

**EPSRC**

Engineering and Physical Sciences  
Research Council

# **Economic Impact Reporting Framework 2008/09**

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**Polaris House  
North Star Avenue  
Swindon, SN2 1ET  
T: 01793 444000  
[www.epsrc.ac.uk](http://www.epsrc.ac.uk)**

## EPSRC Economic Impact Reporting Framework – October 2009

### Report for the period 2008-2009

This is the fourth annual Economic Impact Reporting Framework (EIRF) report published by EPSRC. These reports were implemented across all Research Councils in 2005 and form part of the economic impact reporting framework managed by the Department for Business, Innovation and Skills. More information on the EIRF can be found at:

[http://www.dius.gov.uk/science/science\\_funding/ten\\_year\\_framework](http://www.dius.gov.uk/science/science_funding/ten_year_framework)

The economic impact reporting framework contains data on selected aspects of EPSRC performance relevant to the government's objectives for the UK science base:

1. Overall economic impacts
2. Investment in the research base and innovation
- 3.a Knowledge generation (stock of publicly available knowledge)
- 3.b Knowledge generation (human capital)
4. Framework conditions (public engagement)
5. Framework conditions (financial sustainability)
6. Knowledge exchange efficiency

The majority of metrics originate from the EPSRC Output Framework Reports for 2005/06, 2006/07 and 2007/08. Hence, where possible this report shows data for 2005/06, 2006/07, 2007/08 alongside the data for 2008/09. Some indicators in the report have been modified with the aim of improving read-across between this report and those of other Research Councils.

The report should be read in conjunction with the EPSRC Delivery Report 08/09 (<http://www.epsrc.ac.uk/Publications/Corporate/deliveryreport0809.htm>) and Annual Report 08/09 (<http://www.epsrc.ac.uk/Publications/Corporate/ARA08-09.htm>), which provide a comprehensive summary of achievements over the period.

### Highlights from 2008/09

- *Economic Impact:* Kromek, a Durham University spin-out rooted in EPSRC-supported research, has developed pioneering, award winning and worldwide-patented technology in digital colour imaging with applications in medical imaging, security screening, industrial inspection and space exploration. The company has recently been valued at £46.5M and current turnover is expected to increase to tens of millions of pounds over the next three years.
- *Encouraging collaboration:* Some 2,300 user organisations collaborated on research grants and (as at 31 March 2009) around 1400 PhD students were engaged on collaborative training projects; over £198 million in resources was committed by business and other users in support of new research grants (a significant increase on the £115 million committed by users in 2007/8).
- *Excellence in research:* The UK maintained its high ranking in terms of Citation Impact among the G8 nations in Physical Sciences (3), Mathematics (2) and Engineering (3).
- *Providing skilled scientists and engineers:* EPSRC supported an estimated 9,129 PhD students (which represents 30% of all students in the EPS disciplines); almost half of

PhD graduates entered either business or the public sector within a year of finishing their studentships.

- *Fostering international collaboration*: the proportion of grants reporting at least one publication with an international co-author has remained at over 50% since 2005.
- *Public Engagement*: 'The Naked Scientists' - the UK's only live weekly radio talk show, which is supported by EPSRC through a Partnerships for Public Engagement Award, achieved an audience of around 1 million listeners and over 50,000 downloads per week. The work of EPSRC's Senior Media Fellows has enabled the communication of research topics to millions through extensive media coverage and participation in major events.

## 1. Overall Impacts

- 1.1. Engineering and the physical sciences (EPS) are fundamentally important to the UK economy because of the way they contribute to innovation in products, processes, services, and public policy – one study<sup>a</sup> has estimated that the sectors which depend most heavily on EPS account for 30% of UK GDP and 75% of all industrial R&D. The analysis also confirms the overwhelming importance of the engineering base for manufacturing in the UK. EPS sectors account for more than 70% of all Value Added, Employment, and Investment in manufacturing, and are of even greater importance in terms of exports, accounting for more than 80% of the UK total.
- 1.2. The routes from research to innovation are varied and complex; during the year EPSRC has continued to improve our understanding of these routes and the role of EPSRC in promoting successful outcomes. Examples of the impact of EPSRC research on society and the economy include:
  - *Welfare/Health Impact*: EPSRC-funded researchers at the University of Bristol have developed a new faster, safer breast imaging technique to assist in the diagnosis of breast cancer. The technology has been commercialised by the spin-out company Micrima.
  - *Energy Impact*: A new way of making LEDs developed by researchers at Cambridge University with EPSRC support could mean cheap, mass produced LEDs becoming available for lighting within 5 years. Based on current results, GaN LED lights in every home and office could cut the proportion of UK electricity used for lights from 20% to 5% and see household lighting bills reduced by up to 75% within five years.
  - *Economic Impact*: Kromek (formerly Durham Scientific Crystals Ltd 'DSC') was spun out from the Physics Department of Durham University in 2003<sup>b</sup>. Kromek is pioneering digital colour imaging for x-rays and has brought ground-breaking innovation to advanced 3D imaging that has significant potential for application most notably in medical imaging, security screening, industrial inspection and space exploration. The technology, which has a worldwide patent protection, was developed in the University through research over the last 3 decades, much of it

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<sup>a</sup> 'Engineering and Physical Sciences in the UK', SPRU, 2003 – report commissioned by EPSRC in 2003 and updated in 2009

<sup>b</sup> [http://www.dur.ac.uk/technology.transfer/spinouts/durham\\_scientific\\_crystals/](http://www.dur.ac.uk/technology.transfer/spinouts/durham_scientific_crystals/)

supported by research council funding. Kromek have recently developed non-invasive, low-cost scanners that are able to detect dangerous chemicals hidden in bottles and cans. It is widely speculated that the development of these scanners, which are currently being tested across Europe, will lead to the rules on carrying liquids on aircraft being relaxed within a year, saving airlines millions of pounds per year in lost revenue. The company raised in excess of £9M to develop its current product range. They have recently been valued at £46.5M and expect to increase their staff numbers to over 100 soon. Their market value doubled in the year 2007 to 2008 and current turnover is expected to increase to tens of millions of pounds over the next three years.

- 1.3. The economic impact of our research portfolio and community is now a key element in our evaluation framework used, for example, in our rolling programme of International Reviews. To help develop our methodology for assessing economic impact further we have commissioned independent expert studies into the economic impact of basic physics and basic chemistry research, the impact of energy research and the value of PhD training in Engineering and the Physical Sciences.

