



HM TREASURY



department for  
education and skills

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# Science & innovation investment framework 2004 - 2014

July 2004

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### **HM Treasury contacts**

This document can be accessed from the Treasury Internet site at:

**[www.hm-treasury.gov.uk](http://www.hm-treasury.gov.uk)**

For further information on the Treasury and its work, contact:

Correspondence and Enquiry Unit  
HM Treasury  
1 Horse Guards Road  
London  
SW1A 2HQ

Tel: 020 7270 4558

Fax: 020 7270 5718

E-mail: [ceu.enquiries@hm-treasury.gov.uk](mailto:ceu.enquiries@hm-treasury.gov.uk)

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### **Department for Education and Skills contacts**

For further information on the DfES and its work, contact:

Public Enquiry Unit  
Department for Education and skills  
Castle View House  
East Lane  
Runcorn  
WA7 2GJ

Tel: 0870 000 2288

E-mail: [info@dfes.gsi.gov.uk](mailto:info@dfes.gsi.gov.uk)

### **Department of Trade and Industry contacts**

For further information on the DTI and its work, contact:

Enquiry Unit  
Department of Trade and Industry  
1 Victoria Street  
London  
E14 5HS

Tel: 020 7215 5000

Fax: 020 7215 0105

Email: [dti.enquiries@dti.gov.uk](mailto:dti.enquiries@dti.gov.uk)

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# FOREWORD

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The nations that can thrive in a highly competitive global economy will be those that can compete on high technology and intellectual strength - attracting the highest-skilled people and the companies which have the potential to innovate and to turn innovation into commercial opportunity. These are the sources of the new prosperity.

This is the opportunity. This framework sets out how Britain will grasp it. It sets out how we will continue to make good past under-investment in our science base - the bedrock of our economic future. More than that, it sets out not only how we intend to invest in this great British asset - the world-class quality of our scientists, engineers and technologists - but how we will turn this to greater economic advantage by building on the culture change under way in our universities, by promoting far deeper and more widespread engagement and collaboration between businesses and the science base, and by promoting innovation in companies directly.

While it would be easier to take the short term route - and fail to continue to make the necessary investments for the future - we propose to take the longer term view, to choose science and technology above many other spending priorities. So building on the investment since 1997, including £7 billion invested by Research Councils in over 130 UK Higher Education Institutions and £2.6bn invested in infrastructure in partnership with the Wellcome Trust by 2005-06 this paper sets out the Government's long term investment framework for British science, technology and innovation over the next decade.

At the Budget, we committed to raising science spending faster than the trend rate of growth of the economy. We can now announce that in total, the average annual growth rate for science funding, through the DTI and DfES, in this Spending Review is 5.8 per cent in real terms. DfES funding committed to research will rise to £1.7 billion in 2007-08. The DTI dedicated Science Budget will rise to £3.3 billion in 2007-08. Together, this represents an additional £1 billion funding for science over the Spending Review period.

And because we want Britain to be the most attractive location in the world for science and innovation, we are setting a new and ambitious target of increasing UK R&D investment as a proportion of national income from its current level of 1.9 per cent to 2.5 per cent by 2014 over the next decade.

We recognise the role that Government can play in achieving this. But this stretching target will not be possible without partnership with, and investment from, our co-funders of the science base such as business and charities. So we will continue to work closely with science based companies, along with the scientific community and research charities, to meet this challenge together.

Today the Government responds to the Lambert Review, setting out an agenda for increasing business-university collaboration to create more routes to bring new skills into businesses and to bring new ideas successfully to the marketplace.

And we will set out our plans to drive up the numbers of skilled scientists and engineers; to put the science base on a sound financial footing through better financial management and investment in infrastructure; to support business R&D and to make the best of research across Government, especially in medical research.

We are delighted that over 200 organisations have contributed views to this consultation, including: universities; science, research and knowledge transfer organisations; businesses; non governmental organisations; charities; and RDAs – and we welcome further dialogue as we implement this framework over the coming months and years.

