, CBE	Independent
Baroness Onora O'Neill, CBE	The British Academy
Professor J Petts	University of Southampton
Professor T Rodden	University of Nottingham
Mr N Ross	Independent
Professor K Sykes, OBE	University of Bristol
Professor Sir Martin Taylor, FRS	University of Manchester
Professor P Younger, FREng	Newcastle University

Resource Audit Committee (RAC) Membership:

Professor Sir William Wakeham, FREng, **Chair**	Independent
Mr M Carr, FREng	Independent
Mr P Douglas	Independent
Mr A Neal	Lancaster University
Professor J R Sambles, FRS	University of Exeter

CORPORATE ACTIVITIES
EPSRC COUNCIL MEMBERS' REGISTER OF INTERESTS

Name	University interest	Industry interest	Other Government departments	Other
Professor A Anderson University of Glasgow	Head of college	None	None	None
Mr J Armitt Olympic Delivery Authority	Professor J Petts Birmingham University (Sister) Professor G Petts Westminster University (Brother-in-Law)	Non-executive post with Berkeley Homes Chairman – Olympic Delivery Authority PriceWaterhouseCoopers Siemens	None	None
Mr M Carr Independent	None	None	Non-Executive Director of Ordnance Survey	None
Professor B Collins Department for Transport / BIS	None	Director – Europium Consulting	DFT BIS Director – ITSO Ltd (DfT)	None
Professor D Delpy EPSRC	None	None	Member of healthcare Innovation Council from 2007	Chair, Royal Society URF Panel (Aii) Board member Energy Technologies Institute from 2008 Member of TSB Strategic Advisory Group Council member, Royal Academy of Engineering
Professor L Gladden University of Cambridge	University of Cambridge Department of Chemical Engineering	Unilever (Consultant) Johnson Matthey (major sponsor) Schlumberger (major sponsor) Holds Shell Chair of Chemical Engineering. (Department has no links with Shell anymore)	None	National Physical Laboratory (member of NPL Royal Society/Royal Academy of Engineering Advisory Group to NPL)
Mr D Hendon BIS	None	None	Director Information Economy BIS (full-time employee)	Trustee, Radio Communications Foundation Member, Institute of Engineering & Technology Communications Sector Panel Member of Membership Panel 5 of the Royal Academy of Engineering
Dr A Herbert Microsoft Research Ltd	Member 2008 RAE Assessment Panel for Computer Science & Information Technology Industry advisor board member for University of Lancaster 'InfoLab 21' Fellow, Wolfson College Cambridge Life Member, Cambridge University Computer Laboratory 'Cambridge Ring' alumni network — Microsoft and Microsoft Research have many strategic research investments and collaborations with UK universities	Managing Director, Microsoft Research Ltd Non-executive board member, Greater Cambridgeshire Partnership Member CBI Eastern Regional Council Managing Director, Herbert Aviation Ltd	None	Member UK Computer Science Research Committee Independent expert UK Defence Scientific Advisory Committee
Dame S Ion Independent	University of Manchester – Member of Board of Governors UCLAN Honorary Professor Imperial College – Visiting Professor – possible recipient of EPSRC grants and other awards	Member of AWEML Science & Engineering Technical Ctte Non Exec Director on the Board of the Health and Safety Labs of HSE	Council for Science and Technology – Policy Issues HSE HSL Policy Advice	Vice President Royal Academy of Engineering (Until Sept 08) – Possible link with EPSRC awards and policy Member of Euratom Science & Technology Ctte Royal Academy of Engineering VP (until Sept 08)

Name	University interest	Industry interest	Other Government departments	Other
Professor T Pedley University of Cambridge	University of Cambridge – Emeritus position from 1 Oct 2009	None	None	Chairman of Applied Mathematics subpanel for the 2008 Research Assessment Exercise Member of various Royal Society committees Member of Council, Institute of Mathematics and its Applications President, International Union of Theoretical and Applied Mechanics (2008-2012)
Dr M Roberts Guidance Ltd	KTP awards with Oxford University & Liverpool University CASE Award with Cambridge University; Research sponsorship Oxford University Nottingham University DTC partner	Managing Director, Guidance Ltd, Guidance Navigation Ltd have a collaboration and consultation with University College, London	Guidance Navigation Ltd have RDA award (East Midlands). Guidance Microwave have awards from East of England RDA	Member of Loughborough University Industry Advisory Committee and de Montfort University advisory panel
Professor R Sambles University of Exeter	University of Exeter. KTP with Qinetiq Farnborough.	2 CASE studentships with Hewlett-Packard PhD studentship with BAE ICASE PhD studentship with Qinetiq Fully funded studentship with Omni ID	Member of DSAC Oversight Board Member CENTRE Consultant DSTL Porton Down 2 ICASE PhD Studentship with DSTL	G C Sambles – SIRCO (Son)
Professor C Snowden University of Surrey	University of Surrey Vice-Chancellor	Intense Ltd – Non-Executive Director to December 2009 Filtronic Plc – (Corporate Advisor) Board Member of UUK (Non Executive Director) Consultant for Diamond Microwave Devices Ltd	Member of DSAC of the MoD (Defence Scientific Advisory Council) Technology Strategy Board Member – from July 2009 Expert Panel for Review of BIS March – June 2010	Member of the SE Science and Technology Council Vice-President of the Royal Academy of Engineering Senior Deputy president of the IET to September 2009 President IET from October 2009 Board Member of the ETB (Engineering Technology Board) (to July 2009) Chair Daphne Jackson Trust to November 2009
Professor Sir M Taylor University of Manchester	None	None	None	Vice-President and Physical Secretary of the Royal Society
Professor Dr P-L Viollet EDF	None	EDF Energy	None	EDF Research in UK
Professor Sir W Wakeham Independent	University of Southampton Vice-Chancellor Universities & Colleges Employers Association – Board Member, Chair: September 07 Southampton University Development Trust – Trustee Worldwide University Network Group – Board Member Worldwide University Network Trading – Board Member Worldwide University Network Foundation – Trustee Research Collaboration (CASE Award) Schlumberger Cambridge Research	COGENT – non-executive director Southampton Asset Management Ltd – director	South East England Development Agency – Director	Southampton and Fareham Chamber of Commerce – Board Member Higher Education South East – Board Member

Name	University interest	Industry interest	Other Government departments	Other
Dr D Watson IBM UK Labs Ltd	Member of the Industrial Advisory Panel, Computer Science, University of Oxford Collaborations with York University, Imperial College, Royal Holloway College, Cranfield University, Aberdeen University, Cambridge University, Southampton University	Full time employee of IBM Corporation	Member of the RCUK Global Uncertainties Programme – Strategic Advisory Group	None
Professor M Welland Ministry of Defence	University of Cambridge Professor	None	Ministry of Defence	None
Professor Lord R Winston Imperial College, London	Professor Science & Society, Imperial College London Principal Investigator Reproductive Medicine, Imperial College London Chairman, Royal College Music Chancellor, Sheffield Hallam	Director of Atazoa Ltd – company making large transgenic animals	Member, House of Lords Science & Technology Committee	Trustee of Stem Cell Foundation

Professor D Delpy Accounting Officer
25th November 2010

ACCOUNTS

REMUNERATION REPORT

Unaudited Information

Remuneration Policy

The remuneration of the Chief Executive of EPSRC is decided by a Remuneration Panel chaired by the Director General of Science and Research and approved by the BIS Permanent Secretary.

EPSRC's Council has established a Remuneration Committee to assess, annually, the individual performance of the EPSRC staff on personal contracts and decide, in the light of these assessments, the remuneration they shall receive. The Committee members are the Chair of EPSRC, Chair of the Resource Audit Committee and EPSRC's Chief Executive.

The remuneration of members of EPSRC's Council is reviewed annually by the Department for Business, Innovation and Skills (BIS).

Details of the service contracts of the Chief Executive and staff on personal contracts are given in the table below.

These individuals do not have any specific contractual rights for compensation on termination of their contract.

	Contract start date	Contract end date	Notice period
Professor D Delpy, Chief Executive	1 September 2007	31 August 2011	3 months
Mrs C Coates, Director	Permanent Contract	–	3 months
Mr A Emecz, Director	Permanent Contract	–	3 months
Dr L Thompson, Director	Permanent Contract	–	3 months
Mr S Ward, Director	Permanent Contract	–	3 months
Mr A Lewis, Associate Director	Permanent Contract	–	3 months

Audited Information

Salary and pension entitlements

The following section provides details of the remuneration and pension interests of the Chief Executive, Directors and EPSRC Council members.

Remuneration

(Chief Executive and Senior Staff)	2009-10 Salary £k (a)	2009-10 Performance related bonus (b)	2008-09 Salary £k (a)	2008-09 Performance related bonus (b)
Professor D Delpy, Chief Executive (b)	140-145	0-5	135-140	10-15
Mrs C Coates, Director (c)	75-80	0-5	75-80	0-5
Mr A Emecz, Director (c)	65-70	0-5	60-65	0-5
Dr L Thompson, Director (c)	65-70	0-5	60-65	0-5
Mr S Ward, Director (c)	80-85	0-5	80-85	0-5
Mrs V Cassely, Associate Director	60-65	n/a	50-55	n/a
Dr C Hayter, Associate Director	55-60	n/a	50-55	n/a
Mr A Lewis, Associate Director (c) *(from November 2009)*	25-30	0-5	–	–
Mr V Osgood, Associate Director	60-65	n/a	60-65	n/a
Dr N Viner, Associate Director	60-65	n/a	55-60	n/a
Dr A Wall, Associate Director	55-60	n/a	55-60	n/a

(a) 'Salary' includes gross salary; overtime; recruitment and retention allowances and any other allowance to the extent that it is subject to UK taxation.

(b) The Chief Executive's salary includes a responsibility allowance. The Performance related bonus and any change in salary are decided by a Remuneration Panel chaired by the Director General of Science and Research and approved by the BIS Permanent Secretary.

(c) Performance Related bonuses and any changes in salary for these individuals are determined by the EPSRC Remuneration Committee on an annual basis. The EPSRC Remuneration Committee comprises the Chair of Council, the Chair of the Resource Audit Committee and EPSRC's Chief Executive.

(d) The average annual earnings increase (excluding bonuses) for these members of staff between 2008/09 and 2009/10 was 2.8%.

(e) There were no benefits in kind paid to these members of staff in 2009/10.