The recent study on the economic impact of physics research to the UK economy, undertaken by Oxford Economics and commissioned by the Institute of Physics, the Royal Astronomical Society the Engineering and Physical Sciences Research Council and the Science and Technology Facilities Council concluded that the basic physics research undertaken by UK researchers and funded by EPSRC and other similar organisations translates into technologies that generate significant wealth. Examples include the following:

- Since their development by pioneering UK physicists and chemists in the 1960s and 70s **Liquid Crystal Displays** have generated over £275 million for the UK economy from the royalties and the licensing agreements based on the technology. In addition, the key players in the LCD industry have contributed over £132 million directly to the UK GDP and have spent £70 million on R&D. In collaboration with the start up company Cambridge Display Technologies, EPSRC researchers at the Universities of Oxford and St Andrews have continued to develop LCD technology, producing more efficient LCD displays. Over 30 years on from the pioneering research work, the UK continues to lead the way in some of the more recent emerging display technologies such as P-OLEDs, while further contributing to the development of next-generation LCD technologies.
- European Space Agency's Galileo **satellite navigation system** is being launched with technology developed by the British satellite manufacturer Surrey Satellite Technology Ltd (SSTL). SSTL was spun out by EPSRC-funded researchers from the University of Surrey in 1985. One recent study found that between 2006 and 2025, Galileo is likely to bring cumulative economic benefits to the nation of over £18 billion, from such benefits as transport safety improvements and environmental benefits from shorter journey times.
- The magnetic fields necessary for MRI are generated by superconducting magnets, developed in the UK by the first physics-technology spin-out company from the University of Oxford, Oxford Instruments, which today employs more than 1,500 people, and has a turnover of £177 million. There are now 20,000 MRI scanners installed around the world and the global market is expected to reach around £4 billion by 2010. Over 1 million MRI

scans are performed in the UK every 12 months and MRI scanners are estimated to save 700 lives in the UK each year through the early detection of breast cancer.

## 2. Investment in the Research Base

- 2.1. Reflecting increased levels of government funding, Table 1 shows how EPSRC Annual Net Expenditure increased during the three years from 2005/06 to 2007/08. The proportion of spend on research grants reduced slightly in 2008/09, largely as a result of a significant investment (£11M) in capital and increased expenditure on academic fellowships. The proportion of spending on training has remained relatively stable. There has been a planned increase in our spend on identified priority research areas which accounts for 36% of net research grant expenditure in 2008/09. Nearly two-thirds of our spending is directly on research grants and just over a fifth on postgraduate training. Administration accounted for less than 3% of spending (see Table 11); the balance covers such things as fellowships, public engagement, and investment in facilities.
- 2.2. Approximately 36% of EPSRC's annual research spend has been focused on identified priority areas such as Energy, Nanoscience, Digital Economy and Next Generation Healthcare. Examples of societal and economic impacts made as a result of our investment in priority research areas include:

**Energy:** A new type of wave-power device (the "Oyster") developed by EPSRC-funded researchers at Queen's University Belfast will be generating power for the National Grid by 2013. The device reduces the environmental risks that exist with current hydro-power devices and has proven to be more reliable and more cost effective to maintain. The technology has been commercialised by the Edinburgh-based company Aquamarine Power who are set to be the first company of its kind in the world to deploy both wave and tidal devices on a commercial scale.

**Nanoscience through Engineering to Application:** A multidisciplinary team of EPSRC-funded researchers are working with the Forensic Science Service, BAE Systems and coatings manufacturer Andura to exploit breakthrough bullet tagging technology that will help to provide robust forensic evidence to link the cartridges fired during a crime and whoever handled them, leading to a significant increase in successful convictions. There may also be scope to apply this nanotag and DNA capture technology in other fields, such as knife crime, in the future.

### **Digital Economy:**

- Revolutionary software, incorporating sensor, swipe card and recording technology, developed by EPSRC-funded researchers at the Universities of Aberdeen and Dundee is helping children with disabilities such as cerebral palsy to have conversations in a faster, more interactive way.
- The EPSRC-led RCUK Digital Economy Programme has funded a joint project with India into next generation telecommunication

networks. The project, which has attracted over £4M of private investment to date, will aid healthcare and early warning weather systems in rural areas in both countries.

**Towards next generation Healthcare:** Software developed from research at Oxford University and commercialised by t+Medical is being used to improve lives of people with chronic diseases such as diabetes and asthma. The software, which is downloaded to a mobile telephone enables patients to record details about their condition which are then sent to their GP or other care provide in real time so that the patient's condition can be monitored and controlled between medical appointments.

There has been a significant increase in our support for multidisciplinary research with the number of grants increasing gradually over the period to over 2300 by 2008/09. Multidisciplinary grants now account for 43% of our total gross research grant expenditure. The research councils use a common definition of 'multidisciplinary' which includes the following:

- research funded through cross-Council programmes such as Energy and e-Science;
- research funded through any of EPSRC's own multidisciplinary managed programmes (e.g. complexity science); and
- any grants led by investigators from more than one discipline.

**Table 1 Research Base – Headline Facts and Figures (Research)**

| Ref. | Metric  | 2005/06        | 2006/07        | 2007/08        | 2008/09        |
|------|---|----------------|----------------|----------------|----------------|
| 1.1  | <b>EPSRC Annual Expenditure (Net)</b>                             | <b>£567.9M</b> | <b>£653.7M</b> | <b>£751.0M</b> | <b>£768.1M</b> |
| 1.2  | <b>Net Research Grant Expenditure</b>                             | <b>£360.0M</b> | <b>£420.3M</b> | <b>£475.0M</b> | <b>£464.0M</b> |
| 1.21 | (% of Annual Net Expenditure)                                     | (63%)          | (64%)          | (63%)          | (60%)          |
| 1.22 | (Number of Grants which incurred expenditure)                     | (5,129)        | (5,161)        | (5,311)        | (5,339)        |
| 1.3  | <b>Net Training Expenditure<sup>1</sup></b>                       | <b>£130.3M</b> | <b>£148.4M</b> | <b>£156.8M</b> | <b>£167.3M</b> |
| 1.31 | (% of Annual Net Expenditure)                                     | (23%)          | (23%)          | (21%)          | (22%)          |
| 1.4  | <b>Research Spend in Identified Priority Areas</b>                | <b>£102.9M</b> | <b>£119.3M</b> | <b>£141.9M</b> | <b>£166.2M</b> |
| 1.41 | (% of research grant spend) <sup>2</sup>                          | (28%)          | (28%)          | (30%)          | (36%)          |
| 1.42 | (Grants in Identified Priority Areas which incurred expenditure)  | (1,126)        | (1,199)        | (1,366)        | (1,455)        |
| 1.5  | <b>Net Research Spend on multidisciplinary grants<sup>3</sup></b> | <b>£141.1M</b> | <b>£155.5M</b> | <b>£182.4M</b> | <b>£198.2M</b> |
| 1.51 | (% of net research grant spend)                                   | (39%)          | (37%)          | (38%)          | (43%)          |
| 1.52 | (Multidisciplinary Grants which incurred expenditure)             | (1,761)        | (1,810)        | (2,085)        | (2,367)        |

<sup>1</sup> This figure excludes spending on project students, who are included in 'net research grant expenditure' (metric 1.2).

<sup>2</sup> 'Identified Priority Areas' covers all targeted mode research grants with the exception of Portfolio Partnerships, Fellowships, Chemistry National Services, INTERACT, Follow-on fund and IMRCs.

<sup>3</sup> Figures for 2005/06, 2006/07, 2007/08 have been re-stated.