**Gordon Brown**

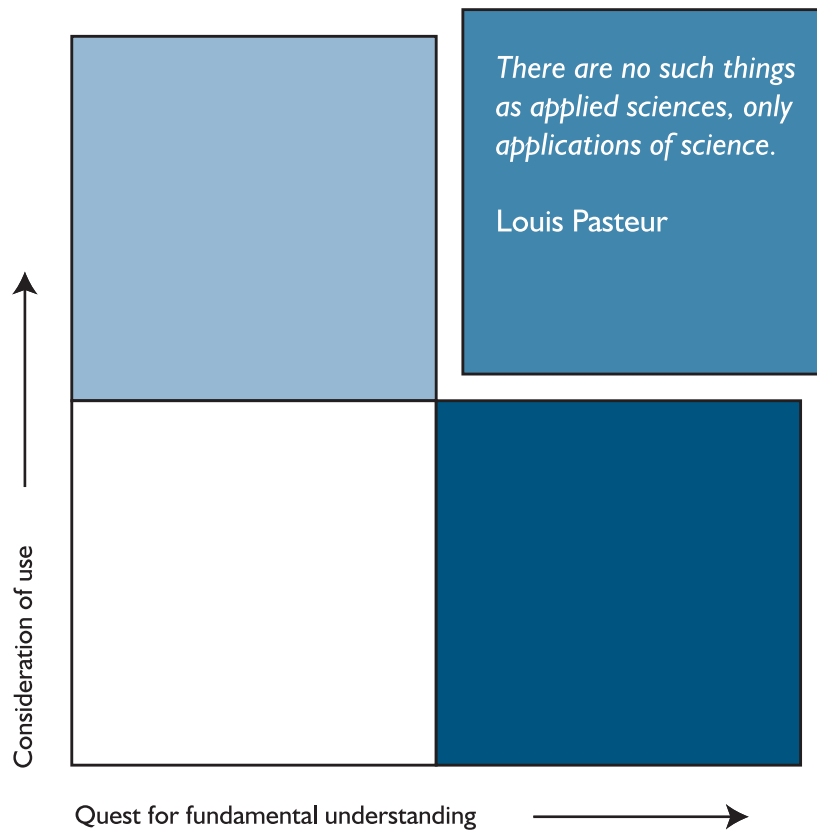
**Chancellor of the  
Exchequer**

**Charles Clarke**

**Secretary of State for  
Education and Skills**

**Patricia Hewitt**

**Secretary of State for  
Trade and Industry**



Pasteur's Quadrant. Basic Science and Technological Innovation. Donald E. Stokes Brookings Institution Press 1997



# SUMMARY

**'He that will not apply new remedies must expect new evils; for time is the great innovator'**

Francis Bacon<sup>1</sup>

**'The most basic proposition of growth theory is that in order to sustain a positive growth rate of output per capita in the long run, there must be continual advances in technological knowledge in the form of new goods, new markets, or new processes.'**

Aghion and Howitt<sup>2</sup>

## BUILDING BRITAIN'S KNOWLEDGE BASE

**1.1** Harnessing innovation in Britain is key to improving the country's future wealth creation prospects. For the UK economy to succeed in generating growth through productivity and employment in the coming decade, it must invest more strongly than in the past in its knowledge base, and translate this knowledge more effectively into business and public service innovation. The Government's ambition, shared with its partners in the private and not-for-profit sectors, is for the UK to be a key knowledge hub in the global economy, with a reputation not only for outstanding scientific and technological discovery, but also as a world leader in turning that knowledge into new products and services.

**1.2** At the core of the UK's knowledge base is its research and development (R&D) capacity, in the public and private sectors, which enables it to create, absorb and deploy new ideas rapidly. Working with partners in the business and not-for-profit sectors, the Government aims to build the UK science, research and innovation system in coming years to deliver the attributes of success set out in Box 1.1.

**1.3** This strategy is supported by clear targets for achievement on all these dimensions, against which the government and others will be able to track performance over the coming decade. The Government will publish an annual stocktake on progress against the attributes of the science and innovation system as set out in the framework, reaching a judgement on progress informed by a range of indicators. To inform periodic reviews of public spending, the Government will conduct every two years a detailed assessment of the progress towards the goals for each attribute. In drawing up this assessment, it will consult widely across departments, and with other stakeholders including the Funders Forum, to reach a balanced judgement about UK-wide progress on science and innovation, and the implications for future policy. This is summarised in Box 1.1 and described in more detail in Annex B. Many of these ambitions are dependent on the actions of other research funders, the private sector, and education institutions and professionals. The Government will therefore use this set of indicators and goals as the basis for a dialogue with stakeholders over the coming years, regarding progress and the contributions of public and private funding and other actions towards achieving the UK's longer term science and innovation goals.

