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Science and Technology Committee

The impact of spending cuts on science and scientific research

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The Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Government Office for Science. Under arrangements agreed by the House on 25 June 2009 the Science and Technology Committee was established on 1 October 2009 with the same membership and Chairman as the former Innovation, Universities, Science and Skills Committee and its proceedings were deemed to have been in respect of the Science and Technology Committee.

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Summary

The pressure to be seen to be making cuts across the public sector is threatening to undermine both the Government's good record on investment in science and the economic recovery. Since 2004, the Government has been committed to increasing public expenditure on science and research, in the knowledge that the investment would be recouped in a stronger knowledge-based economy.

There is a growing consensus that increased investment in science is essential to maintain the UK's international standing. That argument is made not only in this report but also in the Royal Society's *The scientific century: securing our future prosperity*, and the Council for Science and Technology's *A Vision for UK Research*, both published earlier this month.

Whilst the contribution of a strong domestic science base is widely acknowledged, methodological problems with quantifying its precise value to the economy mean that it is in danger of losing out in Whitehall negotiations. Despite receiving widespread lip service within Government, the sector is having to make the case anew to even hold on to the money it has at the moment after 2011.

Scientists are under increasing pressure to demonstrate the impact of their work, both retrospectively through the proposed Research Excellence Framework and when they apply for research council grants. Many are happy and able to do so, but there is concern within the academic community that areas without immediate technological applications are being undervalued.

Recent advances in improving translation from basic science to viable businesses are welcome, but can only continue for as long as there is a strong and broad research base to draw upon. The Government faces a strategic choice: invest in areas with the greatest potential to influence and improve other areas of public spending, or make cuts of little significance now, but that will have a devastating effect upon British science and the economy in the years to come.

1 Introduction

1. On 24 February 2009, the Prime Minister gave the Romanes Lecture at the Sheldonian Theatre in Oxford. The title of his speech was 'Science and our Economic Future', and he argued that:

> Some say that now is not the time to invest, but the bottom line is that the downturn is no time to slow down our investment in science but to build more vigorously for the future. And so we will not allow science to become a victim of the recession – but rather focus on developing it as a key element of our path to recovery.[1]

2. We welcome the Prime Minister's commitment to protecting science through the recession. Science enables us to address the global and domestic challenges of today and tomorrow, to raise the quality of life and, furthermore, is widely accepted to be an effective vehicle for economic growth. Public Service Agreements (PSA) were introduced in 1998 as a method of setting targets across Government. PSA 4, for which the former Department for Innovation, Universities and Skills (now the Department for Business, Innovation and Skills) was responsible, states that:

> World-class science and innovation in the UK are crucial to maintaining economic prosperity and responding to the challenges and opportunities of globalisation. In the global knowledge economy the UK's competitive advantage will rely on the ingenuity and capabilities of the UK population and will be dependent on the UK having an innovation system that can take advantage of the opportunities on offer.[2]

3. On 9 December 2009, the Chancellor of the Exchequer made his Pre-Budget Report (PBR). In his speech to the House, he announced that the Government would "invest in the dynamic sectors of the future – in digital, bio and low-carbon technology",[3] through a set of targeted measures such as the introduction of the so-called 'patent box'—which will lower corporation tax on income generated from UK innovation—and further investment in the Strategic Investment Fund (SIF), introduced in the 2009 Budget.[4]

4. However, buried in the report itself, a section on 'Prioritising projects and programmes' announced that £600 million would be cut from higher education and science and research budgets "from a combination of changes to student support within existing arrangements; efficiency savings and prioritisation across universities, science and research; some switching of modes of study in higher education; and reductions in budgets that do not support student participation".[5] In its memorandum to our inquiry, the Department for Business, Innovation and Skills (BIS) stated that "the Pre-Budget Report was not a spending review, but it does set out where efficiency savings will be needed by 2012–13.