- 2.3. Investment in the research base includes significant support for the development of research capability through training in research skills. EPSRC targets the majority (61% for 2008/09) of its training budget in support of PhD-level training, and invests substantial sums to support research careers, as shown in Table 2. The majority of the remainder of EPSRC's net training expenditure (£52.8M) was allocated to Collaborative Training Accounts.<sup>4</sup>

**Table 2 Research Base – Headline Facts and Figures (Training)**

| Ref.       | Metric  | 2005/06       | 2006/07       | 2007/08       | 2008/09            |
|------------|---|---------------|---------------|---------------|--------------------|
| <b>2.1</b> | <b>Estimated total Number of PhDs supported<sup>5</sup></b> | <b>7,692</b>  | <b>8,070</b>  | <b>8,240</b>  | <b>9,129</b>       |
| 2.11       | (est. number via Doctoral Training Accounts)                | (4,080)       | (4,081)       | (4,061)       | (5,033)            |
| 2.12       | (est. number on Collaborative Schemes)                      | (1,812)       | (1,841)       | (1,854)       | 1,387 <sup>6</sup> |
| 2.13       | (number of EPSRC Project Students)                          | (1,678)       | (2,012)       | (2,214)       | (2,607)            |
| 2.14       | (number of Core e-Science & Basic Technology)               | ( 122)        | ( 136)        | ( 111)        | ( 102)             |
| <b>2.2</b> | <b>Net Spend<sup>7</sup> on PhDs</b>                        | <b>£84.5M</b> | <b>£93.9M</b> | <b>£99.6M</b> | <b>£102.7M</b>     |
| 2.21       | (% of net Training Expenditure)                             | (65%)         | (63%)         | (63%)         | (61%)              |
| <b>2.3</b> | <b>Number of active research fellowships<sup>8</sup></b>    | <b>271</b>    | <b>292</b>    | <b>313</b>    | <b>310</b>         |
| 2.31       | Spend on active research fellowships;                       | £11.9M        | £16.2M        | £22.2M        | £24.9M             |
| 2.32       | (% of net Research Grant Expenditure)                       | (3.3%)        | (3.9%)        | (4.7%)        | (5.4%)             |
| <b>2.4</b> | <b>Number of EPSRC-funded RAs<sup>9</sup>;</b>              | <b>4,746</b>  | <b>5,161</b>  | <b>5,006</b>  | <b>5,089</b>       |
| 2.41       | Spend on EPSRC-funded RAs;                                  | £106.8M       | £113.7M       | £106.6M       | £111.9M            |
| 2.42       | (% of net Research Grant Spend)                             | (30%)         | (27%)         | (22%)         | (24%)              |

- 2.4. The increase in number of PhD students supported is largely attributable to the increased number of students supported through Doctoral Training Accounts. There has also been a significant increase in the number of project students being supported through research grants. As at 31 March 2009, we had been informed (through data supplied by HEIs via the DTA reporting tool) that 1387 students were registered at that time on collaborative schemes. However exact student numbers cannot be readily quoted as the data on the number of students supported is provided retrospectively by universities, and builds up over time. Figures for 2008/09 will be re-stated for next year's EIRF.
- 2.5. There has been a planned growth in the number of research fellowships since 2005/06, with support being provided to 310 research fellows in 08/09. EPSRC has broadened its portfolio of available fellowship funding in 08/09 with the introduction

<sup>4</sup> To date, EPSRC's main vehicle for funding collaborative postgraduate training in higher education institutions. EPSRC funds over 90 accounts, running activities such as engineering doctorates, research assistant industrial secondments, knowledge transfer partnerships, industrial CASE and masters training.

<sup>5</sup> Numbers of PhD students for 2005/06 and for 2006/07 incorporate new estimates for Life Science Interface Doctoral students. The numbers quoted include students funded through Doctoral Training Grants and Project Students.

<sup>6</sup> This data is taken from the DTA reporting tool and information is supplied by HEIs. This figure represents a snapshot of data received as at 31 March 09 and the figure will increase over the coming months as further data is submitted.

<sup>7</sup> The 'spend' figure is for those students supported through Doctoral Training Grants, LSI Doctoral Training Centres and International Doctoral Scholarships, and includes 'Roberts' skills payments. It *excludes* spend on project students (who are supported through research grants) and those supported via Collaborative Training Grants/Accounts

<sup>8</sup> The figures are for fellowships in post as on 31<sup>st</sup> March in 2006, 2007, 2008 and 2009 respectively. They include Advanced, EURYI, Postdoctoral, Springboard and Statistics Mobility Fellowships (with the addition of Career Acceleration and Leadership Fellowships for 2008/09). Note that the data *excludes* Senior and Senior Media Fellowships on the basis that these do not provide substantive research training.

<sup>9</sup> The methods used to calculate the numbers of, and spend on, Research Assistants have been updated and are based respectively on the staff resources planned at the start of a grant and the payments made against the staff budget lines during the relevant financial year. Figures have been re-stated accordingly.

of Career Acceleration Fellowships that offer up to 5 years of funding for talented researchers who have 3-10 years of postdoctoral experience. Through the Leadership Fellowships scheme, we now offer up to 5 years funding for researchers with the most potential to develop into the UK's future research leaders.

### 3. Knowledge Generation

#### (Stock of Publicly Available Knowledge)

- 3.1. The UK continues to rank very highly relative to others in terms of citation impact in the EPS disciplines- i.e. the rate at which published UK research is cited by other researchers. The UK has maintained a leading position in the ranking of G8 countries in each of the three main fields representing EPSRC's remit area – 2 in Mathematics, 3 in Physical Sciences and 3 in Engineering.

**Table 3 Bibliometric Indicators**

| Ref.                         | Metric   | 2005/06 <sup>10</sup>              | 2006/07 <sup>11</sup>              | 2007/08 <sup>12</sup>             | 2008/09 <sup>13</sup>                          |
|------------------------------|--|------------------------------------|------------------------------------|-----------------------------------|--|
| <b>3.1 Mathematics</b>       |  |                                    |                                    |                                   |  |
| 3.11                         | <b>UK Share of world citations</b><br>(UK rank among BIS benchmark countries)  | <b>10.0%</b><br>(3 <sup>rd</sup> ) | <b>10.4%</b><br>(3 <sup>rd</sup> ) | <b>9.1%</b><br>(4 <sup>th</sup> ) | <b>9.7%</b><br>(4 <sup>th</sup> )              |
| 3.12                         |  |                                    |                                    |                                   |  |
| 3.13                         | <b>UK citation impact relative to world average for field and year</b><br>(UK rank among G8 countries excl. Russia <sup>14</sup> ) | <b>1.38</b><br>(2 <sup>nd</sup> )  | <b>1.42</b><br>(1 <sup>st</sup> )  | <b>1.28</b><br>(2 <sup>nd</sup> ) | <b>1.43</b><br>(2 <sup>nd</sup> )              |
| 3.14                         |  |                                    |                                    |                                   |  |
| <b>3.2 Physical Sciences</b> |  |                                    |                                    |                                   |  |
| 3.21                         | <b>UK Share of world citations</b><br>(UK rank among BIS benchmark countries)  | <b>12.1%</b><br>(4 <sup>th</sup> ) | <b>9.5%</b><br>(4 <sup>th</sup> )  | <b>9.9%</b><br>(5 <sup>th</sup> ) | <b>9.1%</b><br>(5 <sup>th</sup> )              |
| 3.22                         |  |                                    |                                    |                                   |  |
| 3.23                         | <b>UK citation impact relative to world average for field and year</b><br>(UK rank among G8 countries excl. Russia <sup>14</sup> ) | <b>1.67</b><br>(2 <sup>nd</sup> )  | <b>1.46</b><br>(2 <sup>nd</sup> )  | <b>1.62</b><br>(1 <sup>st</sup> ) | <b>1.63<sup>15</sup></b><br>(3 <sup>rd</sup> ) |
| 3.24                         |  |                                    |                                    |                                   |  |
| <b>3.3 Engineering</b>       |  |                                    |                                    |                                   |  |
| 3.31                         | <b>UK Share of world citations</b><br>(UK rank among BIS benchmark countries)  | <b>8.7%</b><br>(4 <sup>th</sup> )  | <b>8.1%</b><br>(5 <sup>th</sup> )  | <b>7.8%</b><br>(5 <sup>th</sup> ) | <b>7.7%</b><br>(3 <sup>rd</sup> )              |
| 3.32                         |  |                                    |                                    |                                   |  |
| 3.33                         | <b>UK citation impact relative to world average for field and year</b><br>(UK rank among G8 countries excl. Russia <sup>14</sup> ) | <b>1.21</b><br>(3 <sup>rd</sup> )  | <b>1.19</b><br>(3 <sup>rd</sup> )  | <b>1.23</b><br>(3 <sup>rd</sup> ) | <b>1.22</b><br>(3 <sup>rd</sup> )              |
| 3.34                         |  |                                    |                                    |                                   |  |