Pension benefits

A Cash Equivalent Transfer Value (CETV) is the actuarially assessed capitalised value of the pension scheme benefits accrued by a member at a particular point in time. The pension figures shown relate to the benefits that the individual has accrued as a consequence of their total membership of the pension scheme, not just their service in a senior capacity. The CETV includes any lump sum payments due on retirement.

The real increase in CETV reflects the increase in CETV effectively funded by the employer. It takes account of the increase in accrued pension due to inflation, contributions paid by the employee (including the value of any benefits transferred from another pension scheme or arrangement) and uses common market valuation factors for the start and end of the period.

Chief Executive, Directors and Assoc. Directors	Accrued pension at age 60 as at 31/03/10 or at date of leaving £'000	Real increase in pension at age 60 £'000	CETV at 31/03/10 £'000	CETV at 31/03/09 £'000	Real increase in CETV £'000
Professor D Delpy, Chief Executive	80-85 with no lump sum	0-5 with no lump sum	1,434	1,228	53
Mrs C Coates, Director	25-30 plus 85-90 lump sum	0-5 plus 0-5 lump sum	669	569	31
Mr A Emecz, Director	15-20 plus 45-50 lump sum	0-5 plus 0-5 lump sum	262	214	19
Dr L Thompson, Director	20-25 with no lump sum	0-5 with no lump sum	422	351	22
Mr S Ward, Director	40-45 plus 125-130 lump sum	0-5 plus 5-10 lump sum	1,022	939	42
Mrs V Cassely, Associate Director	10-15 plus 30-35 lump sum	0-5 plus 0-5 lump sum	166	132	16
Dr C Hayter, Associate Director	5-10 plus 20-25 lump sum	0-5 plus 0-5 lump sum	104	81	12
Mr A Lewis, Associate Director	20-25 plus 65-70 lump sum	5-10 plus 15-20 lump sum	354	262	83
Mr V Osgood, Associate Director	30-35 plus 90-95 lump sum	0-5 plus 0-5 lump sum	773	663	36
Dr N Viner, Associate Director	15-20 plus 50-55 lump sum	0-5 plus 5-10 lump sum	313	251	28
Dr A Wall, Associate Director	15-20 plus 30-35 lump sum	0-5 plus 0-5 lump sum	285	230	23

Council Members' remuneration

The Chairperson and the Council Members are appointed by the Department for Business, Innovation and Skills (BIS) on behalf of the Secretary of State for Business, Innovation and Skills. The contract terms vary between individual members, but the terms and conditions of appointment are standard. EPSRC provides each member of Council with a Code of Practice which sets out a framework in which they are expected to operate.

Council members receive an honorarium in recognition of their service to EPSRC, together with a refund of their reasonable expenses. Council members are not employees of EPSRC and the appointments are not pensionable. Members of Council who are civil servants are not entitled to receive an honorarium.

Remuneration

	2009-10 £	2008-09 £
Mr J Armitt CBE, FREng **(Chairperson)**	**16,305**	16,165
Professor A Anderson OBE	**6,795**	6,655
Mr M Carr FREng	**6,795**	6,655
Professor B Collins FREng *from 11 November 2009*	**–**	–
Professor L F Gladden CBE, FRS, FREng	**9,040**	8,860
Mr D Hendon CBE, FREng *to 31 October 2009*	**–**	–
Dr A Herbert OBE, FREng	**6,795**	6,655
Dame Sue Ion OBE, FREng	**6,795**	6,655
Professor T Pedley FRS	**6,233**	–
Dr M Roberts	**6,795**	6,655
Mr D Rutherford *to 31 March 2009*	**–**	6,655
Professor J R Sambles FRS	**6,795**	6,655
Professor C M Snowden FRS, FREng	**7,733**	8,965
Professor Sir Martin J Taylor FRS *to 31 March 2009*	**–**	6,735
Professor P-L Viollet	**6,233**	–
Dr D Watson	**8,123**	–
Professor W Wakeham FREng	**9,040**	8,860
Professor M Welland FRS, FREng	**–**	–
Professor Lord Robert Winston	**9,040**	8,860

Professor David Delpy Accounting Officer
25th November 2010

STATEMENT OF ACCOUNT
FOR THE FINANCIAL YEAR 2009/10

Statement of the responsibilities of the Engineering and Physical Sciences Research Council and of its Chief Executive with respect to the Financial Statements

Under Paragraph 3 of Schedule 1 to the Science and Technology Act 1965, the Secretary of State for Business, Innovation and Skills, with the approval of HM Treasury, has directed EPSRC to prepare for each financial year a Statement of Accounts in the form and on the basis set out in the Accounts Direction. The Accounts are prepared on an accruals basis and must give a true and fair view of the state of affairs of EPSRC and of its income and expenditure, changes in taxpayers' equity and cash flows for the financial year.

In preparing the Accounts the Accounting Officer is required to comply with the requirements of the *Government Financial Reporting Manual* and in particular to:

- observe the Accounts Direction issued by the Secretary of State for Business, Innovation and Skills, including the relevant accounting and disclosure requirements and apply suitable accounting policies on a consistent basis;
- make judgements and estimates on a reasonable basis;
- state whether applicable accounting standards as set out in the *Government Financial Reporting Manual* have been followed and disclose and explain any material departures in the financial statements; and
- prepare the financial statements on a going concern basis.

The Department for Business, Innovation and Skills has appointed the Chief Executive as the Accounting Officer of EPSRC. The responsibilities of an Accounting Officer, including responsibility for the propriety and regularity of the public finances for which the Accounting Officer is answerable, for keeping proper records and for safeguarding EPSRC's assets, are set out in the Accounting Officers' Memorandum, issued by HM Treasury and published in *'Managing Public Money'*.

Accounting Officer's Statement on Internal Control

1. Scope of responsibility

As Accounting Officer, I have responsibility for maintaining a sound system of internal control that supports the achievement of EPSRC's policies, aims and objectives, whilst safeguarding the public funds and organisational assets for which I am personally responsible, in accordance with the responsibilities assigned to me and described in *'Managing Public Money'*.

2. The purpose of the system of internal control

The system of internal control is designed to manage risk to a reasonable level rather than to eliminate all risk of failure and to achieve policies, aims and objectives; it can therefore only provide reasonable and not absolute assurance of effectiveness. The system of internal control is based on an ongoing process designed to identify and prioritise the risks to the achievement of organisational policies, aims and objectives, to evaluate the likelihood of those risks being realised and the impact should they be realised and to manage them efficiently, effectively and economically. The system of internal control has been in place in EPSRC for the year ended 31 March 2010 and up to the date of approval of the Annual Report and Accounts and it accords with Treasury guidance.

3. Capacity to handle risk

EPSRC Leadership Team

The EPSRC Leadership Team (ELT), comprising the Chief Executive, Directors and Associate Directors is the executive body for EPSRC and provides leadership and guidance on risk management issues. ELT has agreed a Corporate Risk Management Policy and regularly considers risk matters at its monthly formal meeting. In particular it reviews the Corporate Risk Register which includes any risks which are of a corporate nature and are assigned to individual Directors. This register also includes any Directorate and project risks which have been given a red residual risk score. Such risks are escalated to ELT which will then consider the appropriate action to take.

Performance and Risk Management System

EPSRC implemented the Performance and Risk Management (PRM) System in 2006. PRM is based on the Balanced Scorecard Model and brings together performance measures, actions and risk under EPSRC objectives. The Communications, Information and Strategy Directorate maintains the PRM system and provides reports on both Performance and Risk to ELT and Directorate management. These risks have been evaluated, to include consideration of the desired level of risk appetite having regard to EPSRC strategies and priorities; controls have been assessed and responsibilities for management of risks assigned at various levels.

EPSRC's risk register is accessible to all staff through the PRM intranet site. Other documents, such as the EPSRC risk policy, are linked to PRM. General risk awareness is made available to staff through issued guidance and the corporate induction, with more detailed training in risk assessment and management being provided to the Directorate 'risk champions' which has extended the skill base across EPSRC. This Group meets regularly to share issues and consider ways of continuously developing and enhancing the risk management framework.

Business Assurance

The Associate Director of Operations is responsible for the Business Assurance function within EPSRC, including the coordination of risk management activities. These activities cover: provision of advice and guidance to Directorates; organising training courses; reviewing quarterly reports from the Directorates and Business Critical Projects; providing commentaries to ELT; representing EPSRC at the meetings of the RCUK Risk Management Network and liaising with Internal Audit on its audit activities. RCUK Risk Management Network Group has been established by RCUK which meets on a six-monthly basis to support sharing of knowledge and approaches to risk management across the Research Councils. This now includes membership of RCUK SSC Ltd.

Fraud Control

EPSRC's fraud policy, response plan and whistle blowing policy are made aware to all new members of staff as part of the induction process. Fraud guidance is available to all staff on the Intranet ensuring that there is an awareness of their responsibilities to report fraud and the process by which to do so. During 2009/10 no instances of fraud were reported.

4. The risk and control framework

The Council of EPSRC

The Council of EPSRC has a responsibility to ensure that high standards of corporate governance are observed at all times. The Council periodically receives information about risk management. It also receives a report at each meeting and an annual report from the Resource Audit Committee which includes comment on risk management and Business Critical Projects. The Council has responsibility for decisions on major capital projects after having reviewed the business case and the risks involved in the venture.

Accounting Officer's Statement on Internal Control continued

The Resource Audit Committee

The Resource Audit Committee (RAC) is a committee of the Council tasked with monitoring standards of internal control and propriety, economy, efficiency and effectiveness and for evaluating the extent to which systems and procedures are appropriate to allow EPSRC's objectives to be met. RAC's responsibilities include: examining the manner in which management ensures and monitors the adequacy of the nature, extent and effectiveness of internal control systems; paying particular attention to risks and contingency plans on all Business Critical Projects; and monitoring the nature and scope of the work of both External and Internal Audit. RAC makes recommendations to ELT and reports to the Council following its meetings.

Directors and Directorates

ELT delegates responsibility for each of the Corporate Risks to one or more of the Directors. Each Director bears a responsibility for these and the risks associated with his/her Directorate's activities. A Director may choose to delegate responsibility for the day-to-day management of risk and associated mitigation or contingency plans to a member of the Directorate staff.

The Directors and their senior managers review the risk register for their own Directorate on a regular basis: to consider new risks or new elements to an existing risk; for changes in status (changes in the likelihood of occurrence or in the impact that would be felt should the risk be realised) as a result of factors internal or external to the Council; for progress in mitigating risks; to determine whether or not the existing controls are adequate; and to determine whether further actions are required.