1 The Prime Minister, 'Science and our Economic Future', The Romanes Lecture 2009, www.number10.gov.uk/Page18472

2 HM Treasury, *Comprehensive Spending Review 2007*

3 HC Deb, 9 December 2009, col 359

4 HC Deb, 9 December 2009, cols 366–7; for further information on the SIF, see paragraph 9 below.

5 HM Treasury, *Pre-Budget Report: Securing the recovery: growth and opportunity*, December 2009, Cm 7747, p 110

These savings will amount to 4 to 5% of the total Government spend on higher education and science and research".[6]

5. Despite this official estimate of between 4 and 5%, Lord Drayson told us that:

> we have to be very clear that the £600 million that has been looked at as an efficiency saving is off a figure which has not been determined yet, and so, therefore, my lack of comfort is due to the fact that I am arguing very strongly for the figure for the overall future research budget [...] You cannot calculate a percentage because you do not know what the CSR numbers are yet. The argument is still to be made and won.[7]

It was not at all clear from the PBR how the figure of £600 million was reached. During an evidence session held by the Business, Innovation and Skills Committee on 19 January 2010, the Secretary of State for BIS (the Rt Hon Lord Mandelson) was asked how the figure of £600 million was reached. His cryptic reply was "That is not quite how I would characterise discussions with the Treasury".[8] **The announcement of a £600 million cut across higher education and science budgets was most unwelcome. Not only does it appear to be an entirely arbitrary figure imposed by Treasury diktat, but it undermines the Government's previously good record on valuing science and higher education.**

6. Taken together, this information caused us great concern, and in light of the messages we had been receiving from academia since the autumn about concerns over funding beyond the current Comprehensive Spending Review (CSR) period, we announced our inquiry on 13 January 2010. We received memoranda from 89 individuals and organisations, and took oral evidence:

a) on 3 February from Lord Broers, Professor Brian Cox, School of Physics and Astronomy, University of Manchester, Nick Dusic, Director, Campaign for Science and Engineering, Sir Peter Williams, Vice-President, The Royal Society, Iain Gray, Chief Executive, Technology Strategy Board, Dr Tony Peatfield, Director of Corporate Affairs, Medical Research Council, Professor Michael Sterling, Chair, Science and Technology Facilities Council, and Professor Alan Thorpe, Chair, Research Councils UK;

b) (b) on 10 February from Professor Michael Arthur, Chair, The Russell Group, Professor Janet Beer, Chair, University Alliance, Professor Les Ebdon, Chair, million+, Professor Paul Wellings, Chair, The 1994 Group, Dr Alastair Hunter, President, University and College Union, Sir Alan Langlands, Chief Executive, Higher Education Funding Council for England, Professor Adrian Smith, Director General, Science and Research, Department for Business, Innovation and Skills, and Professor Steve Smith, President, Universities UK; and

c) (a) on 24 February from the Rt Hon Lord Drayson, Minister for Science and Innovation, and the Rt Hon David Lammy MP, Minister of State for Higher Education and Intellectual Property, Department for Business, Innovation and Skills.