<sup>10</sup> Citation Shares for 2005/06 are based on 2004 citation data

<sup>11</sup> Citation Shares for 2006/07 are based on 2005 citation data

<sup>12</sup> Citation Shares for 2007/08 are based on 2007 citation data. Subject-level data on un-cited publications was reported in last year's EIRF. However, it is no longer included in the underlying report prepared for BIS by Evidence Ltd. and hence is not available for 2007/08

<sup>13</sup> Citation Shares for 2008/09 are based on 2007 citation data. Subject-level data on un-cited publications was reported in last year's EIRF. However, it is no longer included in the underlying report prepared for BIS by Evidence Ltd. and hence is not available for 2007/08

<sup>14</sup> Citation impact data for Russia was not available in the PSA target indicators report

<sup>15</sup> The differences in the citation impact scores for the top 3 countries in the G8 comparator group are marginal for physical sciences (Germany 1.67, USA 1.65, UK 1.63)



3.2. This performance is also delivered more efficiently, with UK productivity in terms of citations second only to the USA (with the exception of Engineering where it lies 4<sup>th</sup>), and the UK has an impact of 1.2 to 1.5 times the world average. Alternative indicators that may be considered include:

- **The proportion of a country’s output which is regarded as “highly cited”.** By this measure, the UK is 3<sup>rd</sup> overall in the EPS disciplines (including Engineering) and produces 8-12% of the world’s output.
- **The proportion of a country’s output which lies in the world’s most cited 0.1% of papers in a field.** By this measure, the UK ranks 2<sup>nd</sup> overall in the EPS disciplines and produces 6-16% of the world’s output

3.3. Table 4 provides three further measures describing the aggregate output from EPSRC research grants. The number of publications reported in 2008/09 has increased significantly compared to 2007-08, due to the larger number of grants that ended and were assessed during the year. However, the average number of publications reported per grant has remained relatively constant over the last three years. International engagement of EPSRC-supported researchers remains healthy: approximately one quarter of publications reported on grants have an international co-author and over half of completed grants have at least one internationally co-authored paper.

**Table 4 Research Publications**

| Ref. | Metric  | 2005/06       | 2006/07       | 2007/08       | 2008/09       |
|------|---|---------------|---------------|---------------|---------------|
| 4.1  | <b>Number of publications per year from EPSRC research grants.</b>  | <b>19,095</b> | <b>22,687</b> | <b>19,652</b> | <b>34,649</b> |
| 4.11 | <i>Average number of publications per grant</i>   | <i>14.1</i>   | <i>16.4</i>   | <i>20.1</i>   | <i>17.0</i>   |
| 4.2  | <b>Joint international publications as a proportion of all publications arising from EPSRC research grants.</b> | <b>27%</b>    | <b>22%</b>    | <b>25%</b>    | <b>24%</b>    |
| 4.3  | <b>Percentage of completed grants reporting at least one published paper with an international co-author.</b>   | <b>51%</b>    | <b>54%</b>    | <b>56%</b>    | <b>51%</b>    |

**(Human capital)**

3.4. EPSRC grant holders represent approximately 40% of the UK active researchers<sup>16</sup> in engineering and physical sciences (EPS), as shown in Table 5. Demographic analysis using HESA data shows that a 1.8% increase has been recorded this year in staff under 35 matched by a similar decrease in the proportion of staff over 50. Overall, the age distribution is remaining fairly stable.

3.5. EPSRC is investing substantially to help more academics to establish themselves as successful researchers regardless of the stage they are at in their careers. Table 5 shows how the number of current research fellowships (including Senior

<sup>16</sup> Data here is derived by comparing EPSRC grant records with the annual staff data returns made by universities to HESA

Research Fellows) has been increased year on year to 353 in 2008/09<sup>17</sup>. This also includes 23 Career Acceleration Fellowships and 23 Leadership Fellowships.

**Table 5 Academic Staff**

| Ref. | Metric   | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|------|--|---------|---------|---------|---------|
| 5.1  | Number of permanent academic staff for EPSRC-related disciplines   | 16,353  | 16,745  | 17,762  | 19,104  |
| 5.2  | % of EPSRC funded researchers relative to total number of UK active researchers in engineering and physical sciences | 41%     | 36%     | 40%     | 38%     |
| 5.3  | Age demographic for permanent academic staff in EPSRC related areas <sup>18</sup>                                    |         |         |         |         |
| 5.31 | Proportion aged under 35 yrs   | 12.2%   | 12.0%   | 12.7%   | 14.5%   |
| 5.32 | Proportion aged over 50 yrs  | 36.3%   | 36.0%   | 35.6%   | 34.9%   |
| 5.4  | Number of current EPSRC Fellowships  | 289     | 313     | 333     | 353     |

- 3.6. EPSRC is a major funder of PhD training and funds 30% of all students in the EPS disciplines.
- 3.7. Two types of information are presented in Table 6: estimates of the total numbers of students supported and starting each year, based on the training grant spend and the notional cost of supporting a student, and actual numbers of students as reported to us by the universities.

<sup>17</sup> The data in this table is the same as in Table 2 **except** that this time *Senior Fellows are included*. Senior Media Fellowships (covered under Public Engagement), Daphne Jackson Fellowships, Research Chairs, Professorial Research Fellowships, and Fellowships awarded jointly with the Royal Society and the Royal Academy of Engineering are all excluded.