In addition proposed projects or initiatives are considered at an early stage to assess the potential risks and to determine the balance of benefits and risks. The relevant Director or delegated staff member will then make a decision on whether or not to proceed, or will seek a decision from ELT.

Each Directorate has an individual responsible for co-ordinating risk management activities.

Research Councils' Internal Audit Service

The Research Councils Internal Audit Service (RCIAS) and ELT work together to agree the range of audits to be carried out each year. RAC confirms the annual Audit Plan. The results of these audits are used by ELT in its decision-making on what actions are necessary to maintain high standards in EPSRC's corporate governance and risk management procedures.

The RCIAS carries out audits relevant to EPSRC's risk management activities on a regular basis. In 2009/10 audits included: Readiness to Migrate to the Shared Services Centre (three separate reviews) and Risk Management.

In addition to the advice resulting from audits, Internal Audit guidance is welcomed as a source of updated best practice.

Controls

EPSRC has in place a system of controls which includes:

- annual Directors' Statements of Internal Control;
- Funding Assurance Programme (FAP) visits by officials to Higher Education Institutions and Office-based tests. The objective of these visits is to obtain assurance that Research Grant funds are used for the purpose for which they are given and that Grants are managed in accordance with the terms and conditions under which they are awarded;
- ongoing review of risks and the necessary resulting actions;
- responsibility for managing risks delegated to the appropriate level within the organisation;
- regular management review of risks and Business Critical Projects; and
- regular external review of risk management procedures.

5. RCUK Shared Services Centre Development

The Shared Services Centre (SSC) implementation is a Business Critical Project that will deliver a shared administrative support service for all UK Research Councils. This includes the main administrative activities in Human Resources, Payroll, Finance and Procurement, IT and Grants Processing. EPSRC migrated Human Resources to RCUK Shared Services Centre Ltd (RCUK SSC Ltd) in February 2009, Payroll in May 2009 and Finance and Operational Procurement in November 2009. EPSRC monitors and manages risks associated with the integrity of data maintained by the RCUK SSC Ltd, the service provided by RCUK SSC Ltd and the development of the new Grants Processing System.

All financial controls in EPSRC remained unchanged up to the migration of Finance and Procurement in November 2009. The decisions to migrate functions were joint decisions between EPSRC and RCUK SSC Ltd and were taken on assurance that the RCUK SSC Ltd systems and processes were sufficiently robust to provide support services to EPSRC. Grants Processing is due to migrate to RCUK SSC Ltd in 2010/11. The controls within the Grants module remain unchanged. The new interface's processes and controls are being robustly tested by all Research Councils in preparation for migration.

Following EPSRC's migration of Finance, a number of process and technical issues have emerged which have been and continue to be addressed by the Service Review Group comprising representatives of all migrated Councils together with RCUK SSC Ltd. All known issues have been captured to form an orderly focus for resolution

Accounting Officer's Statement on Internal Control continued

and a basis for entry into full service delivery.

During 2009/10 RCUK SSC Ltd has put considerable effort into establishing the security and controls framework now in operation. Following migration, it became apparent that more work was required to provide the assurances necessary to validate the security and controls framework within the Shared Services Centre. To compensate for the limited assurance available on the security and controls framework within RCUK SSC Ltd, EPSRC have implemented additional internal controls and checks. For example, the management information provided to EPSRC is incomplete at the present time. To compensate for this, EPSRC has created bespoke financial reports to ensure that we can continue to meet our financial reporting obligations. Additional checks around coding and postings are also undertaken. These and other compensating controls will be maintained until the Service Review Group confirm that all outstanding issues have been resolved satisfactorily and reliance can be placed upon the systems security and controls framework within the Shared Services Centre.

6. Key control and assurance areas

EPSRC has the following key control and assurance areas:

- Governance and risk management of the SSC implementation project is provided by the RCUK SSC Ltd Project Board on behalf of the Research Councils. An RCUK SSC Project Audit Committee comprising representatives from each Research Council's Audit Committee operates to provide oversight and assurance on risk management and control of the project. EPSRC has its own Project Group which manages its participation and associated risks in the project. The high level risks and mitigation strategies are scrutinised by ELT on a regular basis. Governance arrangements are also monitored by EPSRC's Audit Committee.
- RCUK SSC Ltd has a Board of Directors and Audit Committee which provides a corporate governance framework in line with statutory and best practice requirements. Directors have been appointed by Research Councils as shareholders, with the EPSRC nominee being EPSRC's Director of Research Base.
- As a stakeholder EPSRC manages its participation and associated risks in this project. The high level risks and mitigation strategies are regularly scrutinised by ELT. Governance arrangements are regularly monitored by EPSRC's Resource Audit Committee.
- Internal Audit assurance has been provided on the RCUK SSC Ltd business operations (supporting that Company's annual Statement on Internal Control), the readiness of each Research Council to transfer to RCUK SSC Ltd live operations and independent assurance on project delivery.
- A comprehensive Internal Audit strategy relating to the RCUK SSC Ltd project and operations for 2010/11 and beyond has been developed. A feature of this strategy is that the control framework operating within the SSC and the interfaces with the respective Research Councils will be tested end to end after the implementation of the solution.
- A number of Internal Audit Reviews of the processes operated by the SSC have provided limited assurance. The findings of each of these reviews is actively considered by EPSRC and, where additional internal controls are not already in place, action is taken to mitigate weaknesses identified.

7. Delays in the 2009-10 Account Process

The planned pre-recess sign off of the annual report and accounts was delayed this year. This is in part due to the migration of the finance, HR and payroll functions to the SSC during the reporting year and the subsequent control and assurance issues detailed above and also due to difficulties in agreeing related party and other transactions between the Research Councils and the RCUK Shared Services Centre Ltd owing to weaknesses in the robustness of some information. We also experienced considerable delays in the completion of payroll and bank reconciliations. In addition by migrating the finance function to the SSC in December 2009, there was little time to resolve issues prior to year end. EPSRC, together with the other Research Councils and RCIAS, are working to ensure that the SSC systems and processes are sufficiently robust to ensure that the production of the 2010-11 accounts is significantly improved. We also need to make sure that there are clearly defined responsibilities in place for the controls operating at the SSC and overall monitoring by EPSRC.

Accounting Officer's Statement on Internal Control continued

8. Review of effectiveness

As Accounting Officer, I also have responsibility for reviewing the effectiveness of the system of internal control. My review of the effectiveness of the system of internal control is informed by:

- Regular reports by the Research Councils' Internal Audit Service including the Head of Internal Audit's independent opinion on the adequacy and effectiveness of EPSRC's systems of internal control. All completed EPSRC specific audits undertaken during 2009/10 received an assurance rating of 'Substantial Assurance'. The areas covered are as follows:
  - EPSRC Research Grants
  - Risk Management
  - Information Security and Assurance
  - Energy Technology Institute
  - RCUK SSC-Transitional Assurance and Readiness Stage 3
- EPSRC Leadership Team members who have responsibility for the development and maintenance of the internal control framework and who provide annual reports on their stewardship and management of risk within their Directorates;
- comments made by the external auditors in their management letter and other reports;
- EPSRC's Resource Audit Committee's review of internal controls and risk management processes;
- Research award validation procedures under the Cross-Council annual Funding Assurance Programme which provide assurance on the regularity of research project expenditure at Universities and other research bodies;
- Measures in place at a cross-Research Council level to obtain assurance on the operation of Transparent Approach to Costing at Universities supporting cost data used in Full Economic Costing of funded research proposals.

I have been advised by the Council and the Audit Committee on the implications of the result of my review of the effectiveness of the system of internal control. A plan is in place to address weaknesses and ensure continuous improvement of the system.

Professor David Delpy Accounting Officer
25th November 2010

The Certificate and Report of the Comptroller and Auditor General to the Houses of Parliament

I certify that I have audited the financial statements of the Engineering and Physical Sciences Research Council for the year ended 31 March 2010 under the Science and Technology Act 1965. These comprise the Statement of Net Expenditure, the Statement of Financial Position, the Statement of Cashflows, the Statement of Changes in Taxpayers' Equity and the related notes. These financial statements have been prepared under the accounting policies set out within them. I have also audited the information in the Remuneration Report that is described in that report as having being audited.

Respective responsibilities of the Council, Chief Executive and Auditor

As explained more fully in the Statement of Accounting Officer Responsibilities, the Chief Executive is responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view. My responsibility is to audit the financial statements in accordance with applicable law and International Standards on Auditing (UK and Ireland). Those standards require me and my staff to comply with the Auditing Practices Board's Ethical Standards for Auditors.

Scope of the Audit of the Financial Statements

An audit involves obtaining evidence about the amounts and disclosures in the financial statements sufficient to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or error. This includes an assessment of: whether the accounting policies are appropriate to the Engineering and Physical Sciences Research Council's circumstances and have been consistently applied and adequately disclosed; the reasonableness of significant accounting estimates made by the Engineering and Physical Sciences Research Council; and the overall presentation of the financial statements.

In addition, I am required to obtain evidence sufficient to give reasonable assurance that the expenditure and income reported in the financial statements have been applied to the purposes intended by Parliament and the financial transactions conform to the authorities which govern them.

Opinion on Regularity

In my opinion, in all material respects the expenditure and income have been applied to the purposes intended by Parliament and the financial transactions conform to the authorities which govern them.

Opinion on financial statements

In my opinion:

- the financial statements give a true and fair view of the state of the Engineering and Physical Sciences Research Council's affairs as at 31 March 2010 and of its net expenditure, changes in taxpayers' equity and cash flows for the year then ended; and
- the financial statements have been properly prepared in accordance with the Science and Technology Act 1965 and Secretary of State directions issued thereunder.

Opinion on other matters

In my opinion:

- the part of the Remuneration Report to be audited has been properly prepared in accordance with Secretary of State's directions issued under the Science and Technology Act 1965; and
- the information given in the Corporate Activities part of the Annual Report for the financial year for which the financial statements are prepared is consistent with the financial statements.

Matters on which I report by exception

I have nothing to report in respect of the following matters which I report to you if, in my opinion:

- adequate accounting records have not been kept; or
- the financial statements are not in agreement with the accounting records or returns; or
- I have not received all of the information and explanations I require for my audit; or
- the Statement on Internal Control doesnot reflect compliance with HM Treasury's guidance.

Report

I have no observations to make on these financial statements.