6 Ev 57, para 4; it should be noted that cuts are not expected to take place before 2011-12.

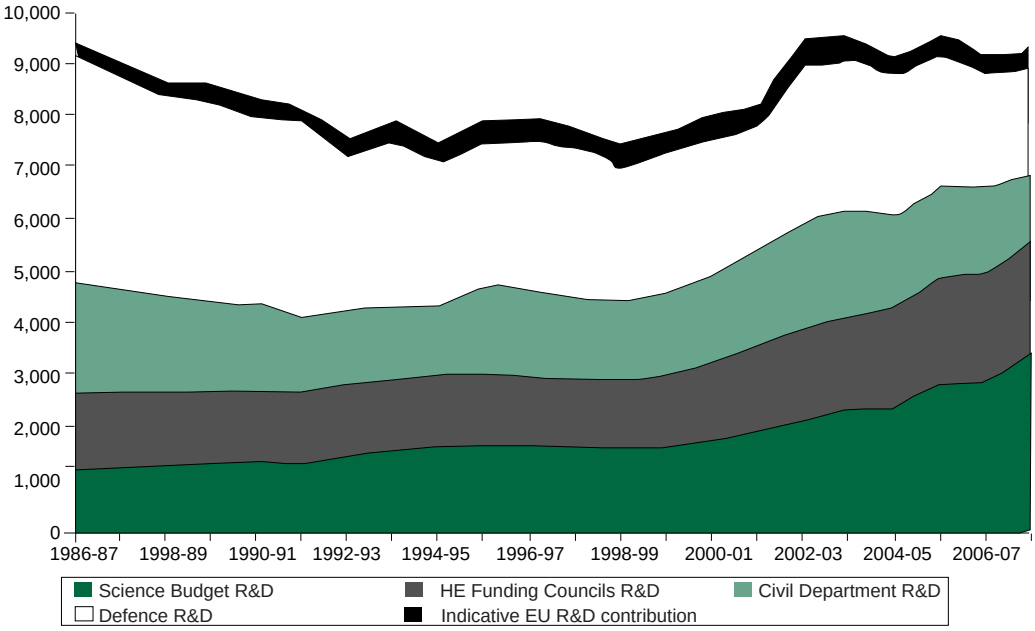
7 Q 288

8 Business, Innovation and Skills Committee, Uncorrected transcript of oral evidence, 19 January 2010, HC 299–i, Q 108

2 Funding science in the UK

7. Science funding in the UK comes from a range of sources: public, charitable and private sector. Public funds are directed to three principal streams. There is the Science Budget, which we discuss in some detail below, QR funding from HEFCE, and departmental research spend. The Science Budget is allocated to the Research Councils which make the detailed decisions, the QR funding is allocated to the universities according to their performance in the Research Assessment Exercise (RAE—soon to be the Research Excellence Framework, REF), and the departments directly administer their own research budgets. The Science Budget, along with some of the departmental research budgets such as the Department of Health's, is 'ring-fenced', meaning that it is protected from being used for other purposes. In practice, this is more complicated than it first seems because what is inside the ring-fence can be increased, thereby stretching it. This breaks the purpose of having a ring-fence and is an issue that deserves further scrutiny.

Figure 1: Sources of public sector investment in science



Source: SET statistics

8. An additional complication is how changes in research spend are tracked over time. For example, this year's SET statistics show a large drop in some departmental R&D spend, much—but not all—of which can be attributed to changes in accounting and definitions of what activities count as R&D. It is not currently possible to track accurately departmental R&D spend over time: it should be straightforward. **These issues—the ring fence, tracking spend on science—are extremely important and we regret that we have not had time to devote a full and detailed inquiry to them. Our successor committee may—especially in the context of a new Parliament—consider exploring the full breadth of science funding in detail.**

9. The Government uses a mixture of direct and indirect methods to fund science, the biggest single component of which is the 'Science Budget', which is worth around £3.5 billion for each year of the current CSR period. Outside of that, science, engineering and technology spending was anticipated as being £2.2 billion in civil government, and £2.6

billion in the Ministry of Defence in 2008–09.[9] The Technology Strategy Board is a non-departmental public body that was created in 2004 and expanded in 2007. Its budget next year will rise to £267 million.[10] It works with government and industry to stimulate "technology-enabled innovation in the areas which offer the greatest scope for boosting UK growth and productivity".[11] The Strategic Investment Fund, worth £750 million between 2009 and 2011 was announced in the 2009 Budget in order to support investments across the UK economy to support growth. Finally, the Government provides tax credits to support private sector investment in research and development. These were worth £790 million in 2008–09.[12]

10. The Science Budget is administered by the Department for Business, Innovation and Skills and allocated to the seven Research Councils, the three national academies (the Royal Society, the Royal Academy of Engineering, and the British Academy) and a number of separate funds which stimulate investment and commercialisation within higher education. The Research Councils account for over four-fifths of the Science Budget in the current Comprehensive Spending Review period.

Table 1: Science Budget Allocations by Research Council, Comprehensive Spending Review 2007

Research Council (£,000)	2008–09	2009–10	2010–11	Total
Arts and Humanities Research Council	103,492	104,397	108,827	316,716
Biotechnology and Biological Sciences Research Council	427,000	452,563	471,057	1,350,620
Economic and Social Research Council	164,924	170,614	177,574	513,112
Engineering and Physical Sciences Research Council	795,057	814,528	843,465	2,453,050
Medical Research Council	605,538	658,472	707,025	1,971,035
Natural Environment Research Council	392,150	408,162	436,000	1,236,012
Science and Technology Facilities Council	623,641	630,337	651,636	1,905,614
Total (Research Councils)	3,111,802	3,239,073	3,395,584	9,746,459
Total Science Budget	3,554,423	3,715,423	3,970,423	11,240,269

Source: Department for Innovation, Universities and Skills, The Allocations of the Science Budget 2008/9 to 2010/11, December 2007, Table 2.1

11. With these funds, the Research Councils invest in a mixture of grants for researchers, postgraduate awards and international subscriptions. Listed below are the major areas of