<sup>18</sup> The proportions are derived from HESA data and reflect returns from HEIs for the academic year two years prior to the report year

**Table 6 Research Students<sup>19</sup>**

| Ref. | Metric  | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|------|---|---------|---------|---------|---------|
| 6.1  | <b>Total Estimated PhD students supported<sup>20</sup></b>            | 7,692   | 8,070   | 8,240   | 9129    |
| 6.11 | <b>Estimated new PhD students supported</b>                           | 2,198   | 2,306   | 2,354   | 2,608   |
| 6.2  | <b>Number of new PhD students reported starting by Universities</b>   | 2,291   | 2,192   | 2,082   | 1,855   |
| 6.21 | number via Collaborative Training Accounts <sup>21</sup>              | 333     | 339     | 367     | 217     |
| 6.22 | number via Doctoral Training Accounts <sup>22</sup>                   | 1,600   | 1,520   | 1,405   | 1,342   |
| 6.23 | number of Engineering Doctorate Students                              | 141     | 149     | 141     | 117     |
| 6.24 | number of students at the Life Science Interface                      | 72      | 91      | 98      | 106     |
| 6.3  | <b>Number<sup>23</sup> (and %) in 'Roberts' Skill Shortage Areas:</b> |         |         |         |         |
| 6.31 | <b>Engineering</b>  | 512     | 464     | 478     | 373     |
| 6.32 |   | (22%)   | (21%)   | (23%)   | (19%)   |
| 6.33 | <b>ICT</b>  | 272     | 220     | 270     | 224     |
| 6.34 |   | (12%)   | (10%)   | (13%)   | (12%)   |
| 6.35 | <b>Materials</b>  | 342     | 305     | 293     | 258     |
| 6.36 |   | (15%)   | (14%)   | (14%)   | (13%)   |
| 6.37 | <b>Statistics / Operational Research</b>                              | 67      | 46      | 54      | 54      |
| 6.38 |   | (3%)    | (2%)    | (3%)    | (3%)    |

- 3.8. EPSRC encourages universities to combine funding from EPSRC with funding from other sources in order to maximise the number of students supported. As a result the actual number of students supported will be more than the notional number; balancing this, universities may offer also higher stipends to attract/retain the best students in key areas, and this will tend to reduce the number of students supported. It is clear from data received from Universities that consistent percentages of students are being recruited into the 'Robert's skill shortage areas'.
- 3.9. Table 8 shows that the gender balance remains relatively stable: around 22% of all EPSRC PhD students and approximately 23% of research assistants and fellows are female.

<sup>19</sup> Data reported in 6.2 *et. seq.* in this table is derived from returns submitted by Universities and is subject to change as more submissions are received.

<sup>20</sup> Estimated numbers include students supported through Doctoral and Collaborative Training Grants and project students.

<sup>21</sup> Includes students supported through the following schemes: CASE for New Academics (CNA); Collaborative Research Student (CTA); Industrial CASE Student.

<sup>22</sup> Includes students supported through the following schemes: Earmarked Award: Analytical Science (DTG); Earmarked Award: Mathematics CASE (DTG); EPSRC/ESRC Studentship; International Doctoral Scholars (IDS grant); Standard Research Student (DTG)

<sup>23</sup> Figures for 2005/6, 2006/7 and 2007/8 have been re-stated. Data for 2008/9 is subject to change as more submissions are received from Universities and will be re-stated in subsequent EIRF submissions.

**Table 8 Diversity**

| Ref. | Metric  | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|------|---|---------|---------|---------|---------|
| 8.1  | Proportion of female EPSRC-funded PhD students          | 25%     | 25%     | 25%     | 22%     |
| 8.2  | Proportion of female EPSRC-funded RAs                   | 21%     | 18%     | 21%     | 22%     |
| 8.3  | Proportion of female EPSRC-funded Fellows <sup>24</sup> | 20%     | 19%     | 20%     | 23%     |

- 3.10. The Research Councils, through the RCUK Research Careers and Diversity Unit (RCDU) have collaborated with the Equality Challenge Unit on a mapping study of equality data in higher education. Jointly with the Higher Education Statistics Agency (HESA) and the funding councils, we are now working to fill the gaps and improve the data on which the research councils can draw in the future.
- 3.11. The Research Councils are also working together to obtain better information on the career paths followed by those who have completed research studies, to contribute to the evidence of outcomes from investments in research training and the impact of research graduates. An analysis of options for the collection of information relating to UK doctoral graduates reported in April 2008. Following the recommendation of the report, data will be gathered through an enhancement of HESA's survey of the destinations of leavers of higher education (DLHE), seeking responses from all the research graduates who responded to the 2005 DLHE survey, (shortly after their graduation). This will build a picture of their career path roughly 3 ½ years after graduation. The analysis will also inform future phases of the study as it follows doctoral graduates' career paths over a number of years. In addition to HESA reports, the Research Councils will commission analysis to inform the higher education sector, policy development and graduates' decisions about their career options. This, along with the analysis of the HESA reports, will be available in autumn 2009.

## 4. Framework Conditions

### 4.1 Public Engagement

#### **Cross-Council activities delivered through the RCUK Public Engagement with Research (PER) Team**

The Research Councils together funded £2.4 million of public engagement initiatives through the RCUK Public Engagement with Research (PER) team (formerly the RCUK Science in Society team) in 2008/09. Our vision is to enable society to value and have confidence in research processes and outputs and to lead a broad spectrum of public engagement activity that has research and researchers at its heart.

<sup>24</sup> Fellowships included here are: Advanced Fellowships; EURYI; Postdoctoral Research Fellowships; Springboard Fellowships; Statistics Mobility Fellowships; Career Acceleration Fellowships and Leadership Fellowships.

### *Finding out what people think*

RCUK PER team has ensured public engagement adds benefit and impact to the cross-Council priority theme programme plans. Information on what people think has contributed toward Research Council policy and research strategy development within these themes. Two cross-Council themes have received RCUK funding for public engagement in 2008/09.

### *Reaching young people - support and encourage young people to engage with contemporary research and follow R&D careers*

We fund a range of initiatives<sup>25</sup> which support both the ages 5-19 Department for Children, Schools and Families "STEM" programme objectives and researchers who wish to carry out public engagement with young people and the schools sector. Our policy focus in this area has developed significantly in the last year, and is now changing from providing unique support and opportunity for teachers and young people to additionally ensuring support to our researchers in terms of their own skills development. A resource for the research community will be the first major output of this policy development in 2009.

### *Encourage researchers to engage with the public*

The Research Councils also continue to invest significantly in encouraging researchers to engage with the public through the Beacons for Public Engagement initiative (£9.2m over four years with the funding councils and the Wellcome Trust). The scheme has established six university-based collaborative centres and a National Coordinating Centre to support, recognise, reward and build capacity for public engagement within HEIs. RCUK along with other funders are now considering the legacy of this pilot programme and ways of further embedding public engagement in the HE sector.

RCUK has also been compiling an evidence base which demonstrates the benefits that undertaking public engagement can have for researchers and their research. A publication aimed at the research community will be published in 2009.

### *Keep people informed and up to date about RC-funded research*

RCUK PER team has also led on joint activity at a science and art festivals in the UK (e.g. Cheltenham Science Festival). The RCUK PER funded Darwin Today exhibition, led by BBSRC, is currently touring the UK and will have been to over 30 venues (such as science festivals, cathedrals, schools and museums) by the end of Darwin Year 2009 (potentially reaching over 60,000 people). RCUK PER has also contributed funding to the BIS Science:[So What? So everything] campaign.

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<sup>25</sup> For example, our major schemes to bring researchers and schools together are 1) Researchers in Residence – a placement and training scheme for researchers wishing to work with schools. RCUK researchers were funded for placements in 153 UK secondary schools in 2008 2) Contemporary Science in the Classroom – a teacher CPD initiative which supports researchers and teachers working together to overcome barriers to teaching the curriculum. It is anticipated that by March 2011 that at least 1200 teachers will have received CPD. RCUK also provides teacher resources through SchoolsScience.co.uk which received over 80,000 hits in 2008 3) BA CREST – RCUK part funds this nationally recognised accreditation scheme for science and technology projects. Over 18,000 prizes were awarded in 2008 (across whole scheme) 4) Nuffield Bursaries – support for students to carry out projects in research environments working alongside practising scientists. 100 young people were funded directly by RCUK in 2008.