Amyas C E Morse
Comptroller and Auditor General
14th December 2010

National Audit Office
157-197 Buckingham Palace Road
Victoria, London SW1W 9SP

Statement of net expenditure
For the year ended 31 March 2010

	Notes	31 March 2010 £'000	31 March 2009 £'000
EXPENDITURE			
Research	6	**530,040**	507,343
Energy Technologies Institute LLP	7	**3,703**	3,295
Public Engagement Programme	8	**9,105**	7,467
UK Research Facilities	9	**15,749**	14,426
International Subscriptions	10	**792**	540
Postgraduate Awards	11	**198,877**	175,907
Research Fellowships	12	**57,943**	52,514
Staff costs	13	**14,593**	14,722
Other operating expenditure	14	**25,008**	19,822
Total operating expenditure		**855,810**	796,036
INCOME			
Other operating income	4	**2,448**	3,523
NET OPERATING EXPENDITURE		**853,362**	792,513
Non-operating income due to Consolidated Fund	5	**(12)**	(11)
Amounts paid to the Consolidated Fund	5	**–**	12
Share of Losses of Joint Ventures	17	**154**	–
Notional cost of capital		**(134)**	(239)
NET EXPENDITURE FOR THE YEAR		**853,370**	792,275
Reversal of notional cost of capital		**134**	239
NET EXPENDITURE FOR THE YEAR AFTER REVERSAL OF NOTIONAL COST OF CAPITAL		**853,504**	792,514

The notes on pages 79 to 96 form part of these Accounts.

Statement of financial position
As at 31 March 2010

	Notes	31 March 2010 £'000	31 March 2009 £'000	1 April 2008 £'000
NON-CURRENT ASSETS:				
Property, plant and equipment	15	**28,409**	24,161	33,783
Intangible assets	16	**73**	108	176
Investment in Joint Venture	17	**497**	651	–
Non-current receivables	18	**–**	146	143
Total non-current assets		**28,979**	25,066	34,102
CURRENT ASSETS:				
Trade and other receivables	18	**63,855**	58,552	36,766
Cash and cash equivalents	19	**4,242**	4,836	6,546
Total current assets		**68,097**	63,388	43,312
Total assets		**97,076**	88,454	77,414
CURRENT LIABILITIES:				
Trade and other current liabilities	20	**(105,587)**	(79,082)	(88,907)
Total current liabilities		**(105,587)**	(79,082)	(88,907)
Total assets less net current liabilities		**(8,511)**	9,372	(11,493)
NON CURRENT LIABILITIES:				
Provisions for liabilities and charges	21	**(234)**	(326)	(316)
Non-current payables, accruals and deferred revenue	20	**–**	(220)	(290)
Total non-current liabilities		**(234)**	(546)	(606)
Assets less liabilities		**(8,745)**	8,826	(12,099)
Equity				
Revaluation reserve		**2,722**	489	2,566
Income and expenditure reserve		**(11,467)**	8,337	(14,665)
		(8,745)	8,826	(12,099)

Professor David Delpy Accounting Officer
25th November 2010

The notes on pages 79 to 96 form part of these Accounts.

Statement of cash flows for the year ended 31 March 2010

	Notes	2010 £'000	2009 £'000
Cash flows from operating activities			
Net expenditure after cost of capital and interest		**(853,504)**	(792,514)
Depreciation and loss on disposal of assets	14	**11,806**	9,969
Share of losses of joint venture	17	**154**	–
(Decrease)/increase in provisions	21	**(92)**	10
(Increase) in receivables	18	**(5,158)**	(21,789)
Increase/(decrease) in payables	20	**26,285**	(10,069)
Net cash outflow from operating activities		**(820,509)**	(814,393)
Purchase of Property, Plant and Equipment	15	**(13,785)**	(2,351)
Net cash outflow before financing		**(834,294)**	(816,744)
Financing			
Grant in aid received	22	**799,000**	784,870
Funding from other bodies	22	**34,700**	30,164
Net cash inflow from financing activities		**833,700**	815,034
(Decrease) in cash and cash equivalents		**(594)**	(1,710)
Cash and cash equivalents at 1 April 2009	19	**4,836**	6,546
Cash and cash equivalents at 31 March 2010	19	**4,242**	4,836

The notes on pages 79 to 96 form part of these Accounts.

Statement of taxpayers' equity for the year ended 31 March 2010

	Revaluation Reserve £'000	Income and Expenditure Reserve £'000	Government Funds £'000
Balance at 1 April 2008	2,566	(14,665)	(12,099)
Release of Reserves to the Net Expenditure Account	(483)	483	–
Net Loss on Revaluation of Tangible Assets	(1,594)	–	(1,594)
Grant-in-Aid Financing received in year	–	784,870	784,870
Funding from other Research Councils	–	15,445	15,445
Funding from Government Departments, Executive Agencies and the EU	–	7,454	7,454
Funding from other bodies	–	7,264	7,264
Net Expenditure for the Year after reversal of notional cost of capital	–	(792,514)	(792,514)
Balance at 31 March 2009	**489**	**8,337**	**8,826**
Balance at 1 April 2009	489	8,337	8,826
Net Gain on Revaluation of Tangible Assets	2,233	–	2,233
Grant-in-Aid Financing received in year	–	799,000	799,000
Funding from other Research Councils	–	20,833	20,833
Funding from Government Departments, Executive Agencies and the EU	–	4,977	4,977
Funding from other bodies	–	8,890	8,890
Net Expenditure for the Year after reversal of notional cost of capital	–	(853,504)	(853,504)
Balance at 31 March 2010	**2,722**	**(11,467)**	**(8,745)**

The notes on pages 79 to 96 form part of these Accounts.

NOTES TO THE ACCOUNTS

1. Statement of accounting policies

(a) Basis of accounting

The accounts have been prepared in accordance with a direction given by the Secretary of State for Business, Innovation and Skills (BIS), with the approval of HM Treasury, in pursuance of Section 2 (2) of the Science and Technology Act 1965 and in accordance with the Government's Financial Reporting Manual.

These financial statements have been prepared in accordance with the 2009/10 Government Financial Reporting Manual (FReM). The accounting policies contained in the FReM apply International Financial Reporting Standards (IFRS) as adapted or interpreted for the public sector context. Where the FReM permits a choice in accounting policy, the accounting policy which is judged to be most appropriate to the particular circumstances of the EPSRC for the purpose of giving a true and fair view has been selected.

The particular policies adopted by EPSRC are described below. They have been applied consistently in dealing with items that are considered material to the accounts.

The accounts meet the accounting and disclosure requirements of the Companies Act 1985 and the accounting standards issued or adopted by the Accounting Standards Board so far as these requirements are appropriate in accordance with the FReM.

Transition to IFRSs

The Council has applied IFRS 1 in preparing these financial statements. The Council's transition date is 1 April 2008. The Council prepared its opening IFRS Statement of Financial Position at that date.

The Council has prepared its financial statements for the year ending 31 March 2010 as its first full financial statements under IFRS. As a result the 31 March 2009 financial statements have become its comparatives and have been converted from UK GAAP to IFRS.

The Statement of Financial Position was previously prepared in accordance with the generally accepted accounting principles in the United Kingdom (UK GAAP). UK GAAP differs in some areas from IFRS. In preparing the Statement of Financial Position under IFRS, management has amended certain accounting and valuations applied in the previous GAAP financial statements to comply with IFRS.

The impact of the implementation of IFRS is considered in detail in Note 28.

Adoption of standards effective in 2009-10

The following revised standards and interpretations have been applied by the Council from 1 April 2009:

International Financial Reporting Standards (IFRS/IAS)		Effective date
IFRS 7	Amendments to IAS 39 and IFRS 7: reclassification of financial assets	1 July 2008
IFRS 7	Update to amendments to IAS 39 and IFRS 7: reclassification of financial assets	1 July 2008
IFRS 7	Amendment to IFRS 7 – improving disclosures about financial instruments	1 January 2009
IFRS 8	Operating Segments	1 January 2009
IAS 23	Borrowing Costs	1 January 2009
IAS 1	Presentation of Financial Statements	1 January 2009
IFRS 1	Amendments to IFRS 1: First-time adoption of IFRS and IAS 27: Consolidated and Separate Financial Statements	1 January 2009

IFRS effective in 2009-10 but not relevant

The following amendments were mandatory for accounting periods beginning on or after 1 April 2009 but were not relevant to the operations of the Council:

International Financial Reporting Standards (IFRS/IAS)		Effective date
IFRS 2	Share-based Payment (amendment)	1 January 2009
IAS 32	IAS 32 Financial Instruments: Presentation and IAS 1 Financial Instrument Presentation Amendments – Puttable Financial Instruments and Obligations Arising on Liquidation	1 January 2009

International Financial Reporting Interpretations Committee (IFRIC)		
IFRIC 15	IFRIC 15: Agreements for the construction of Real Estate	1 January 2009
IFRIC 16	IFRIC 16: Hedges of a Net Investment in a Foreign operation	1 October 2008

Standards, interpretations and amendments to published standards which are not yet effective
The IASB and IFRIC issued the following standards and interpretations with an effective date after the date of these financial statements. They have not been adopted early by the Council and the directors do not anticipate that the adoption of these standards and interpretations will have a material impact on the Council's reported income or net assets in the period of adoption.

Effective for the Council for the financial year beginning 1 April 2010:

International Financial Reporting Standards (IFRS/IAS)		Effective date
IAS 39	Amendments to IFRIC 9 and IAS 39: Embedded derivatives	30 June 2009
IFRS 1	Revised version of IFRS 1 with improved structure	1 July 2009
IFRS 3	Business Combinations	1 July 2009
IAS 27	Consolidated and Separate Financial Statements	1 July 2009
IAS 39	Amendment to IAS 39 Financial Instruments: Eligible hedged items	1 July 2009

International Financial Reporting Interpretations Committee (IFRIC)		
IFRIC 17	Distribution of Non-Cash Assets to Owners	1 July 2009
IFRIC 18	Transfers of Assets from Customers	1 July 2009

Effective for the Council in future years:

International Financial Reporting Standards (IFRS/IAS)		Effective date
IFRS 1	Amendment to IFRS 1 – additional exemptions for first-time adopters	1 October 2010
IFRS 2	Amendment to IFRS 2 – group cash-settled share-based payment transactions	1 October 2010

Measurement convention

a) Measurement convention

These financial statements have been prepared under the historical cost basis modified to include the revaluation of land and buildings and other property, plant and equipment where material.

These financial statements are presented in sterling, EPSRC's functional currency and all amounts have been rounded to the nearest thousand, unless otherwise stated.

b) Going concern

These Financial Statements have been prepared on the basis of a Going Concern. Any deficit shown on the Income and Expenditure Reserve will be extinguished over time, having regard to the resource and capital budgets to which EPSRC can be expected to have access.

c) Property, Plant and Equipment and Depreciation/Amortisation

Capital expenditure includes the purchase of land, buildings, construction and services projects, equipment and intangible assets valued at £3,000 or more.