9 Department for Business, Innovation and Skills, *SET Statistics: Science, Engineering and Technology Statistics*, November 2009, www.dius.gov.uk/science/science_funding/set_stats, Table 2.1

10 HM Treasury, *Comprehensive Spending Review 2007*, D4.7

11 Technology Strategy Board, *About us*, www.innovateuk.org/ab`outus

12 Department for Business, Innovation and Skills, *About R&D tax credits*, www.dius.gov.uk/innovation/business_support/randd_tax_credits/about

expenditure for financial year 2008–09, the latest year for which figures are available. Spending not listed falls in areas such as administration.[13]

a) Of the £123 million expended, the Arts and Humanities Research Council spent £64 million on Research Awards, £41 million on Postgraduate Awards and £10 million on Museums and Galleries Awards.[14]

b) Of the £465 million expended, the Biotechnology and Biological Sciences Research Council spent £367 million on Research and Capital Grants and £51 million on Training Awards and Fellowships.[15]

c) Of the £195 million expended, the Economic and Social Research Council spent £119 million on Research and £60 million on Postgraduate Training.[16]

d) Of the £796 million expended, the Engineering and Physical Sciences Research Council spent £507 million on Research, £176 million on Postgraduate awards, and £52 million on Research fellowships.[17] In addition, the EPSRC is responsible for the three international subscriptions, which amounted to £540,000 in 2008–09.[18]

e) Of the £729 million expended, the Medical Research Council spent £229 million on Research Grants, £36 million on other research activities and £68 million on Postgraduate/training awards.[19] The MRC is responsible for the UK's subscriptions to five international programmes (one jointly with EPSRC), which amounted to £15 million in 2008–09.[20]

f) Of the £434 million expended, the Natural Environment Research Council spent £110 million on research grants and contracts, and £33 million on postgraduate training awards.[21] It is responsible for £50 million of international subscriptions.[22]

g) Of the £642 million expended, the Science and Technology Facilities Council spent £108 million on research grants, and £215 million on international subscriptions.[23] Its research grants are split into £61 million on Astronomy, £38 million on Particle Physics, £6 million on Nuclear Physics and £1 million on Neutron and Light Sources.[24] The £215 million spent on international subscriptions increased by £30 million on

13 The money that research councils receive each year are not exactly the same as they money they spend.

14 Arts and Humanities Research Council, *Annual Report and Accounts 2008–09*, HC 780, p 62

15 Biotechnology and Biological Sciences Research Council, *Annual Report and Accounts 2008–09*, HC 587, p 53

16 Economic and Social Research Council, *Annual Report and Accounts 2008–09*, HC 710, p 102

17 Engineering and Physical Sciences Research Council, *Annual Report and Accounts 2008–09*, HC 801, p 70

18 *As above*, p 77

19 Medical Research Council, *Annual Report and Accounts 2008–09*, HC 914, p 69

20 *As above*, p 81

21 Natural Environment Research Council, *Annual report and Accounts 2008*–09, HC 594, pp 66–67

22 *As above*, p 67

23 Science and Technology Facilities Council, *Annual Report and Accounts 2008–09*, HC 776, p 89

24 *As above*, p 98

2007–08 on account of exchange rate fluctuations, and has been the source of considerable difficulties, which we consider in detail below.[25]

12. Higher education institutions in England are funded by the Higher Education Funding Council for England (HEFCE). During our oral evidence session on 10 February, Professor Adrian Smith, Director General for Science and Research, noted that there was a "slight danger in thinking of the higher education pot and the science and research pot under [...] separate headings".[26] A significant proportion—half by Professor Smith's estimation—of the monies disbursed to the research councils ends up in the universities, so when considering cuts to science and higher education, the two are not necessarily competing against each other. In its Accounts for 2008–09, the BBSRC noted that £260 million of its expenditure of £465 million went into universities.[27]

13. That science and higher education may not be competing with each other is not, however, necessarily good news. There are several reasons why efficiency savings to higher education might very well take a disproportionate toll on science in the UK. The relationship may not be interdependent, but since much science takes place within higher education, any cuts to higher education funding have the potential to impact upon science as well. Science departments are comparatively expensive to run and, in times of economic stringency, are attractive targets for Vice-Chancellors looking to cut costs.