<sup>1</sup> *Essays 'Of Innovations'*, Francis Bacon, 1625

<sup>2</sup> *Endogenous growth theory*, Philippe Aghion and Peter Howitt, the MIT press, 2000

**Box 1.1: Ambitions for UK science and innovation****World class research at the UK's strongest centres of excellence:**

- Maintain overall ranking as second to the USA on research excellence, and current lead against the rest of the OECD; close gap with leading two nations where current UK performance is third or lower; and maintain UK lead in productivity
- Retain and build sufficient world class centres of research excellence, departments as well as broadly based leading universities, to support growth in its share of internationally mobile R&D investment and highly skilled people

**Greater responsiveness of the publicly-funded research base to the needs of the economy and public services:**

- Research Councils' programmes to be more strongly influenced by and delivered in partnership with end users of research
- Continue to improve UK performance in knowledge transfer and commercialisation from universities and public labs towards world leading benchmarks

**Increased business investment in R&D, and increased business engagement in drawing on the UK science base for ideas and talent:**

- Increase business investment in R&D as a share of GDP from 1¼ per cent towards goal of 1.7 per cent over the decade
- Narrow the gap in business R&D intensity and business innovation performance between the UK and leading EU and US performance in each sector, reflecting the size distribution of companies in the UK

**A strong supply of scientists, engineers and technologists by achieving a step change in:**

- The quality of science teachers and lecturers in every school, college and university, ensuring national targets for teacher training are met
- The results for students studying science at GCSE level
- The numbers choosing SET subjects in post-16 education and in higher education
- The proportion of better qualified students pursuing R&D careers
- The proportion of minority ethnic and women participants in higher education

**Sustainable and financially robust universities and public laboratories across the UK:**

- Ensure sustainability in research funding accompanied by demonstration by universities and public laboratories of robust financial management to achieve sustainable levels of research activity and investment

**Confidence and increased awareness across UK society in scientific research and its innovative applications:**

- Demonstrate improvement against a variety of measures, such as trends in public attitudes, public confidence, media coverage, and acknowledgement and responsiveness to public concerns by policy-makers and scientists

The basket of indicators underlying these ambitions is set out in Annex B.

## Investment framework

**1.4** The Government's long-term objective for the UK economy is to increase the level of knowledge intensity in the UK (as measured by the ratio of R&D across the economy to national gross domestic product), from its current level of around 1.9 per cent to 2.5 per cent by around 2014. If achieved, this would put the UK in a position to secure a leading place among the major European countries, and substantially close the gap between the UK and the USA, the best performing innovation-driven major economy.

**Table 1.1: Public and private sector investment in R&D as a percentage of GDP, 2002**

% of GDP	UK	France	Germany	USA
Business	1.24	1.37	1.73	1.87
Public sector	0.62	0.83	0.78	0.80
<b>Total</b>	<b>1.86</b>	<b>2.20</b>	<b>2.51</b>	<b>2.67</b>

**1.5** To achieve this target requires substantial growth in business R&D in the UK. This in turn requires a similarly significant growth in the underpinning investment in the public science base, both to supply the skills and research results into the economy, and also to attract mobile business R&D investment into the UK. As this framework sets out, it will also require a continued strengthening of the linkages between the public and private sector research bases.

**1.6** On the government side, this Spending Review represents a further very substantial investment in the public science base, **increasing funding, through the DTI and DfES, at an average annual rate of 5.8 per cent in real terms over the Spending Review 2004 period (2004-05 to 2007-08)**. At the same time, there are encouraging signs that, following decades of decline, private sector R&D in the UK is beginning to grow again. The Government is committed to driving this partnership with the private sector forward - the central aim of this ten-year framework.

**1.7** The framework sets out the Government's intention to increase investment in the public science base at least in line with the trend growth rate of the economy through the ten-year period, increasing science spending as a proportion of GDP.

**1.8** However, the Government's overall ambition - that overall levels of R&D in the economy should reach 2.5 per cent of GDP - would require a higher rate of annual growth than this across the aggregate private and public sector research bases - an average annual rate of around 5 <sup>3</sup>/<sub>4</sub> per cent from now over the coming decade.

**1.9** This scenario represents a considerable challenge both for Government and for UK business. It can be achieved only if this commitment from Government to invest substantially in the science base is matched by the private sector and leading charitable funding, and in particular that it is clear that private sector R&D funding is on a new and growing trajectory. This investment framework therefore sets out the Government's plans continually to monitor the implementation of the proposals in this framework as well as progress towards the 2.5 per cent target. These are summarised in Box 1.1 and set out in full in Annex B.

**1.10** Achieving this goal would result in a major increase in UK-based R&D, resulting in a stronger platform for the economy to develop higher value-added knowledge-based products and services and to deliver public services more effectively. Moving from 1.9 to 2.5 per cent of GDP invested in R&D would increase UK-based R&D by around £16½ billion (in real terms, 2004-05 prices), some 75 per cent higher than the current level of investment of around £22½ billion.

### **Strengthening the UK science base**

**1.11** The UK science base is one of the most productive and influential systems of publicly funded research in the world. The Government wants to build on this success, by supporting those institutional structures that have underpinned this success to date, and providing the secure and rising investment which will enable successful research centres to grow with confidence. To ensure that the UK's scientific excellence is fully able to inform and be shaped by the challenges facing business and public services in the UK, the Government will take forward a series of reforms to enhance further the translational impact of science into innovation.