## **The EPSRC's Public Engagement Programme**

EPSRC has continued to successfully stimulate engagement between the research community and the public, and to ensure that current scientific issues and related ethical questions are widely covered.

The Societal Issues Panel (SIP), formed in 2006/07 and chaired by Sir Robert Winston, has developed and articulated a strategy by which it can help EPSRC and the research community respond to societal concerns and issues. During 2008/09 SIP:

- Developed a bespoke framework of reference to assess the societal and ethical issues associated with the digital economy research area.
- Promoted the “Nanotechnology for Healthcare” public dialogue exercise and, based on the outcomes, formulated advice to Council about a policy for employing public dialogues as a generic tool for developing strategy.
- Following on from the Nanotechnology dialogue, discussed the potential societal and ethical issues associated with synthetic biology and initiated a joint EPSRC/BBSRC activity to gauge and understand the public's perceptions, aspirations and concerns around this area of science.

The NOISE (New Outlooks in Science & Engineering) campaign recruits young scientists from across the spectrum of science and engineering providing a rich variety of highly visible and accessible opportunities for interaction between them and the public. Through participation in the BA Festival of Science, web diaries, online videos, and numerous other activities, the programme has continued to raise awareness of science and engineering among young people. In 2008/09, over 5 million people had the opportunity to see, read or hear about NOISE via media activity including press articles (The Guardian Newspaper, Science Worlds UK, The Times Newspaper), and participation in broadcasts on national and local radio. NOISEmaker Guy Billings attempted to replicate the Large Hadron Collider experiment at CERN on BBC Radio 4 and two NOISEmakers participated in the Naked Scientists programme on BBC Radio Cambridgeshire. This series of live programmes- which are supported by EPSRC, achieved a global weekly audience of around 1 million and over 50,000 podcast downloads per week.

EPSRC Senior Media Fellows play a key role in communicating the excitement and value of science to society. During 2008/09, Professor Marcus du Sautoy featured in the BBC's horizon programme in which he took over 2 million viewers through a 300,000 year history of maths. Professor Jim Al- Khalili presented a high-profile, 3-part series on “Science and Islam” for the BBC which attracted half a million viewers. Professor Trevor Cox, entered the Guinness Book of Records at the Street Vibe Festival of Sound in London 2008 for producing and demonstrating the world's largest musical cushion that was used demonstrate the principles of acoustics to the general public.

EPSRC also supported and participated in a number of high profile events aimed at raising the profile of science in society and encouraging collaboration between researchers and business. Pioneers 09, attended by over 700 and with outreach to millions via high-profile media coverage, brought together forward-thinking UK researchers and business people. It included a dynamic, interactive exhibition highlighting examples of leading-edge university research from over 20 top UK research groups. The EPSRC was a major sponsor and contributor to the Cheltenham Science Festival. This year over 35,000 people attended the event making it one of the biggest science festivals in the world. The event was attended by NOISEmakers, Senior Media Fellows, public engagement award holders

and members of the EPSRC-sponsored Bloodhound SSC education programme-an innovative project aimed at inspiring a new generation of British technologists, scientists and mathematicians. EPSRC also used this event to launch its “Impact!” campaign which demonstrates the impact of EPSRC funded research on society and the economy.

December 2008 saw the launch of our quarterly magazine-Pioneer-which highlights the research we fund through engaging features, personal profiles and thought provoking opinion pieces. The magazine is published via the EPSRC website and circulated in paper form to over 6000 key university and business contacts.

Spending by the Public Engagement programme is shown in Table 9. Of this, £2.3M was invested in Partnerships for Public Engagement (PEP) awards. Payments in respect of Additional Programme expenditure on PEP totalling £4.7M were also made on behalf of the Research Council’s UK.

**Table 9 Public Engagement**

| Ref. | Metric  | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|------|---|---------|---------|---------|---------|
| 9.1  | Public Engagement Programme Spend <sup>26</sup> | £2.9M   | £3.9M   | £4.2M   | £7.1M   |
| 9.2  | Number of Senior Media Fellows at 31 March      | 3       | 6       | 7       | 8       |
| 9.3  | Press Releases covering EPSRC Remit Area        | 55      | 47      | 49      | 61      |

## 4.2 Financial Sustainability

The figures in Table 11 show that the reported<sup>27</sup> levels of investment in the research base have been delivered against a background trend of improving efficiency, while EPSRC’s contribution to the savings made by all Research Councils has increased year on year. The biggest contributor to the increased efficiency savings (nearly 81% of the £58.4M) has been from re-prioritisation of programme spending and includes the following key elements:

- £15.6M from growth in Science and Innovation Awards
- £15.1M from growth in student training
- £16.5.M from growth in the energy programme

<sup>26</sup> Expenditure on public engagement activities also takes place across the portfolio (i.e. in addition to the Public Engagement Programme). Includes Payments in respect of Additional Programme expenditure on PEP totalling £4.7M made on behalf of the Research Council’s UK.

<sup>27</sup> Figures are taken from quarterly statements submitted to BIS as part of the RCUK VfM Efficient Delivery Project

**Table 11 Administration Efficiency**

| Ref.        | Metric                                       | 2005/06       | 2006/07       | 2007/08       | 2008/09       |
|-------------|--|---------------|---------------|---------------|---------------|
| <b>11.1</b> | <b>Net Annual Administration Expenditure</b> | <b>£17.1M</b> | <b>£20.2M</b> | <b>£23.1M</b> | <b>£20.1M</b> |
| 11.11       | (% of Annual Net Expenditure)                | (3.0%)        | (3.1%)        | (3.1%)        | (2.6%)        |
| <b>11.2</b> | <b>RCUK VfM efficiency savings – Value</b>   | <b>£13.1M</b> | <b>£29.8M</b> | <b>£52.6M</b> | <b>£58.4M</b> |
| 11.21       | <b>Achieved</b>                              | 17%           | 18%           | 21%           | 34%           |
| 11.22       | % of Cross Council savings achieved          | (£8.0M)       | (£17.1M)      | (£32.1M)      | (£22.7M)      |
| <b>11.3</b> | <b>Administration savings: Value</b>         | <b>£1.8M</b>  | <b>£1.4M</b>  | <b>£7.0M</b>  | <b>£5.7M</b>  |
| 11.31       | (Administration savings: Target)             | (£0.4M)       | (£1.3M)       | (£2.2M)       | (£0.8M)       |

The international competitiveness of the UK research base is underpinned by access to high quality facilities ranging from university based centres for specialised instrumentation (e.g. electron microscopy) to major international facilities in the UK and Europe.

This relationship was emphasised by the 2008 International Review of Materials Research in the UK (sponsored by EPSRC and the Institute of Materials), which found that such facilities have helped the UK establish a lead in research into the physical properties of materials, and noted that this plays a special role in - and contributes visibly to - the international competitiveness of the UK. Most recently, the 2009 International Review of Chemistry concluded that UK chemistry derives enormous strength from recent large investments in infrastructure, shared equipment and national user facilities such as ISIS and Diamond.