CSR 2010

14. The current comprehensive spending review (CSR 2007) expires in the financial year 2010–11. Funding beyond March 2011 is therefore contingent upon a new Budget and CSR, both of which will involve political judgments regarding the importance of science to the UK. The combination of £600 million-worth of as-yet unallocated cuts, the current economic climate, and the anticipated next CSR, there is considerable uncertainty amongst scientists regarding future funding.[28] The Minister for Science and Innovation (Rt Hon Lord Drayson) confirmed that "I recognise that that uncertainty is real".[29] On the same day as our first evidence session on 3 February, the Institute for Fiscal Studies (IFS) published its 'Green Budget' for 2010.[30] It estimated that cuts to public spending in the region of 10.9% would be needed in the four years from 2011, if the Government kept its commitment to protecting the NHS, education and overseas aid. The IFS predicts that:

> Cuts in spending on science and universities are likely to have important long-term consequences. They would lead not only to direct falls in innovative outputs, but also to indirect falls to the extent that the UK would become a less desirable place for firms to conduct research. If the government's aim is 'to strengthen the incentives to invest in innovative industries and ensure the UK remains an attractive location for innovation', as was stated in the PBR, then the revenue loss expected from the patent

25 *As above*, p 99

26 Q 241

27 Biotechnology and Biosciences Research Council, *Annual Report and Accounts 2008–09*, HC 587, p 59

28 Q 115 [Professor Thorpe]

29 Q 246

30 Institute for Fiscal Studies, *The IFS Green Budget: February 2010*, 3 February 2010

> box—£1.3 billion a year—would be better spent protecting the spending in this area. This would go a long way to shoring up the science budget, which for 2010–11 is £3.2 billion.[31]

15. That same day, Professor Alan Thorpe, Chair of Research Councils UK (RCUK), told us that at present the Research Councils were basing their forward planning "on the basis of flat cash" allocations.[32] This was further to the evidence we took from him on 2 December 2009, when he told us that the Research Councils were making plans on flat cash and "other scenarios".[33] According to Professor Thorpe, the consequences of flat cash allocations or a reduction would be:

> [...] extremely serious [...] it is an investment, the research budget, so it has a huge gearing in terms of the economy. If we reduce funding, it is not just a matter of reining back a few research grants; it has a huge knock-on impact right through the economy in terms of the number of highly skilled people we are training in universities. University income levels will go down so universities will find they are less sustainable. Our ability to be world-leading in terms of the excellence of the research will be threatened and, of course, we get a lot of inward investment in the UK because we are seen as having that excellent base of researchers. In terms of facilities [...] negotiations depend on the UK having a significantly strong base. If that is reduced [...] the ability to partner countries that are actually undergoing some stimulus packages in terms of science will be very difficult.[34]

The Government's ambition and international comparators

16. The Government has taken significant steps to increase investment in science in real terms over the past six years, and it is against a background of rising investment and an increased science budget that this inquiry takes place. The Government's strategy for science in the UK was set out in the *Science and Innovation Investment Framework 2004–2014*. In that document, it was stated that:

> 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% to 2.5% 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.[35]

17. The relevant econometric measure is known as gross expenditure on research and development (GERD), expressed as a proportion of gross domestic product (GDP). As the passage above notes, GERD over GDP indicates the "level of knowledge intensity", and is a measure better suited to international comparisons than any comparison of direct funding.

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31 *As above*, section 10.3

32 Q 121

33 Science and Technology Committee, *The work of the UK research councils*, 2 December 2009, HC 102, Q 14

34 *As above*, Q 15

35 HM Treasury, *Science and Innovation Investment Framework*, July 2004, para 1.4

18. On 17 February 2009, President Obama signed the American Recovery and Investment Act into law, which made provision for $17 billion worth of investment in scientific research.[36] On 27 April 2009, in a speech to the National Academy of Sciences, he committed the United States to spending 3% of GDP on GERD.[37] The huge investment as part of an economic stimulus package was welcomed by the scientific community in the United States.