**1.12** To fund this development in the next three financial years, the Government is increasing investment in both the core funding of universities and the strategic funding for Research Councils and other programmes sponsored by the Office of Science and Technology. **The average annual growth rate in science funding, through the DTI and DfES, in the Spending Review 2004 period is 5.8 per cent in real terms.**

	2004-05	2005-06	2006-07	2007-08
<b>DTI Office of Science and Technology</b>				
Departmental expenditure limits <sup>3</sup> (£ million cash)	2,575	2,913	3,067	3,282
Average annual real growth rate since 2004-05				5.6%
<b>DfES funding for research and knowledge transfer in English universities</b>				
Departmental expenditure limits (£ million cash)	1,326	1,465	1,589	1,709
Average annual real growth rate since 2004-05				6.0%
<b>UK Total science spending<sup>4</sup></b>				
	4,201	4,701	4,998	5,356
Average annual real growth rate since 2004-05				5.7%
<b>UK science spend as a proportion of GDP (per cent)<sup>5</sup></b>				
	0.36	0.378	0.382	0.390

**1.13** At the heart of the UK science base, the Government remains committed to developing the Dual Support system as the organising principle for funding university research, combining growth in core annual funding for institutions through the Higher Education (HE) Funding bodies, with growth in project and programme funding from the Research Councils. The Government will continue to work with the university sector and all research partners to deliver stronger research outcomes and financial management through reforms aimed at delivering the attributes of a successful science and innovation system, as set out over the following pages.

## World class research at the UK's strongest centres of excellence

**1.14** UK research funding from Research Councils and HE funding bodies will continue to be driven by excellence wherever that may be found. Increases in Research Council and HE Funding Council investments over a sustained period will enable the UK's major research-intensive universities to plan and deliver their own research

<sup>3</sup> Full resource budgeting basis, net of depreciation

<sup>4</sup> Actual outturns are subject to spending decisions by the devolved administrations. In Scotland, Wales and Northern Ireland, funding other than that provided by Research Councils is a devolved matter for their respective administrations. Total funding by the devolved Funding Councils in higher education research and knowledge transfer totalled £354 million in 2004-05, some 21 per cent of the UK total.

<sup>5</sup> Excludes non cash items

strategies more effectively. A comprehensive performance management system being developed by the Office of Science and Technology will provide a more robust mechanism for translating the overall strategic priorities for the science base into specific aims and objectives for the Research Councils and other delivery agents, and will allow the balance of investment across the Science Budget to be adjusted in response to a more strategic view of new priorities.

## **Financially sustainable universities and public laboratories**

**1.15** Recognising that, without some change, the high productivity of the UK science base is not sustainable, the Research Councils will be funded, through to 2007-08, to increase the share of full economic costs which they provide to universities for the projects they sponsor. In turn, universities will need to identify more clearly the full economic costs of projects. **Proposals to Research Councils will be made on a full economic cost basis, funded at a higher proportion of that cost than at present, from September 2005. Thereafter, the Government will provide resources over subsequent spending review periods to enable Research Councils to provide close to the full economic costs of their university-conducted research by early in the next decade, thus enabling universities to invest more of their core funding in supporting projects from other external funders and their own self-directed work. Spending Review 2004 allocates an additional £80 million as the next tranche of investment towards this goal.**

**1.16** The funding bodies will work with the research charities to close the gap between the full cost of charity-sponsored research and the funds currently available from universities and charities. This will entail both rebalancing the support from charities towards infrastructural elements and increasing the public funding support for such research provided through the funding bodies, by up to £90 million in the first stage by 2007-08.

**1.17** The renewal of the UK's research infrastructure in universities will continue to be supported through a dedicated capital fund of £500 million a year, and a parallel renewal process across Research Council Institutes will be supported through additional capital funding of £50 million a year by 2007-08, accompanied by a more strategic approach to capacity planning for Public Sector Research Establishments (PSREs).

**1.18** The Government will continue to work to ensure that UK researchers have access to large scientific facilities. Where substantial UK investment is required for this, priorities will be guided by the Large Facilities Road Map, and funding committed only where there is a good value for money case for investment, as balanced against other research priorities.

## **Greater responsiveness of the research base to the economy**

**1.19** Securing the growth and continued excellence of the UK's public science and research base will provide a platform for successful innovation in the UK by business and public services. The Government's ambition is to foster a strong, vibrant research base which attracts both talented individuals and corporate investment into the UK, and supplies trained personnel and knowledge for the economy. Better integration of the research base with the evolving needs of the economy should support growth in

business R&D and innovation through encouraging multinational firms to invest in the UK, supporting mid-sized firms in raising their R&D intensity towards the best in their industry, and fostering the creation of new technology-based sectors through the creation and rapid growth of new enterprises.