Property, plant and equipment are included at cost or at valuation. The basis of valuation is Open Market Value for existing use where this can be established, otherwise Current Depreciated Replacement Cost.

Land and Buildings and major items of equipment are professionally valued at least every five years, at which time the remaining useful life of each revalued asset is also reassessed. The last valuation was in March 2010, conducted by Powis Hughes and Associates, Chartered Surveyors. The basis of the valuation was Open Market Value. Appropriate indices are used in between formal professional valuations.

Surpluses or deficits on revaluation are taken to the Revaluation Reserve, except that any permanent diminution in value is charged to the Statement of Net Expenditure in the year in which it arises. Increased depreciation charges arising from the revaluation are matched by annual transfers from the Revaluation Reserve to the Income and Expenditure Reserve. On the disposal of a fixed asset, that element of the Revaluation Reserve which thereby becomes realised is transferred directly to the Income and Expenditure Reserve.

Property, plant and equipment are depreciated at rates calculated to write off the costs or the valuation of each asset evenly over its expected useful life, as follows:

Freehold land	not depreciated
Freehold buildings	62 years
Specialist scientific equipment	3 – 15 years
IT equipment	3 years
Fixtures and fittings	5 years
General office equipment	5 years
Vehicles	4 years

Assets in the course of construction are not depreciated until the asset is available for use.

d) Operating segments

The primary format used for segmental reporting is by programme expenditure as this reflects EPSRC's internal management structure and reporting. EPSRC's assets and liabilities are shared across the operating segments and as segmental information on assets and liabilities is not used internally, disclosure is not needed.

e) Ownership of equipment purchased with EPSRC research grants

Equipment purchased by an organisation with research grant funds supplied by EPSRC belongs to the organisation and is not included in EPSRC's property, plant and equipment. Through the Conditions of Grant applied to funded organisations, EPSRC must be informed if, during the life of the research grant, the need for the equipment diminishes substantially or it is not used for the purpose for which it was funded. EPSRC reserves the right to determine the disposal of such equipment and to claim the proceeds of any sale.

f) Equipment located elsewhere

EPSRC owns assets with a combined net book value of £12.1m which are located elsewhere but are included in the Statement of Financial Position.

This figure includes the HECToR supercomputing facility, which came into operation in October 2007. At the Statement of Financial Position date the combined net book value of assets held at the facility in Edinburgh was £14.1m (2008/09 £13.9m). Of these assets, £8.9m is currently under construction and the remaining £5.2m is shown under IT equipment.

A pool of scientific equipment is provided and updated by the Science and Technology Facilities Council (STFC) on behalf of EPSRC, specifically for loan to research organisations. Wherever located, this equipment remains the property of EPSRC and is therefore included in the Statement of Financial Position.

g) Grant in aid

Grant-in-Aid received for revenue purposes has been regarded as a contribution from a controlling party giving rise to a financial interest in the organisation. Hence, Grant-in-Aid has been accounted for as financing, not income and is credited to the Income and Expenditure Reserve. The same treatment has been adopted for other sources of financing. Grant-in-Aid for the purchase of a specific asset is credited to the Income and Expenditure Reserve and released to the Statement of Net Expenditure over the useful life of the asset in amounts equal to the annual depreciation charge.

h) Research and development

As a research organisation, all the EPSRC's research and development expenditure is charged to the Statement of Net Expenditure when it is incurred. Intellectual property rights arising from research and development funded by EPSRC are passed to the organisations performing the research.

i) Operating leases

EPSRC currently hold no finance leases. Operating lease rentals are charged to the Statement of Net Expenditure on a straight line basis over the period of the lease.

j) Foreign exchange

Transactions denominated in foreign currencies are translated into sterling at the rate of exchange ruling at the date of transactions. Any exchange differences arising in the ordinary course of business are taken to the Statement of Net Expenditure. Assets and liabilities in foreign currencies in existence at the Statement of Financial Position date are translated at the rates ruling at that date.

k) Research grants

Subject to the terms and conditions under which research grants are awarded, EPSRC makes payments for grants on the basis of pre-determined quarterly profiles. Profiles are arranged, in overall terms, to reflect the rate and incidence of expenditure at the grant holding organisation. Payments are normally made in the period to which they relate, although EPSRC retains some latitude in timing. Grant expenditure is accounted for on an accruals basis to reflect the usage of grant funds on work carried out. Future commitments at the Statement of Financial Position date are disclosed in note 24.

l) Value Added Tax

As EPSRC is partially exempt for VAT purposes, all items of expenditure and fixed asset purchases are shown inclusive of VAT where applicable. Residual input tax reclaimed under the partial exemption scheme is taken to the Statement of Net Expenditure as other income.

m) Pension scheme

The employees of the Council are members of the Research Councils' Pension Scheme (RCPS) which is a defined benefit scheme funded from annual grant-in-aid on a pay as you go basis. The benefits are by analogy to the Principal Civil Service Pension Scheme, except that while the schemes provide retirement and related benefits based on final emoluments, redundancy and injury benefits are administered and funded by the Council. As permitted by paragraph 31 of IAS 19, the Company has recorded the pension contributions payable for the period as its charge to the Statement of Net Expenditure.

n) Notional cost of capital

The financing structure of EPSRC does not include specific interest-bearing debt. To ensure that the Statement of Net Expenditure bears an appropriate charge for the use of capital in the year, a notional interest charge is included. In accordance with HM Treasury guidance, the calculation is based on a 3.5% rate of return on average net assets employed at cost or valuation and the capital charge is written back to the Income and Expenditure Reserve.

o) Employee benefits

Under IAS 9 'Employee Benefits' an entity is required to recognised short term employee benefits when an employee has rendered a service in exchange for those benefits. No material benefits have been recognised by EPSRC for the year ended 31 March 2010.

p) Derivatives and other financial instruments

Due to the non-trading nature of its activities and the way in which EPSRC is financed, EPSRC is not exposed to the degree of financial risk faced by non-public sector entities. Moreover, financial instruments play a much more limited role in creating or changing risk that would be typical of the listed companies to which IAS 32, 39 and IFRS 7, mainly apply. EPSRC has very limited powers to borrow or invest surplus funds and financial assets and liabilities are generated by day to day operational activities and are not held to change the risks facing EPSRC in undertaking its activities.

Trade receivables are not interest bearing and are carried at original invoice amount less allowance for non collectable amounts. Provision for impairment is established when there is objective evidence that the Council will not be able to collect all amounts due according to the original terms of the receivable. The amount of provision is the difference between the carrying amount and recoverable amount and is recognised in the Statement of Net Expenditure.

Trade and other payables are recognised in the period in which related money, goods or services are received or when a legally enforceable claim against EPSRC is established or when the corresponding assets or expenses are recognised.

Receivables and payables which mature or become payable within 12 months from the Statement of Financial Position date have been omitted from the currency profile.

q) Cash and cash equivalents

Cash and cash equivalents comprise cash balances and call deposits.

r) Other operating income

Other operating income is recognised on a receivable basis and mainly represents income from other Research Councils for services provided.

s) Accounting estimates

The Council makes estimates and assumptions that affect the reported amounts of assets and liabilities in the next financial year. Estimates and judgements are continually evaluated and based on historical experience and other factors, including expectations of future events that are believed to be reasonable under the circumstances at the reporting date. The estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amount of assets and liabilities within the next financial year are discussed below.

The estimated economic useful lives of property, plant and equipment and intangibles are estimated

based on the period over which the asset is expected to be available for use. Such estimation is based on experiences with similar assets and practices of similar businesses. The estimated useful life of each asset is reviewed periodically and updated if expectations differ from previous estimates due to physical wear and tear, technical or commercial obsolescence or legal or other limits on the use of an asset. An increase in the estimated useful life of any item of property, plant and equipment and intangibles would decrease the recorded operating expenses and increase non current assets values.

t) Key accounting judgements

EPSRC's significant accounting policies are stated above. Not all of these policies require management to make difficult subjective or complex judgements. Those that follow are intended to provide an understanding of the policies that management consider critical because of the level of complexity and judgement involved in their application and their impact on the financial statements.

— Provisions for liabilities

Estimates are subject to uncertainty regarding timing or amounts of obligations (legal or constructive) due by the EPSRC. Significant judgements are made regarding probability and measurement of obligations. Provisions have been made in accordance with IAS 37 for redundancy costs and system termination fees arising from the transition to the Shared Services Centre.

— Impairment of assets

Property, Plant and Equipment are included at recoverable amounts. Management assess whether assets retain their recoverable amount or whether the asset is impaired, suffering a permanent diminution in value. Judgements are made on obsolescence, damage and loss resulting from normal business operations and changes in value as part of the annual review of Property Plant and Equipment.

2. Analysis of net expenditure by segment

The primary format used for segmental reporting is by category of expenditure, as this reflects the internal management reporting of EPSRC.

EPSRC's staff costs, other operating expenditure, depreciation, assets and liabilities are shared across all operating segments and consequently it is not necessary to accurately analyse them by segment for inclusion in this note.

	Research 2010 £'000	Postgraduate Training 2010 £'000	Other Programme 2010 £'000	Total 2010 £'000	Total 2009 £'000
Research	530,040	–	–	**530,040**	507,343
Energy Technologies Institute LLP	3,703	–	–	**3,703**	3,295
Public Engagement Programme	–	–	9,105	**9,105**	7,467
UK Research Facilities	15,749	–	–	**15,749**	14,426
International Subscriptions	–	–	792	**792**	540
Postgraduate Awards	–	198,877	–	**198,877**	175,907
Research Fellowships	–	57,943	–	**57,943**	52,514
Staff Costs	–	–	–	**14,593**	14,722
Other Operating Expenditure	–	–	–	**13,202**	9,853
Depreciation	–	–	–	**11,806**	9,969
Total operating expenditure by segment	**549,492**	**256,820**	**9,897**	**855,810**	796,036

The attribution of the comparative 2009 figures is the same as for 2010.

3. Parliamentary grant in aid

The grant of £799,000k (2008/09 £784,870k) was provided under the Department for Business, Innovation and Skills Request for Resources 2 for the financial year 2009/10.