19. At the meeting of the Liaison Committee on 2 February 2010, the Chairman asked the Prime Minister why he had not made such a commitment to using science as a route to economic recovery. In answering, the Prime Minister claimed that "What America has not done is what we have done over the last ten years which is to double the science budget and America is trying to catch up in a way that we have been investing consistently in science over these last few years".[38] This assertion was disputed the next day by Nick Dusic, Director of the Campaign for Science and Engineering (CaSE).[39] He said that whilst the UK Government has invested heavily in science, particularly during a period when the science in the United States was not seen as a priority, the figures relating to GERD indicate that any "catching up" by the USA was hardly necessary. The latest year for which the Organisation for Economic Co-operation and Development (OECD) has produced figures for GERD is 2008. As the figures show, there was no significant difference in the proportion of GERD financed by government between the UK and USA in the period 2000–2008, but the USA had a well-established higher ratio of GERD to GDP. The UK's GERD to GDP ratio increased by 11% in the four years from 2004, an annual rate of 2.75% per year. For the Government's target of 2.5% of GDP being spent on GERD by 2014, the rate of increase would have to be 33% over six years, or 5.5% per annum. From the Prime Minister's remarks at the Liaison Committee, we do not anticipate that such an increase or Obama-style stimulus package is being contemplated.

Table 2: Gross Expenditure on Research and Development as a proportion of GDP 2000–2008, UK and USA

	2000	2001	2002	2003	2004	2005	2006	2007	2008
United Kingdom	1.81	1.79	1.79	1.75	1.69	1.73	1.75	1.81	1.88
% of which financed by government	*30.2*	*28.9*	*28.9*	*31.7*	*32.9*	*32.7*	*31.9*	*30.2*	*29.5*
United States of America	2.71	2.72	2.62	2.61	2.54	2.57	2.61	2.66	2.77
% of which financed by government	*25.8*	*27.2*	*29.1*	*30.0*	*30.8*	*29.3*	*29.3*	*28.3*	*27.0*

Source: OECD Main Science and Technology Indicators 2009/2

36 American Recovery and Reinvestment Act of 2009

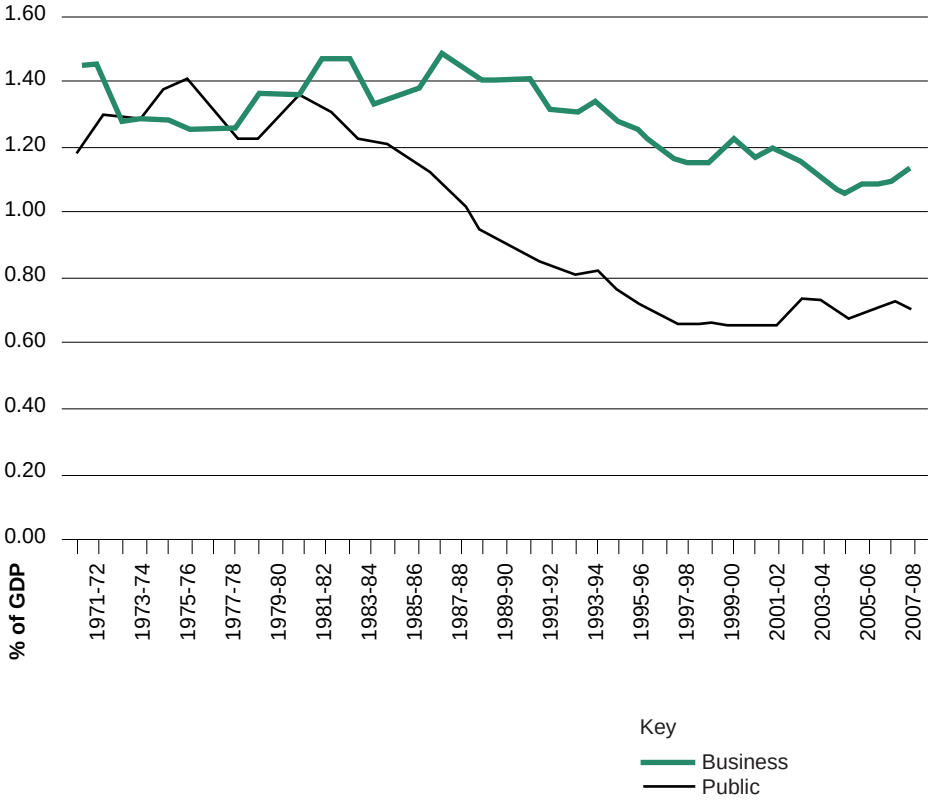
37 The White House, *Remarks by the President at the National Academy of Sciences Annual Meeting*, 27 April 2009

38 Liaison Committee, HC 346–i, Q 22

39 Q 26

20. Iain Gray, Chief Executive of the Technology Strategy Board, agreed that uncertainty in terms of future funding could also damage private sector investment.[40] Far from the private sector 'picking up the slack', Professor Thorpe said that the two were correlated.[41] In the Royal Society's report on *The scientific century*, the relationship between public and private sector investment in science is illustrated very effectively.