**1.20** The Director General of the Research Councils will agree with each Research Council plans and goals for increasing the rate of knowledge transfer and level of interaction with business, with explicit targets for each Research Council to grow their proportion of collaborative research. The level of interaction with business for each Research Council will be subject to peer review within Research Councils UK (RCUK) and to external challenge by a group which includes business representatives.

**1.21** The new approach to assessing research, through reforms to the Research Assessment Exercise, which will form the basis of the HE funding bodies' allocation of research funding from 2008, will provide greater reward, and thus stronger incentives, for academics to work on both research relevant to users and work which crosses disciplinary boundaries.

## **Increased business investment in R&D, drawing on UK science**

**1.22** Building on the substantial work of the DTI Innovation report and the Lambert Review of Business-University Collaboration, both published in 2003, the Government will commit additional resources through to 2007-08 to help bridge the funding gap between commercial application of new technologies and the underpinning research.

**1.23** The DTI Technology Strategy will provide a clearer framework for setting priorities and improving the effectiveness of support for business innovation. With funding rising to at least £178m by 2007-08 for collaborative R&D and knowledge transfer networks, the DTI will work closely with business to pull through and exploit technologies from the UK and international research base. The Technology Strategy will provide a clear focal point to draw in expert views from business, government and the science base, and in turn will influence national and regional partners in shaping their own investment plans.

## **Knowledge transfer and innovation**

**1.24** Universities will be incentivised to build on the progress made in commercialising their research and working collaboratively with business, through increased funding for the Higher Education Innovation Fund, which will rise to £110 million a year by 2007-08. Public sector research laboratories will be similarly encouraged and funded to develop their own knowledge transfer missions. In addition, responding to the recommendations in the Lambert Review on ways to promote business-relevant research. RDAs will continue to build their capacity to promote science and innovation as a key driver of economic growth. The first steps towards this will be assessed in their tasking framework, which will be finalised in autumn 2004. Each RDA will have a Science and Industry Council by the end of 2004.

## Science, engineering and technology skills: more responsive supply

**1.25** Moving the UK to a higher level of R&D intensity over the coming decade relies fundamentally on improving the flow of people into the economy who are educated in science, engineering and technology (SET) subjects, and on a stronger demand from employers, reinforced by the clear market signals to attract those people into high-value sectors. **As a central part of this framework, the Government's overall ambitions are to achieve a step change in: the quality of science teachers and lecturers in every school, college and university; the results for students studying science at GCSE level; the numbers choosing SET subjects in post-16 education and in higher education; and the proportion of better qualified students pursuing R&D careers.**

**1.26** It is crucial both for the objectives of this framework and for the wider reasons identified in the recent inquiry by Adrian Smith on post-14 mathematics<sup>6</sup> that the Government addresses the problems in mathematics. The DfES's response<sup>7</sup> to the Inquiry in respect of England sets out complementary ambitions and commitments on mathematics.

**1.27** The Government recognises that focusing on teaching and learning outcomes in schools is vital to engaging young people in science and increasing the number of young people studying science. Both a relevant curriculum that gives teachers flexibility to meet the needs of their individual students and a good supply of high quality science teachers are crucial to achieving our overall aims for science.

**1.28** There has already been real improvement in recent years in the recruitment of new graduates and career-changers into science teaching. In addition, the Government strongly encourages schools' efforts to use existing pay flexibilities to recruit and retain high calibre teachers, including in shortage subjects. In this framework, the Government sets out new commitments to:

- **eliminate as far as possible the undershooting of the national Initial Teacher Training targets for science by 2007/08;<sup>8</sup>**
- **double the number of science places on the Graduate Teacher Programme from 2005/06<sup>8</sup> (provided that sufficient demand from schools for places remains);**
- **increase the value of the teacher training bursary for science graduates from £6,000 to £7,000 from September 2005 and raise the 'Golden Hello' for new science teachers from £4,000 to £5,000 for trainees entering PGCE and equivalent courses from September 2005;**
- **deregulate the salaries of science Advanced Skills Teachers (ASTs), including removing the cap on how much they may be paid (subject to the School Teacher Review Body's recommendations), resulting in scientists on the advanced skills scale securing a high minimum pay of £40,000 (£45,000 in London);**

<sup>6</sup> Making Mathematics Count: The Report of Professor Adrian Smith's Inquiry into Post-14 Mathematics Education, February 2004