4. Other operating income

	2010 £'000	2009 £'000
RCUK income	**270**	–
Income for Services Provided	**2,178**	3,523
Total other operating income	**2,448**	3,523

5. Non-operating income

	2010 £'000	2009 £'000
Unanticipated receipts this financial year relating to amounts paid or claims registered in previous year	**12**	11
Unanticipated receipts carried over from previous year	**–**	1
Total payable to Consolidated Fund Extra Receipts (CFER)	**12**	12

6. Research

Total gross expenditure on research grants shown by programme:

	2010 £'000	2009 £'000
Nanoscience	**8,463**	2,802
Next Generation Healthcare	**4,536**	3,710
Digital Economy	**7,817**	4,098
Energy Multidisciplinary Applications	**7,302**	532
Energy Research Capacity	**57,220**	63,899
Knowledge Transfer	**33,744**	13,501
Infrastructure and International	**51,422**	49,499
Mathematical Sciences & Public Engagement	**27,347**	15,727
Cross Disciplinary Research	**39,411**	49,359
Materials Mechanical & Medical Engineering	**70,740**	73,600
Information & Communication Technology	**83,165**	84,151
Physical Sciences	**94,667**	97,858
Process Environment & Sustainability	**27,157**	28,240
User Led Knowledge and Skills	**17,049**	20,367
Total expenditure on research	**530,040**	507,343

7. Energy Technologies Institute LLP

Energy Technologies Institute LLP (ETI LLP) was established in 2008 as a joint initiative between the public and private sectors to encourage research and investment in new and emerging energy technologies.

ETI LLP has been established with the aim to accelerate the development, demonstration and eventual commercial deployment of a focused portfolio of energy technologies which will increase energy efficiency, reduce greenhouse gas emissions and help achieve energy and climate change goals.

EPSRC and the Technology Strategy Board (TSB) represent the public sector's 50% interest in the partnership. The Secretary of State for Business, Innovation and Skills is a designated member of ETI LLP but EPSRC and TSB are responsible for providing the member's contributions on behalf of BIS.

EPSRC has made payments of £3,703k (2008/09 £3,295k) to ETI LLP which have been expensed as EPSRC itself does not have an investment in ETI LLP.

8. Public Engagement Programme

	2010 £'000	2009 £'000
PEP awards	**1,532**	2,148
PEP fellowships	**427**	319
PEP additional programme expenditure	**7,146**	5,000
Total expenditure on PEP	**9,105**	7,467

EPSRC has a Public Engagement Programme (PEP) for its research grant holders and Fellows. PEP Additional Programme Expenditure in 2009/10 includes payments totalling £5.3m (2008/09 £4.7m) made on behalf of Research Councils UK.

9. UK Research facilities

	2010 £'000	2009 £'000
High Performance Computing:		
University of Edinburgh (HPCx)	**2,181**	2,439
University of Edinburgh (HECToR)	**8,261**	6,324
Total High Performance Computing	**10,442**	8,763
Science and Technology Facilities Council facilities	**3,730**	3,292
Other expenditure on research facilities	**1,577**	2,371
Total expenditure on UK research facilities	**15,749**	14,426

EPSRC provides facilities to enable world class research. HECToR, a high end computing facility, was introduced in October 2007. At the Statement of Financial Position date, EPSRC held assets with a combined net book value of £8.9m at the HECToR facility.

10. International subscriptions

Total amounts paid in the year for current operations:

	2010 £'000	2009 £'000
European Science Foundation (ESF)	**632**	258
ITER (International Fusion Research)	**–**	122
Institute des Hautes Etudes Scientifiques (IHES)	**160**	160
	792	540

11. Postgraduate awards

	2010 £'000	2009 £'000
Collaborative Training Accounts	**57,820**	59,100
Doctoral Training Grants	**81,077**	76,229
Dorothy Hodgkin Postgraduate Awards	**6,060**	7,581
International Doctoral Scholarships	**969**	1,455
LSI Doctoral Training Centres	**37,373**	12,317
Roberts Skills Training	**13,643**	13,703
Other Awards	**1,934**	5,522
Total expenditure on Postgraduate Awards	**198,877**	175,907

EPSRC acts as a manager for the Dorothy Hodgkin Awards on behalf of Research Councils UK (RCUK). Funding toward Dorothy Hodgkin Awards is provided by the Research Councils and by industrial collaborators.

Roberts Skills Training is not an EPSRC Postgraduate Award; rather it is expenditure to deliver enhanced training for postgraduate and postdoctoral award holders. Roberts Skills Training expenditure has been separated out to reflect the significant level of expenditure.

12. Research Fellowships

	2010 £'000	2009 £'000
Academic	**18,544**	18,890
Advanced	**14,332**	16,300
European Young Investigator (EURYI)	**641**	701
Post-Doctoral	**7,882**	7,753
Senior	**2,665**	2,937
Other Fellowships	**13,879**	5,933
Total expenditure on Research Fellowships	**57,943**	52,514

13. Staff

(a) Staff costs

	2010 £'000	2009 £'000
Salaries and Wages:		
Permanent Staff	**9,998**	9,263
Agency Staff & Contract Personnel	**1,571**	2,450
Social Security Costs	**715**	656
Other Pension Costs	**1,881**	1,983
Council and Panel Members' Fees and Honoraria	**533**	401
Current staff costs	**14,698**	14,753
Net early retirement costs	**(105)**	(31)
Total expenditure on staff costs	**14,593**	14,722

Staff Early Retirement costs are negative due to an over-provision in previous years.

(b) Staff numbers

Average numbers of full-time equivalent employees during the year:

	2010	2009
Senior Management	**43**	47
Managerial and Supervisory	**187**	193
Administrative Support	**81**	89
Average number of staff employed	**311**	329
Contract Staff	**15**	28
Agency Staff	**2**	10
Total average number of staff	**328**	367

(c) Remuneration of Council and Panel Members

The total emoluments of the Chairperson, Mr John Armitt, were £16,305 including taxable benefits (2008/09 £16,165).
The standard honorarium paid to Council members was £6,740 (2008/09 £6,740).
The standard daily attendance allowance paid to Panel members was £160 (2008/09 £160).

	No	2010 £'000	No	2009 £'000
Council Members' annual honoraria:				
£5,001 to £10,000	**13**	**88**	12	89
Daily Attendance Fees paid to Panel Members		**190**		195
Social Security Costs		**9**		5
		287		289
Chairman's Emoluments		**16**		16
Total expenditure on Council and Panel Members		**303**		305

d) Superannuation

The employees of the Council are members of the Research Councils' Pension Schemes (RCPS) which are defined benefit schemes funded from annual grant-in-aid on a pay as you go basis. The benefits are by analogy to the Principal Civil Service Pension Scheme, except that while the schemes provide retirement and related benefits based on final or average emoluments any redundancy and injury benefits are administered and funded directly by EPSRC.

The scheme is administered by the Research Councils' Joint Superannuation Services with the associated grant-in-aid managed by the Biotechnology and Biological Sciences Research Council (BBSRC). The schemes' accounts are prepared by BBSRC, on behalf of the BBSRC Chief Executive as the Accounting Officer for the RCPS. Separate accounts are published for the Pension Schemes. Employees' contributions vary between 1.5% and 3.5%. The employer's contribution is agreed by the RCPS Board of Management on the recommendation of the Government Actuary's Department and is set at 21.3% of pensionable pay (2009 21.3%).

The RCPS is an unfunded multi-employer defined benefit State scheme which is funded on a pay-as-you-go basis: contributions are set at a level that is expected to be sufficient to pay the required benefits falling due in the same period; future benefits earned during the current period will be paid out of future contributions. In RCPS, the entity has no legal or constructive obligation to pay those future benefits: its only obligation is to pay the contributions as they fall due and if the entity ceases to employ members of RCPS, it will have no obligation to pay the benefits earned by its own employees in previous years. For this reason, RCPS is treated as a defined contribution plan as stated in IAS 19.

The actuarial valuation was carried out as at 31 March 2006 by a qualified independent actuary. The full actuarial valuation is carried out every 4 years, with the next valuation calculated as at 31 March 2010. The draft report is available and discussions have commenced about a possible increase in the employer contribution rate to 26% from 21.3%, effective from 1 April 2010. The employers' contribution rate of 21.3% therefore applies to these accounts. Details are available in the accounts of the RCPS, which can be found at www.bbsrc.ac.uk.

For 2009/10, employer's contributions of £1,808,653 were payable to the RCPS (2008/09 £1,893,080) at 21.3% of pensionable pay, based on the salary bands. Employer contributions are to be reviewed every three years following a full scheme valuation by the Government Actuary. The contribution rates reflect benefits as they are accrued, not when the costs are actually incurred and reflect past experience of the scheme.

14. Other operating expenditure

	2010 £'000	2009 £'000
Services	**7,714**	5,720
Travel and Subsistence	**1,989**	1,855
Equipment and Supplies	**655**	217
Consultancies	**998**	610
External Auditors' Remuneration	**111**	98
Rent, Rates and Maintenance	**1,251**	741
General Administration	**105**	604
Write-offs and Recoveries	**379**	8
Depreciation and Loss on Disposal of Assets	**11,806**	9,969
Total other operating expenditure	**25,008**	19,822

External Auditors' Remuneration is comprised of £102k relating to the audit of the year end accounts and £9k for audit work relating to the introduction of International Financial Reporting Standards. There has been no remuneration for non-audit services.