Figure 2: The relationship between public and private sector investment in science



Source: The Royal Society, The scientific century, *p53*

21. **Although gross expenditure on research and development has increased since 2004, the Government is some way off its target of 2.5% of GDP being spent on R&D by 2014. Indeed, the annual rate of change would have to double between 2009 and 2014 compared to 2004 and 2008 if the target were to be met. Such a doubling could only be met if public sector investment were to increase dramatically. Any cuts to the rate of increase, with the attendant decline in private sector investment, would be seriously damaging.**

22. In the next chapters, we consider the roles of demonstrating impact, setting priorities and higher education in the funding of science and scientific research.

40 Q 123

41 *As above*

3 Demonstrating impact

23. When he gave evidence to us on 3 February, Professor Brian Cox drew attention to the 1996 review commissioned by the Treasury of *The relationship between publicly funded basic research and economic performance* by the Science Policy Research Unit at the University of Sussex.[42] On the issue of assessing the economic benefits arising from investment in science, the review concluded that:

> Virtually all [studies of the impact of research on productivity] have found a positive rate of return, and in most cases the figure has been comparatively high. However, these attempts have been beset with both measurement difficulties and conceptual problems such as the assumption of a simple production function model of the science system.
>
> [...]
>
> One can attempt to estimate the rate of return to basic research but only on the basis of very questionable assumptions. [Edwin] Mansfield's work suggests that there is a very substantial rate of return, but the precise figure he arrives at (28%) is open to some doubt.[43]

24. That review also suggested that "Government expectations about the benefits from basic research are changing. A new 'social contract' is emerging in which there are more specific expectations that basic research should generate economic and social benefits in return for the substantial public funds that it receives".[44] Lord Drayson confirmed that the idea of a social contract did influence Government policy in this area, when he told us that "this is taxpayers' money [...] researchers should expect to be part of a process which ensures that that taxpayers' money has the biggest impact that it possibly can have for the benefit of the country, whether that is economic, or social, or what have you".[45]

25. The so-called "impact agenda", as referred to in several of the memoranda we received,[46] has long been the policy of the Research Councils. Professor Thorpe reminded us that it was "not for nothing that our [Research Councils UK's] strap line is excellence with impact, because that has actually characterised the last 20 years up to now".[47] In its memorandum, Universities UK referred to "accusations that include the emergence of an 'instrumentalist' approach to funding research and that there is too great a focus on research as an economic driver".[48] It was nevertheless persuaded that:

42 Martin, Salter *et. al.*, *The relationship between publicly funded basic research and economic performance: A SPRU Review*, July 1996; Q 6, Q 31

43 Martin, Salter *et. al.*, para 8.1.1

44 *As above*, para 8.2

45 Q 269

46 Ev 72 [University and College Union], para 1; Ev 169 [University of Leeds], para 3; Ev 28 [million+], section 6; Ev 69 [Universities UK], para 19

47 Q 71

48 Ev 68, para 14

> moves by the Research Councils and HEFCE have, however, sought to foster a system which incentivises impact at every opportunity rather than seeking to redirect research funding into particular areas that have an immediate or apparent impact, economic or otherwise. In this regard the debate has, to an extent, unfortunately become distorted and artificially polarised.[49]

26. The question of impact arose in two separate contexts in the course of our inquiry. The first was in HEFCE's proposals for a replacement for the Research Assessment Exercise (RAE), the process by which the excellence of research in universities is assessed. Proposals for the new assessment, the Research Excellence Framework (REF) include a retrospective measure of impact weighted at 25% of the overall assessment. The second context in which impact arose was the Research Councils' grant application forms. The forms invite researchers to "add to their case for support by describing the potential impact of their work, and pathways towards realising that, under the following headings [academic beneficiaries, impact summary, impact plans]".[50]

The Research Excellence Framework

27. Funding of research activities within the higher education sector takes place under a system of "dual support". HEFCE provides grants to support infrastructure and running costs, while the Research Councils, the EU, charities and Government fund specific projects. HEFCE allocates grants on the basis of quality-related research funding (QR). The quality of research was until recently assessed through the RAE, an exercise which was held roughly quadrennially between 1986 and 2008. The REF will place greater emphasis upon the "impact" of research to the economy, society, public policy, culture and quality of life. The proposals attracted significant comment in the memoranda we received.