<sup>7</sup> Making Mathematics Count, The Department for Education and Skills' response to Professor Adrian Smith's Inquiry into Post-14 Mathematics Education, July 2004

<sup>8</sup> Both references to academic years and financial years are made in this document. Using 2005 as an example, the notation used to depict an academic year, starting in September, is as follows: 2005/06. A financial year, starting in April, is depicted with a hyphen, for example: 2005-06

- **train a new cadre of science-specialist Higher-Level Teaching Assistants to enable every secondary school in England to recruit at least one by 2007/08;**
- **improve the quality of science teaching by expanding the continuing professional development opportunities available to science teachers, and enhancing support for the new Science Learning Centres; and**
- **expand substantially the number of undergraduate volunteers supporting pupils learning science, by 2006/07.**

**1.29** The Government also encourages the work by business to develop and promote a model of best practice for their partnership work with schools, including participating in the Science and Engineering Ambassadors programme and giving support to the new network of Science Learning Centres to improve the professional development of science teachers.

**1.30** It is crucial that we ensure students have access to high quality post-16 education in SET. The ability of the sector to recruit and retain a good quality workforce is key to this aim. The Government is already implementing a reform programme for the sector and sets out new commitments in this framework to:

- **undertake immediate, focused research to understand why and when teachers join and leave the sector to inform a long-term strategy to reduce shortages, including in SET, with early indications available by March 2005;**
- **continue ‘Golden Hellos’ for teachers in shortage subjects and increase the amount paid to science teachers (from £4,000 to £5,000) from 2005/06; and**
- **continue supporting, subject to forthcoming evaluation, the bursary scheme for trainee teachers with an expectation that future payments will be increased for science (from £6,000 to £7,000) once data is available on subject specialism from 2005/06.**

**1.31** The post-16 sector also plays a key role in responding to the needs of employers. With input from employer-led Sector Skills Councils, new Regional Skills Partnerships will focus learning providers on meeting skills shortages to help employers meet their need for SET skills at intermediate levels.

**1.32** Higher Education Institutions (HEIs) and the other stakeholders that collaborate closely with them have a crucial role to play in better informing students about the choices they have on entering higher education and in delivering high quality courses. To build on these roles, this framework sets out the following new commitments:

- **the Government welcomes the recommendation of the Lambert Review and will ensure high quality information is provided to prospective students on course quality and employment across subjects by each HEI, by 2006 at the latest. Information on salary outcomes is also valuable for students and this data is being collected systematically for the first time this year. The Government will work with HEIs and the sector bodies to explore the most useful and efficient means of them providing all this information, including through the Teaching Quality Information web-site and HEIs publishing it in their prospectuses, and will report by the end of 2004;**

- to increase participation in physical sciences and engineering higher education, HEFCE will work to increase significantly the science links to schools by supporting HEIs, industry and scientific societies in their outreach activities to schools and colleges;
- HEFCE will now take a more active role in examining the implications that falling science provision may have for student access at the regional level. HEFCE will now consider providing additional funding to university departments if there is a powerful case that falling provision in a particular region would hinder student access to disciplines that are important to national and regional development; and
- HEFCE will set up an expert group, including business and scientific leaders, to review how falling SET provision will affect long-term economic development and the roles to be played by all stakeholders in securing future SET provision.

**1.33** HEIs are developing a more flexible approach to managing their workforces, backed by investment from the Government of £0.5 billion over 2001-06 to support their human resource strategies. To maintain a good stock of high quality staff in SET subjects, it is important for HEIs to adopt a responsive approach to remuneration. In support of their efforts, the Government will commit to:

- increasing the PhD stipend in line with inflation over the SR2004 period and reviewing the stipend rate over the period, implementing any further increases where appropriate; and
- maintaining the funding for 'Golden Hellos' for new teaching staff in shortage subject areas beyond 2005-06, subject to the evaluation showing that the initiative is good value for money.

**1.34** A major issue for the UK is the considerable under-representation of women in SET education and the workforce. This contributes directly to the skills shortage and, left unaddressed, would have a considerable negative economic effect on the UK. The Government will therefore push forward its strategy for **increasing women's participation in SET, including investing £2.4 million in the new resource centre for women over the next three years, to help employers make SET a more attractive career for women.** It will also develop a strategy to address the under-representation of ethnic minorities.

**1.35** It will be important to bring coherence and coordination to the many science, engineering, technology and mathematics initiatives across the education system and review success. **The Government will review, with key stakeholders, the evidence on student participation in shortage subjects in schools, post-16 and higher education, and workforce employment, annually, and will judge the relative balance between supply and demand for those skills over the medium-term and recommend whether there is a need for further action by the Government or by others.**

## **Public confidence in and engagement with science and technology**

**1.36** In pushing forward the boundaries of science and breaking new ground in technological progress, the public needs to have confidence in the ethical and regulatory framework within which these advancements are being made. This

document sets out how the Government promotes public understanding of and engagement with the science base and stresses the need for regulatory and ethical issues to be considered at the emerging stages of new science, when action can be taken to address them head-on.