15. Property, plant and equipment

	Land & buildings excluding dwellings £'000	IT £'000	Plant & machinery £'000	Furniture & fittings £'000	Payments on account & assets under construction £'000	Total £'000
Net Book Value at 1 April 2008	**5,285**	**4,922**	**22,190**	**93**	**1,293**	**33,783**
Cost or valuation						
At 1 April 2008	**8,518**	**6,648**	**28,521**	**461**	**1,293**	**45,441**
Reclassification	–	22,110	(22,110)	–	–	–
Additions	–	9	55	5	1,804	1,873
Disposals	–	(51)	(1,056)	(21)	–	(1,128)
Revaluations	(2,335)	(138)	(198)	(1)	–	(2,672)
At 31 March 2009	**6,183**	**28,578**	**5,212**	**444**	**3,097**	**43,514**
Depreciation						
At 1 April 2008	**3,233**	**1,726**	**6,331**	**368**	**–**	**11,658**
Reclassification	–	4,464	(4,464)	-	–	–
Charged in year	95	7,383	2,391	35	–	9,904
Disposals	–	(51)	(1,035)	(21)	–	(1,107)
Revaluations	(886)	(132)	(83)	(1)	–	(1,102)
At 31 March 2009	**2,442**	**13,390**	**3,140**	**381**	**–**	**19,353**
Net book value at 31 March 2009	**3,741**	**15,188**	**2,072**	**63**	**3,097**	**24,161**
Cost or valuation						
At 1 April 2009	**6,183**	**28,578**	**5,212**	**444**	**3,097**	**43,514**
Additions	–	2,352	924	845	9,664	13,785
Disposals	–	–	–	–	–	–
Revaluations	(334)	25	3	16	–	(290)
At 31 March 2010	**5,849**	**30,955**	**6,139**	**1,305**	**12,761**	**57,009**
Depreciation						
At 1 April 2009	2,442	13,390	3,140	381	-	19,353
Charged in year	123	11,073	505	64	-	11,765
Disposals	-	-	-	-	-	-
Revaluations	(2,557)	25	1	13	-	(2,518)
At 31 March 2010	**8**	**24,488**	**3,646**	**458**	**-**	**28,600**
Net book value at 31 March 2010	**5,841**	**6,467**	**2,493**	**847**	**12,761**	**28,409**
Asset financing						
Owned	5,841	6,467	2,493	847	12,761	28,409
Leased	-	-	-	-	-	-
Net book value at 31 March 2010	**5,841**	**6,467**	**2,493**	**847**	**12,761**	**28,409**

These assets are funded solely from Grant-in-Aid.

Following a review of the accounting treatment, EPSRC reclassified the costs of the HECToR Supercomputing Facility from Plant and Machinery to IT.

EPSRC currently has two assets in the course of construction. £3.9m represents the EPSRC's agreed share (8.24%) of the capital costs to date of the Research Councils UK Shared Services Centre. £8.9m represents the costs to date of the HECToR Supercomputing Facility.

Included in Freehold Land and Buildings is £2.4m (2008/09 £0.7m) in respect of Freehold Land which is not depreciated.

The last professional valuation of land and buildings was in March 2010, conducted by Powis Hughes and Associates, Chartered Surveyors. The basis of the valuation was Open Market Value for existing use. The valuation was made in accordance with RICS Appraisal and Valuation Manual or a named alternative. Between formal professional valuations appropriate indices are used.

16. Intangible assets

	Software £'000	Licences £'000	Total £'000
Net Book Value at 1 April 2008	**174**	**2**	**176**
Cost at valuation			
At 1 April 2008	286	20	306
Revaluation	(37)	(3)	(40)
At 31 March 2009	**249**	**17**	**266**
Amortisation			
At 1 April 2008	112	18	130
Charged in year	39	2	41
Revaluation	(10)	(3)	(13)
At 31 March 2009	**141**	**17**	**158**
Net book value at 31 March 2009	**108**	**–**	**108**
Cost at valuation			
At 1 April 2009	249	17	266
Revaluation	10	1	11
At 31 March 2010	**259**	**18**	**277**
Amortisation			
At 1 April 2009	141	17	158
Charged in year	41	–	41
Revaluation	4	1	5
At 31 March 2010	**186**	**18**	**204**
Net book value at 31 March 2010	**73**	**–**	**73**

17. Investment assets

	SSC 'A' shares	SSC 'B' shares	Total
At 1 April 2009	1	650,960	**650,961**
Share in losses of joint ventures	–	(153,807)	**(153,807)**
Net book value at 31 March 2010	**1**	**497,153**	**497,154**

The Council's share ownership in RCUK Shared Services Centre Limited (RCUK SSC Ltd) is one (2009: one, 2008: one) 'A' ordinary share of £1 and 650,960 (2009:650,960, 2008: nil) 'B' shares of £1 each. The 'A' shares carry a voting right per share. Each of the seven Research Councils are joint investors in the project and each Council's individual share is 14%. The 'B' shares convey ownership rights to the holder, including any distributions or proceeds from sale of the RCUK SSC Ltd. The 'B' shares are apportioned in accordance with the agreed share of the implementation costs – EPSRC's share ownership is therefore 8.24% (2009: 8.24%).

The operating results, assets and liabilities of SSC Ltd are reflected in the Group's Financial Statements in accordance with IAS 31. SSC Ltd has posted a loss for the year of £0.4m (2008-09 loss of £1.4m).

18. Trade receivables and other current assets

	2010 £'000	2009 £'000	2008 £'000
Current:			
Trade receivables – Central Government Bodies	**43,150**	44,126	19,839
Trade receivables – Public corporations	**164**	26	–
Other Trade Receivables	**1,568**	2,721	4,269
Other Receivables	**–**	49	82
Prepayments and accrued revenue – Central Government Bodies	**3,546**	4,727	2,721
Prepayments and accrued revenue – Public corporations	**575**	–	873
Other Prepayments and accrued revenue	**14,852**	6,903	8,982
	63,855	58,552	36,766
Non current:			
Other receivables	**–**	146	143

19. Cash and cash equivalents

	2010 £'000
Balance at 1 April 2008	**6,546**
Net change in cash and cash equivalent balances	**(1,710)**
Balance at 31 March 2009	**4,836**
Balance at 1 April 2009	**4,836**
Net change in cash and cash equivalent balances	**(594)**
Balance at 31 March 2010	**4,242**
The following balances at 31 March 2010 were held at:	
Office of HM Paymaster General	**1,262**
Commercial banks and cash in hand	**2,980**
Balance at 31 March 2010	**4,242**

20. Trade payables and other current liabilities

	2010 £'000	2009 £'000	2008 £'000
Current:			
VAT	**266**	263	33
Trade Payables – Central Government Bodies	**3,149**	–	389
Other Trade Payables	**8,307**	13,264	5,269
Accruals and deferred revenue – Central Government Bodies	**823**	2,910	7,953
Other Accruals and deferred revenue	**93,042**	62,645	75,263
	105,587	79,082	88,907
Non current:			
Other payables, accruals and deferred revenue	**–**	220	290

21. Provisions for liabilities and charges

	Severance Costs £'000	System Termination £'000	Total £'000
Balance at 1 April 2008	**234**	**82**	**316**
Increase in Provision	7	3	10
Balance at 1 April 2009	**241**	**85**	**326**
Payment/utilisation of provision	(126)	–	**(126)**
Increase in Provision	82	–	**82**
Reduction in Provision	–	(48)	**(48)**
Net Movement in Provision	(44)	(48)	**(92)**
Balance at 31 March 2010	**197**	**37**	**234**

Analysis of expected timing of discounted flows:

	Severance Costs £'000	System Termination £'000	Total £'000
In the remainder of the Spending Review period (to 2011)	197	37	**234**

The Research Councils and the RCUK Shared Services Centre Ltd are in the process of developing a Shared Services Centre to carry out the central functions of HR, Finance, Grants processing, Procurement and IT across the Councils. As a result some research councils will incur redundancy costs, particularly where existing staff live a distance away from Swindon where the Centre is situated.

The Research Councils have collectively agreed that they will be jointly liable for all necessary redundancies. The Councils have calculated their likely redundancy liabilities in order to make a 2008/09 provision and have updated this as at 31 March 2010. A funding allocation model was developed and agreed by all the Research Councils and this identified the proportion of SSC project spend and liability that each individual Council would incur. The total provision for redundancies has been apportioned using this model. The table below shows, for each Council, the amount that they need to provide for redundancies of their own staff. Some Councils will incur a cost for terminating their existing systems and these costs are also being shared. It then notes the proportion of the total liability it will incur and the amount of provision that that represents. The figure below this denotes the contributions that an individual Council has from the other Research Councils. The bottom line shows the net provision they have recorded in each Council.

	AHRC £'000	BBSRC £'000	EPSRC £'000	ESRC £'000	MRC £'000	NERC £'000	STFC £'000	SSC £'000	Total £'000
Opening provision required for the council's own redundancies	68	431	**–**	–	1,276	909	520	–	3,204
Opening provision required for system termination fee	–	–	**–**	–	754	–	–	–	754
Total opening provision	68	431	**–**	–	2,030	909	520	–	3,958
Net movement in provisions	15	23	**–**	–	(469)	(337)	(520)	174	(1,114)
Closing total provision	**83**	**454**	**–**	**–**	**1,561**	**572**	**–**	**174**	**2,844**
% of liability to be borne by the council	1.33%	20.54%	**8.24%**	1.83%	26.98%	20.54%	20.54%	0.0%	100%
Provision required to be borne by each council	38	584	**234**	52	768	584	584	–	2,844

22. Capital commitments

Contracted capital commitments at 31 March 2010 for which no provision has been made:

	2010 £'000	2009 £'000	2008 £'000
Property, plant and equipment – Shared Services Centre	**682**	17,100	24,000
HECToR (Cray Inc/University of Edinburgh HPCX Ltd/ National Algorithms Group)	**3,500**	33,500	47,000
	4,182	50,600	71,000

In 2007-08 and 2008-09 EPSRC held contractual commitments on behalf of all the Research Councils for the future committed spend on the shared services centre project. Responsibility for future spend has now passed directly to the RCUK Shared Services Centre Ltd and therefore EPSRC's contractual commitment is limited to EPSRC's share of future spend.

Contractual commitments of £3.5m existed at 31 March 2010 with regard to the upgrade and service provision of the supercomputer HECToR, the first phase of which was delivered in September 2007. The value of the HECToR contractual commitments are for the whole of the project and includes service charges and computational engineering support. Not all of these costs are capitalised and held as fixed assets as they are written off in the year they are incurred.

23. Commitments under leases

Operating leases

Commitments under operating leases to pay rentals during the year following the year of these accounts are given in the table below, analysed according to the period in which the lease expires.

	2010 £'000	2009 £'000
Obligations under operating leases comprise:		
Buildings:		
Expiry within 1 year	**2**	2
Expiry after 1 year but not more than 5 years	**–**	–
Expiry thereafter	**–**	–
	2	2
Other:		
Expiry within 1 year	**16**	43
Expiry after 1 year but not more than 5 years	**2**	41
Expiry thereafter	**–**	–
	18	84

Finance leases

EPSRC has no obligations under finance leases.

24. Other financial commitments

EPSRC estimates that the future costs to completion of research and training grants at 31 March 2010 are £1,957 million. The payments to which EPSRC is committed during 2009/10, analysed by the period during which the commitment expires are as follows:

	2010 £'000
Expiry within 1 year	**729,938**
Expiry within 2 to 5 years	**1,169,442**
Expiry thereafter	**58,386**
Total financial commitments	**1,957,766**

25. Contingent liabilities

EPSRC had no contingent liabilities as at 31 March 2010.