A recent key investment by EPSRC (amounting to almost £48M in to date) is HECToR – the most advanced super-computer in the UK. It will play a key role in keeping researchers at the forefront of their fields and is already delivering the largest known direct numerical simulation of turbulent fluid flows in the UK in research of crucial importance to the aerospace industry. A return on the investment made in HECToR is already being seen. A group of researchers at the University of Cambridge have used HECToR to simulate the behaviour of flames in turbulent air, the results of which are being used by power and transport industries in the development of engines with higher performance and lower emissions.

EPSRC investment in facilities is by one of two principal routes: it is either a component of the spend on research grants ('equipment' is a budget line that may be requested as a resource on a grant); or for the more significant national facilities, it may be the subject of a separate capital grant. The figures given in Table 12 demonstrate both a consistently high level of investment made through research grants and the significant volume of additional investment in equipment.



**Table 12 Support to Research Facilities Infrastructure**

| Ref. | Metric   | 2005/06       | 2006/07       | 2007/08       | 2008/09       |
|------|--|---------------|---------------|---------------|---------------|
| 12.1 | Spend on Research Equipment & Facilities <sup>28</sup> | £93.4M        | £107.4M       | £123.8M       | £97.7M        |
| 12.2 | <i>Spend on Research Equipment<sup>29</sup></i>        | <i>£53.9M</i> | <i>£66.6M</i> | <i>£53.3M</i> | <i>£54.3M</i> |
| 12.3 | <i>Spend on Facilities<sup>30</sup></i>                | <i>£39.5M</i> | <i>£40.8M</i> | <i>£70.5M</i> | <i>£43.4M</i> |

## 5. Knowledge Exchange Efficiency

5.1. The strengthening of knowledge transfer between the research base and industry is a key component in EPSRC's strategy to achieve greater economic impact from the research it funds. Interactions between Research Councils and the Technology Strategy Board (TSB) are a key element of government strategy to boost the percentage of R&D spend in the UK and ensure closer links in the science base and business. EPSRC-funded research forms a basis for much of the next-stage work of the TSB. To date EPSRC has contributed over £90 million towards collaborative research in partnership with the TSB. Examples of projects funded with TSB include:

- Low Carbon Vehicles Integrated Delivery Programme. EPSRC contributed £10M to this £200M programme that will help meet Government and consumer demand for more environmentally-friendly vehicles. This initiative is already creating business opportunities for established industry players and innovative new entrants.
- An investment of £1M from EPSRC and £7M from TSB has enabled the commercialisation of innovative lighting technology developed by EPSRC-funded researchers.
- A joint TSB/ EPSRC investment of £20M has been matched by £20M of private money in projects that will help British manufacturers stay ahead of the competition. Projects include the development of carbon neutral construction products and mouldable car parts made from sustainable resources.

5.2. Overall, expenditure on research that is collaborative with users increased by around 22% over the past 3 years and spending on collaborative and vocational postgraduate training increased by nearly 10%. To encourage further collaborative training, EPSRC has introduced a notional 10% conversion to CASE target to Doctoral Training Grant holders. The effects of this will be evaluated as part of next year's EIRF submission. A significant increase has been noted in the user resource committed on new research grants per annum, rising to £198.2M in 2008/09 (£74M of which is user resource committed to the 45 Centres for Doctoral Training announced in December 2008). The number of companies that engage in collaborative research has grown by around 15% since 2005/06 to over 2300 in 08/09 (Table 13). Of the £199M total spent by EPSRC on collaborative research,

<sup>28</sup> Figures from earlier years have been restated and summed. The total spend includes the amount reported in EPSRC Annual Reports as 'Trends in equipment investment – capital grants'

<sup>29</sup> Spend on Research Equipment is incurred against the 'equipment' budget lines of research grants.

<sup>30</sup> Spend on Facilities in 2007/08 includes £30M investment in the HECTOR Supercomputer

nearly 60% was on targeted collaborative research activity, and the remainder was on researcher-led or responsive mode projects.

**Table 13 Collaboration intensity**

| Ref.   | Metric  | 2005/06       | 2006/07        | 2007/08        | 2008/09        |
|--------|---|---------------|----------------|----------------|----------------|
| 13.1   | <b>EPSRC spend on collaborative research<sup>31</sup> with users</b>                        | <b>£156M</b>  | <b>£151M</b>   | <b>£178M</b>   | <b>£199M</b>   |
| 13.1.1 | <i>(% of total net spend on research grants)</i>  | <i>(43%)</i>  | <i>(36%)</i>   | <i>(37%)</i>   | <i>(43%)</i>   |
| 13.2   | <b>Number of user organisations collaborating on current research grants</b>                | <b>2,007</b>  | <b>2,036</b>   | <b>2,309</b>   | <b>2,366</b>   |
| 13.3   | <b>Number of user organisations reported engaged in collaborative training<sup>32</sup></b> | <b>259</b>    | <b>254</b>     | <b>222</b>     | <b>214</b>     |
| 13.4   | <b>User Resource committed on new<sup>33</sup> research grants announced per annum</b>      | <b>£63.0M</b> | <b>£154.7M</b> | <b>£115.1M</b> | <b>£198.2M</b> |
| 13.5   | <b>EPSRC net spend on collaborative and vocational postgraduate training<sup>34</sup></b>   | <b>£52.5M</b> | <b>£56.0M</b>  | <b>£57.9M</b>  | <b>£55.9M</b>  |
| 13.6   | <b>Number of collaborative studentships reported starting during the year<sup>32</sup></b>  | <b>666</b>    | <b>605</b>     | <b>538</b>     | <b>472</b>     |
| 13.7   | <b>Spend on programmes to promote commercialisation and enterprise</b>                      | <b>£0.7M</b>  | <b>£1.3M</b>   | <b>£2.9M</b>   | <b>£4.7M</b>   |

5.3. EPSRC is extending the focus of support for knowledge exchange beyond direct collaborative research grants by engaging with users at a strategic level. This includes ensuring adequate user representation on our policy and advisory bodies such as Council, the User Panel, the Societal Issues Panel and our Strategic Advisory Teams which provide advice to Heads of Programmes: approximately one third of members are research users drawn from sectors such as industry, commerce, and government. In addition EPSRC ensures user views are also represented within our normal peer review process, with approximately 15% of the peer review college drawn from the research user community. EPSRC aims to increase this figure to 25% by January 2010 with the appointment of the new EPSRC peer review college.

5.4. EPSRC has also been strengthening engagement with research users through an expanding programme of Strategic Partnerships. These are formal agreements between EPSRC and other organisations to jointly fund activities such as research and training in areas of interest. Five new university/industry Partnerships were formed this year, with over £81 million research funding from EPSRC and £56 million from the partners. We currently have Strategic Partnerships in a wide range of areas including risk management, flooding, systems engineering, active control, array chemistry, drug delivery, future intelligent transport systems, power

<sup>31</sup> Figure includes co-funded and collaborative research projects. The value of a co-funded grant is shared between EPSRC and the co-funding organisation. A collaborative research grant has a collaborating project partner from a user organisation. 'User organisation' means any organisation except universities, other Research Councils and certain government departments, e.g. the funding councils.

<sup>32</sup> This data is derived from returns submitted by Universities and is subject to change as more submissions are received. Data for 2008/09 will be re-stated for next year's EIRF.

<sup>33</sup> Data re-stated Sept 2009. Significant increase in 2006/07 and 2007/08 due to funding of Innovative Manufacturing Research Centres.