**1.37** The Government will launch a new grants scheme to build the capacity of citizens, the science community and policy makers to engage in the dialogue necessary to establish and maintain public confidence in making better choices about critical new areas in science and technology. The Government will also work closely with others in the public, charity and private sectors to promote coherence in the growing range of initiatives for encouraging public engagement with science and technology. To support the new grants scheme, and to build upon the Government's other activities to promote public confidence and engagement in science and to sustain the science workforce, the Office of Science and Technology's Science and Society expenditure will increase from £4.25 million per year in 2005-06 to over £9 million per year by 2006-07.

**1.38** This document also reiterates the Government's determination to protect legitimate research activities from animal rights extremists. The Home Office will publish shortly a document setting out in full the approach by the Government and the police to tackling animal rights extremism.

## Science and innovation across government

**1.39** Science and innovation underpin evidence-based policy development and improved service delivery. Within this, excellent horizon-scanning of current science and technology, looking at opportunities and threats at least five to ten years ahead, and often considerably beyond that, is essential to the effective governance and direction of Government policy, publicly funded research and many of the activities of the private sector, and to the interactions between them. Building on the work already taking place in the OST's Foresight Directorate, in Government more widely, and in Research Councils UK (RCUK), the Government's Chief Scientific Adviser will work with RCUK, the Prime Minister's Strategy Unit and Departmental Chief Scientific Advisers across Government to build up a single centre of excellence in science and technology horizon scanning. This will feed directly into cross-government priority setting and strategy formation, improving Government's capacity to deal with cross-departmental and multi-disciplinary challenges. It will also inform and be informed by the Government's strategy for public engagement with science.

**1.40** Government departments' own science and innovation strategies are important components of the UK-wide R&D framework, as are the significant investments in research for the public good made by the charities, particularly those with a health mission. The Government's investment framework for science and innovation should provide a secure backdrop against which public bodies and charities can plan their own research investment strategies. Stronger science base and business R&D in the UK will create good scope for complementary investments by other research partners in the public and not-for-profit private sector. The Government will build on reforms to departmental science in recent years to ensure that even stronger partnerships across government and between public and private sectors are built into the Government's R&D portfolio.

**1.41** Charities play a central role in funding university research in the health arena. As part of the Dual Support system of research funding for the sector, they currently invest some £ $\frac{2}{3}$  billion in the UK science base, of which around £ $\frac{1}{2}$  billion is placed in

universities. In recognition of this, the Government will (as highlighted above) develop stronger public funding for charity-sponsored work, in return for a long-term commitment from the medical, and subsequently other, research charities to sustain investment in the UK science base and rebalance their funding towards the research infrastructure needed to support the science they sponsor.

**Box 1.2: The Wellcome Trust: investing in UK science in partnership with Government**

Since 1998, the Government has developed a productive partnership with the Wellcome Trust to deliver on their shared goals of securing a strong UK science base to meet the country's needs in the biomedical sciences. The Wellcome Trust has invested over £600 million into major capital renewal of the UK's university research infrastructure and major facilities in partnership with the Research Councils. It has also invested with DfES in science learning centres to support professional development of science teachers, and supported joint research programmes with Government (for example, in veterinary science).

Looking forward, the Government's aims for the UK science & innovation investment framework are very closely aligned with those of the Wellcome Trust. In recognition of the current and prospective quality of the UK science base, underpinned by the Government's increased financial support, the Wellcome Trust expects, assuming current levels of investment return, to commit at least £1.5 billion in the UK over the coming five years, with the UK remaining the strong centre of gravity for the Trust's research activity over the next decade. The Wellcome Trust will continue to work with the Government in securing stronger outcomes for health, the economy and public services from investment in the research base, through a series of partnerships including:

- translating research into patient benefit through investment in clinical research, as part of the UK Clinical Research Collaboration. The Wellcome Trust currently spends around £100 million on clinical research and training each year. The Wellcome Trust hopes to build on this investment with further commitment, totaling a further £13 million, in state-of-the-art clinical research infrastructure over the next five years;
- building on the Wellcome Trust's £50 million commitment in public health research and training over the past five years. The Wellcome Trust in looking to the future expects to develop, in partnership with Government and other agencies, innovative schemes to support training and research in the public health sciences;
- using UK research strengths to support international development. Working in partnership with DfID to combat malaria through research, the Wellcome Trust expects to commit around £10 million over the next five years, matched by DfID investment. The Trust is also exploring with DfID the joint development of a capacity building initiative for health research in sub-Saharan Africa; and
- working to secure a robust and vibrant UK university research base, in partnership with other public and private sector funders to promote greater financial sustainability through balanced funding across research activity and infrastructure.