26. Related-party transactions

EPSRC is a Non Departmental Public Body sponsored by the Department for Business, Innovation and Skills (BIS). It complies with the International Accounting Standard on Related Party Transactions (IAS 24) as amended for Central Government use by HM Treasury.

For the purposes of IAS 24, BIS is regarded as a related party. During the year, EPSRC had various material transactions with BIS and other bodies for which BIS is regarded as the parent department; namely the Biotechnology and Biological Sciences Research Council, the Economic and Social Research Council, Natural Environment Research Council; Medical Research Council; Science and Technology Facilities Council; Arts and Humanities Research Council; Technology Strategy Board and the RCUK Shared Services Centre Ltd.

In addition, EPSRC had material transactions with other Government Departments and with other Central Government Bodies (viz. the Ministry of Defence, HM Treasury and the Department for Environment, Food and Rural Affairs).

During the year EPSRC announced the following grants to organisations in respect of proposals from members of the EPSRC Council:

Organisation	Proposer	Grant reference	Value £000
University of Cambridge	Professor L Gladden	EP/H025405/1	**178**
University of Dundee	Dr A Anderson	EP/F500793/1	**91**

The relevant Council members were not involved in the approval of these grants.

During the year EPSRC announced the following numbers and cumulative values of grants and postgraduate and fellowship awards to organisations where Council members occupied senior positions in the organisation:

Organisation	Research grants No.	Research grants £'000	Partnership for Public Engagement Awards No.	Partnership for Public Engagement Awards £'000	Postgraduate Awards No.	Postgraduate Awards £'000	Research Fellowships No.	Research Fellowships £'000
University of Cambridge	44	25,763	16	77	6	13,167	12	5,717
Cranfield University	8	3,562	12	4,905	2	1,311	–	–
University of Dundee	14	6,599	1	2	2	381	–	–
University of Exeter	9	2,696	1	2	3	617	–	–
Imperial College London	84	46,281	1	15	5	10,172	6	4,269
University College London	47	28,519	–	–	4	4,634	5	4,875
University of Manchester	55	27,709	5	244	4	5,261	2	971
Sheffield Hallam University	2	537	1	83	1	130	–	–
University of Southampton	39	25,324	1	2	5	5,692	–	–
University of Surrey	19	14,333	1	3	3	1,412	2	1,123

No Council member was involved in the approval of grants or awards to the organisation where he/she is a member of staff.

EPSRC operates a process of peer review of proposals for research grants, as part of which 'Colleges', panels formed of senior members of the academic and industrial communities, evaluate grant proposals for technical merit and then propose a ranking for funding. EPSRC receives their recommendations but is not bound by them, taking as it does other significant factors into account, such as the availability of funds and Government policy. These panel members are not therefore regarded as Related Parties within the context of IAS 24.

EPSRC has adopted a Code of Practice for all those who assist the work of the Council, which embraces the 'Seven Principles of Public Life' drawn up by the Nolan Committee and endorsed by Parliament. This is designed to remove any staff member from any decision-making process under which he/she or any of his/her close family may benefit.

During the year, EPSRC identified those members of staff who could be regarded as being in positions of financial influence and required a declaration from each of any financial transactions with EPSRC under which the staff member or a member of his/her immediate family was in receipt of a significant amount of money from EPSRC and where the staff member was able to exercise any influence over the transaction.

Such a declaration was also required from members of Council, the Resource Audit Committee, the Technical Opportunities Panel, the Societal Issues Panel and the User Panel. A Council Members' Register of Interests is available for viewing on EPSRC's website.

27. Derivatives and other Financial Instruments

IFRS 7, Financial Instruments: Disclosures, requires disclosure of the role which financial instruments have had during the period in creating or changing the risks EPSRC faces in undertaking its activities. Specifically: (a) the significance of financial instruments affecting financial position and performance; and (b) the nature and extent of risks arising from financial instruments to which it is exposed. Because of the largely non-trading nature of its activities and the way it is financed, EPSRC is not exposed to the degree of financial risk faced by businesses. Moreover, financial instruments play a limited role in creating or changing risk on its operational activities.

Liquidity Risk – EPSRC's net revenue resource requirements are financed by resources voted annually by Parliament and administered as grant-in-aid through the Department for Business, Innovation and Skills, just as its capital expenditure largely is. EPSRC is not therefore exposed to significant liquidity risks. As described in note 1 (a) EPSRC is dependant on funding from the Department for Business, Innovation and Skills to meet liabilities falling due in future years, but there is no reason to believe that this funding will not be forthcoming.

Interest-Rate Risk – All of EPSRC's financial assets and liabilities carry nil or fixed rates of interest. EPSRC is not therefore exposed to significant interest-rate risk.

Currency Profile – At the Statement of Financial Position date EPSRC held no significant foreign currency assets or liabilities.

Foreign Currency Risk – EPSRC's exposure to foreign currency risk is not significant. Foreign currency income is negligible and foreign currency expenditure at less than 1% of total expenditure is not significant.

28. First-time adoption of IFRS

	2010 £'000
Operating cost statement	
Net operating cost for 2008/2009 under UK GAAP	**792,502**
Adjustments for:	
Holiday pay accrual[1]	**12**
Net operating cost for 2008/2009 under IFRS	**792,514**

1. An accrual for paid holiday entitlement has been made in accordance with IAS 19 which was not required under UK GAAP. The figure is the net holiday pay accrual after taking into account adjustments in 2007/08.

Statement of Cash flows

The Statement of cash flows remained the same under IFRS as it was when prepared under UK GAAP.

28. First-time adoption of IFRS continued
Statement of Financial Position as at 1 April 2008

	UK GAAP 31 March 2008 £'000	IFRS Adjustments £'000	IFRS 1 April 2008 £'000
Non-current assets			
Intangible assets[1]	–	176	176
Property, plant and equipment	33,959	(176)	33,783
Investment in Joint Ventures	–	–	–
Non current receivables[2]	143	–	143
Total non-current assets	**34,102**	**–**	**34,102**
Current assets			
Trade and other receivables[2]	36,766	–	36,766
Cash and cash equivalents	6,546	–	6,546
Total current assets	**43,312**	**–**	**43,312**
Total assets	**77,414**	**–**	**77,414**
Current liabilities			
Trade and other payables[3]	(88,793)	(114)	(88,907)
Total current liabilities	**(88793)**	**(114)**	**(88,907)**
Total assets less current liabilities	**(11,379)**	**(114)**	**(11,493)**
Non-current liabilities			
Provisions	(316)	–	(316)
Pension liability	(290)	–	(290)
Total non-current liabilities	**(606)**	**–**	**(606)**
Assets less liabilities	**(11,985)**	**(114)**	**(12,099)**
Equity			
Revaluation reserve	2,566	–	2,566
General reserve[3]	(14,551)	(114)	(14,665)
Total reserves	**(11,985)**	**(114)**	**(12,099)**

28. First-time adoption of IFRS continued

Statement of Financial Position as at 1 April 2009

	UK GAAP 31 March 2009	IFRS Adjustments	IFRS 1 April 2009
Non-current assets			
Intangible assets[1]	–	108	108
Property, plant and equipment	24,269	(108)	24,161
Investment in Joint Ventures	651	–	651
Non current receivables[2]	–	146	146
Total non-current assets	**24,920**	**146**	**25,066**
Current assets			
Trade and other receivables[2]	58,698	(146)	58,552
Cash and cash equivalents	4,836	–	4,836
Total current assets	**63,534**	**(146)**	**63,388**
Total assets	**88,454**	**–**	**88,454**
Current liabilities			
Trade and other payables[3]	(78,954)	(128)	(79,082)
Total current liabilities	**(78,954)**	**(128)**	**(79,082)**
Total assets less current liabilities	**9,500**	**(128)**	**9,372**
Non-current liabilities			
Provisions	(326)	–	(326)
Pension liability	(220)	–	(220)
Total non-current liabilities	**(546)**	**–**	**(546)**
Assets less liabilities	**8,954**	**(128)**	**8,826**
Equity			
Revaluation reserve	489	–	489
General reserve[3]	8,465	(128)	8,337
Total reserves	**8,954**	**(128)**	**8,826**

1. Software that is not an integral part of the related hardware has been categorised as intangible assets as prescribed by IAS 38. Under UK GAAP, this distinction was not required.
2. Reclassification of receivables due in more than one year as required by IAS 1.
3. An accrual for paid holiday entitlement has been made in accordance with IAS 19.

29. Events after the Reporting Period

Following a change in government in May 2010 a comprehensive spending review was signalled, and initial outcomes announced on 20 October 2010. The Science Budget programme funding has been maintained in cash terms although the impact on individual Research Councils is being determined.

It was announced in the budget on 22 July 2010 that the Government intends to adopt the Consumer Price Index (CPI) for the indexation of public service pensions from April 2011. This will impact upon the future operation of the pension schemes that EPSRC provides to employees.

The financial statements were authorised for issue on 14th December 2010 by the Accounting Officer. Post Reporting period events have not been considered after that date.

Feedback

We welcome feedback on all our publications. Comments on this Annual Report should be sent to:

Dr Sue Smart
Head of Performance and Evaluation
EPSRC
Polaris House
North Star Avenue
Swindon SN2 1ET
T: 01793 444061
F: 01793 444005
E: sue.smart@epsrc.ac.uk

Contact us:

EPSRC
Polaris House
North Star Avenue
Swindon SN2 1ET
T: 01793 444100
E: infoline@epsrc.ac.uk
www.epsrc.ac.uk

Research Councils UK

T: 01793 444420
E: info@rcuk.ac.uk
www.rcuk.ac.uk

Published by TSO (The Stationery Office) and available from:

Online
www.tsoshop.co.uk

Mail, telephone, fax and email
TSO
PO Box 29, Norwich NR3 1GN
Telephone orders/general enquiries: 0870 600 5522
Order through the Parliamentary Hotline Lo-Call 0845 7 023474
Fax orders: 0870 600 5533
Email: customer.services@tso.co.uk
Textphone: 0870 240 3701

The Parliamentary Bookshop
12 Bridge Street, Parliament Square,
London SW1A 2JX
Telephone orders/general enquiries: 020 7219 3890
Fax orders: 020 7219 3866
Email: bookshop@parliament.uk
Internet: http://www.bookshop.parliament.uk

TSO@Blackwell and other Accredited Agents

Customers can also order publications from:
TSO Ireland
16 Arthur Street, Belfast BT1 4GD
Telephone orders/general enquiries: 028 9023 8451
Fax orders: 028 9023 5401

ISBN 978-0-10-296641-1