<sup>34</sup> The data represents net spend on Collaborative Training Accounts plus the 11% of net spend on Doctoral Training Accounts which is estimated to be collaborative.

electronics and actuation technology, power systems, and flight deck operations.

- 5.5. The number of organisations engaged through EPSRC’s Strategic Partnerships has almost doubled over the last three years (Table 14). It now stands at 29 organisations which include: Airbus, AstraZeneca, British Energy, E.ON, Philips UK Ltd, Pfizer, CPNI, Cancer Research UK, National Physical Laboratory and GlaxoSmithKline. 6 new partnerships were formed with 5 organisations in 2008/09. The activities supported through strategic partnerships have also increased significantly in number and include: centres and research consortia, engineering doctorates, follow-on projects, calls for research proposals and research chairs.

**Table 14 Collaborator Representation**

| Ref. | Metric   | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|------|--|---------|---------|---------|---------|
| 14.1 | User-representation on EPSRC policy and advisory bodies  | 32%     | 35%     | 30%     | 30%     |
| 14.2 | Number of organisations that engage with EPSRC through a Strategic Partnership agreement <sup>35</sup>       | 17      | 18      | 23      | 29      |
| 14.3 | Number of activities in which EPSRC engages formally in a jointly funded venture with its Strategic Partners | 17      | 24      | 29      | 38      |

- 5.6. Based on information received from HEIs to date, employers contributed £13.3M to collaborative postgraduate training in 08/09 (see Table 15). Analysis of the underlying data shows that the great majority of this support is, as we would expect, related to projects supported through CTAs<sup>36</sup> and in particular Engineering Doctorates; around 10% is due to DTA-supported projects<sup>37</sup> that attract sponsorship from industry. As in previous years, this figure will be re-stated as part of next year’s EIRF.
- 5.7. Table 15 also provides information on the level of user-engagement in the generation of new scientific knowledge arising from EPSRC research grants. It is difficult to draw conclusions about trends here, but it can be noted that approaching 30% of grants give rise to publications with a co-author from industry.

<sup>35</sup> Data re-stated for 2005/06, 2006/07 and 2007/08

<sup>36</sup> CTA – Collaborative Training Account, the principal route through which EPSRC funds collaborative and vocational training – see also Table 6

<sup>37</sup> DTA – Doctoral Training Account, the principal route through which EPSRC funds PhD training – see also Table 6

**Table 15 Collaborator investment**

| Ref. | Metric   | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|------|--|---------|---------|---------|---------|
| 15.1 | Resource contribution of employers to collaborative postgraduate training <sup>38</sup>                      | £12.9M  | £16.8M  | £17.9M  | £13.3M  |
| 15.3 | Percentage of assessed grants with at least one publication with a co-author from industry <sup>39, 40</sup> | 28%     | 30%     | 27%     | 27%     |
| 15.4 | Joint publications with Industry as % of all publications arising from EPSRC Research Grants                 | 8%      | 8%      | 7%      | 9%      |

- 5.8. The number of licences and patents reported arising from EPSRC grants has increased significantly due, in the main, to the large number of finished grants that were assessed in 08/09. Data on the number of spin-out companies is derived from the Final Reports received on finished grants. The number of newly formed spin-out companies being reported has remained stable since 2005/06 with the exception of 2007/08 where a smaller number of Final Reports were received and so less data on spin-out companies was available.

**Table 16 Research Exploitation**

| Ref. | Metric  | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|------|---|---------|---------|---------|---------|
| 16.1 | Number of licences and patents reported <sup>41</sup> | 79      | 93      | 125     | 276     |
| 16.2 | Number of spin-out companies reported                 | 56      | 48      | 26      | 49      |

- 5.9. Caution should be exercised in interpreting the data in Table 17 as annual variations make it difficult to read trends. Nevertheless, the increase in the proportion of research assistants choosing to remain in academia may signal the positive impact of increased stipends and otherwise improved conditions as well, partly, as targeted efforts such as RCUK Academic Fellowship and EPSRC's Science & Innovation Awards designed to build research capacity in areas of strategic importance.
- 5.10. At the same time Table 17 provides encouraging evidence that the wider economy derives significant benefit from those with scientific training who do not choose to pursue academic research careers, with (in 2008/09) over half of PhD students going on to work in business/public service.

<sup>38</sup> Values for 2005-06, 2006-07 and 2007-08 have been restated due to improved data returns from HEIs

<sup>39</sup> Includes 'conference proceedings, journals, refereed journals, books and other'. Data is captured three months after a research grant ends; the values reported are thus conservative since some publications take longer to appear.

<sup>40</sup> The categories of publication on which data is collected were changed in 2006-07; until then they included 'conference papers, journals, patents, books and software; data for 2006/07 has been restated.

<sup>41</sup> Data for 2006/07 and 2007/08 has been restated.

**Table 17 Destinations of Trained Researchers<sup>42</sup>**

| Ref. | Metric   | 2005/06 | 2006/07           | 2007/08 | 2008/09 |
|------|--|---------|-------------------|---------|---------|
| 17.1 | Proportion of EPSRC-funded PhD students who entered Academia <sup>43</sup>   | 35%     | 31%               | 33%     | 32%     |
| 17.2 | Proportion of EPSRC-funded PhD students who entered Business or Public Services <sup>43</sup>  | 36%     | 39%               | 49%     | 53%     |
| 17.3 | Proportion of EPSRC-funded PhD students reported as 'Not Employed' <sup>44,45</sup>  | 22%     | 10%               | 8%      | 6%      |
| 17.4 | Proportion of EPSRC-funded PhD students reported as either "Engaged in Study", "School (education other)", "School teaching or teacher training" or "Other employment (not specified)" <sup>46</sup> | 7%      | 20% <sup>47</sup> | 10%     | 9%      |
| 17.5 | <i>Proportion of EPSRC-funded Research Assistants who entered Academia</i>   | 69%     | 71%               | 76%     | 78%     |
| 17.6 | <i>Proportion of EPSRC-funded Research Assistants who entered Business or Public Services</i>  | 22%     | 22%               | 17%     | 21%     |

<sup>42</sup> Data on PhD Student destinations is derived from the HESA 'DLHE' survey and is the most up to date available. 2008/09 data reflects returns by students who completed their studies in 2006/07 and were surveyed in 2007/08. For ease of comparability the data on Research Assistants (derived from final reports on EPSRC research projects) also relates to those who reported employment destinations to EPSRC during 2007/08.

<sup>43</sup> Data Categories reported are aggregates of sub-categories available from HESA: 'Academia' comprises 'Higher education – academic (Research and Teaching)', 'mainly research' and 'other' 'Business or Public Services' comprises 'Government/public sector - not research related' and 'research related' and 'Industry and commerce - not research related' and 'research related' and 'Research & Development, sector not known'

<sup>44</sup> The HESA data is drawn from students surveyed because their funding recently ended: the 'Not employed' category is not a robust indicator of difficulty in finding employment because students' personal circumstances vary widely and many are still fully engaged in writing-up a PhD thesis.

<sup>45</sup> Destinations classifications were revised and expanded in 2005/06, thus data for the year may not be directly comparable with data for later years. In particular the 'Not Employed' category included those classified in later years as 'Engaged in Study'.

<sup>46</sup> A small proportion of returns were also classified as 'Not Known'.

<sup>47</sup> Three quarters of the students in this category returned as 'Engaged in Study'.