The Wellcome Trust will also continue to work with government to create a regulatory environment that fosters and promotes biomedical sciences in the UK.

**1.42** Building on the Government's strong investment in the National Health Service, and the world class excellence in medical research in the UK's academic and business sectors, the Government is creating a stronger network of public, charitable and private partners to improve the health and wealth benefits from medical research in the UK.

The creation of the UK Clinical Research Collaboration (UKCRC) brings together the Health Departments and the NHS, the Medical Research Council, medical charities, industry and the public to transform the clinical research environment in the UK, providing leadership and taking strategic oversight of clinical research, identifying gaps and opportunities for action, and working in partnership to take advantage of these opportunities.

**1.43** To support this work, the Department of Health (DH) has committed to increase NHS funding for R&D by £25 million per annum for the next four years – an additional £100 million by 2007-08. The DH will in addition work with the NHS to put R&D on a sustainable and transparent footing. This will provide a stronger platform for growth in government investment in medical research, including through the Medical Research Council (MRC), and will complement business and charity-funded clinical research efforts. This should allow the combined budget for medical research and for R&D within the NHS to rise to around £1.2 billion a year by 2007-08.

**1.44** To ensure stronger synergies between the MRC, the Department of Health and NHS on the translation of R&D into patient benefit, the Government has commissioned the creation of the Joint MRC/DH Health Research Delivery Group, working with the Health Departments in the devolved administrations. With a remit to support the work of the UKCRC, this will provide a more coordinated, strategic approach between Government funders of medical research, with resources used effectively and organising joint delivery where appropriate. Taken together, the creation of the UKCRC and the Delivery Group will help to deliver world-class research to benefit patients and the economy, and to ensure that the UK remains a leading player in medical research and the pharmaceutical and biotechnology industries that it supports.

## **Global partnerships, devolved administrations and the regions**

**1.45** The Government's aim is that the UK should be a 'partner of choice' for global businesses looking to locate their R&D, or foreign universities seeking collaboration with the science base or business. Given the devolved nature of UK research funding and industrial policy, it is also important that there are strong connections between international and national R&D networks and the economic plans of the UK's countries and regions. The Government will adopt a more strategic approach to achieving these aims.

**1.46** The Government's Chief Scientific Adviser will lead a cross-government Global Science and Innovation Forum to develop an international strategy based on an analysis of UK performance. This will ensure that UK actions and priorities make the most of international opportunities and take account of the changing economic and research environment, including European action on innovation and R&D, and the Government will pursue a more strategic approach to investment in large research facilities. The Government and devolved administrations will continue to work together with the RDAs on science and innovation policy. This includes following up the Lambert Review's recommendations on building capacity in knowledge transfer and business/HEI interaction, both within and across regions.

## Future developments

**1.47** The achievement of the economic and scientific outcomes targeted by this investment framework will require sustained collaborative working across Government on a range of policies to manage public R&D spending better and secure greater impact for public services and business innovation. This is a core theme of a continuing joint project by the Prime Minister's Strategy Unit (PMSU) and the DTI on wealth creation from innovation and the knowledge economy.

**1.48** Following Spending Review 2004, the PMSU/DTI project team, alongside the Government's Chief Scientific Adviser and his team from the Office of Science and Technology, will carry on work to identify how best to build on the proposals identified by this investment framework. This includes working with departments on their science and innovation strategies, and on how best to secure benefits from collaborative working across Government and with business to make the most efficient use of R&D spend.

## Conclusion

**1.49** The Government is committed to building the UK's capacity to innovate and create wealth for the future through investing with private sector partners in the country's research base. With growing global competition for, and mobility of, capital investment and human talent, this is an increasingly pressing issue for UK economic policy. The Government is committed to following through on the long-term investment framework set out in this document, linked to reforms to improve the operation of the UK innovation system.

**1.50** By its very nature, the precise returns from this innovation system cannot be predicted or managed precisely, and ultimate returns from investments today in education, training and fundamental research will take decades to materialise fully. However, the Government is fully committed to working closely with stakeholders in the research base, business and not-for-profit sector to assess progress on an annual basis towards the long-term goals set out in this framework, and thereby create constructive feedback into the formulation of future policy and funding decisions. The Government believes that, working together, the public and private sectors can successfully increase the knowledge intensity and innovation performance of the UK economy over the coming decade.