28. Opinion was split on the merits of the inclusion of impact. The majority of organisations representing the universities broadly welcomed the proposals, albeit with some caveats.[51] The concern expressed over the inclusion of impact in the REF fell into three camps: those who thought 25% was too great a weighting to place on an untested measure;[52] those who disputed the feasibility of assessing impact at all;[53] and those who postulated a 'hierarchy of impacts', with economic benefits being prioritised over all others.[54] In its memorandum, HEFCE acknowledged that "concerns were raised by some academic associations and the University and College Union (UCU) about the potential adverse consequences of using impact as an element in assessment", and set out the steps it was taking to address them.[55] It is conducting a pilot involving 29 Higher Education (HE) institutions and five expert panels, comprising leading academics and research user representatives from the private, public and third sectors".[56] The outcome of the pilot

49 Ev 68, para 15

50 Ev 15, para 8

51 Ev 32, para 2.9 [The Russell Group]; Ev 44, para 2.1 and Ev 45, para 2.4 [The 1994 Group]; Ev 28, section 6 [million+]; and Ev 40, para 9 [University Alliance]; Ev 67 [Universities UK]

52 Ev 69, para 19 [Universities UK]; Ev 40, para 9 [University Alliance]

53 e.g. Ev 126, para 6 [Wellcome Trust]

54 Ev 72, para 8 [UCU], Ev 28, para 6 [million+]

55 Ev 65, para 5

exercises are expected in the autumn,[57] although it is not anticipated that impact will be dropped as one of the criteria.

29. We raised the issue of the inclusion of retrospective assessments of impact within the REF with the witnesses at our session science within HE on 10 February. Sir Alan Langlands, Chief Executive of HEFCE, suggested that it was "perfectly reasonable for the Higher Education Funding Council, that has a long-term commitment to the sustainability of the research infrastructure, to look back, to determine what has been achieved and to take account of that in our resource allocation process".[58] He recognised the concerns of "a group of physicists who are doing very fundamental work who see difficulty in this", but countered that there was "enthusiasm out there, certainly amongst young scientists, to be thinking in these terms nowadays".[59] Speaking on behalf of the University and College Union, Dr Alastair Hunter told us that, whilst the UCU "had no problem in principle with the idea that you can look at historic impact", "the difficulty with that is how it would fit into current allocations".[60]

30. When we asked the Minister for Higher Education and Intellectual Property (Rt Hon David Lammy MP) about the proposals to include impact within the REF, he did not express a view, stating rather that "the determination on the 'how' must be for the academics themselves, and it is a HEFCE consultation: they must determine the outcome, they must determine the weighting".[61]

31. **We commend the lengths to which HEFCE has gone in order to consult and seek to meet the concerns of the academic community with regard to the inclusion of a retrospective assessment of impact within the Research Excellence Framework. We fear that their efforts may be in vain. It is our view that however meritorious the idea of awarding funding on the basis of past impact may or may not be, the difficulties associated with capturing past impacts effectively and allocating funds fairly on the basis of them will be insurmountable.**

Pathways to impact

32. The second context in which impact arose was Research Council funding for research projects. It was frequently claimed in memoranda we received that the Research Councils were asking researchers to "predict" the impact that their research would have.[62] Professor Thorpe strongly denied this, stating that "what we are asking for researchers to do is to think about how to open up the pathways to enable impact to happen".[63] Nevertheless, Professor Cox told us that "I have no idea how to do it. That is what you hear from each

56 Ev 65, para 7

57 Ev 65, para 6

58 Q 208

59 Q 209

60 Q 211

61 Q 268

62 Ev 102 [Professor Leslie Ann Goldberg], para 1; Ev 131 [Royal Astronomical Society], para 8; Ev 174 [UCL], para 11; Ev 181 [Institute of Physics], para 17

63 Q 76

one of my colleagues who has sat on panels: 'I do not know how to do it'".[64] Lord Drayson told us that his sense was that "actually the majority of the scientific community do believe this is sensible, do believe that it can be done and are willing to work with both HEFCE and the research councils in the projects which they have to try and do this in an effective way".[65]

33. However, we were told numerous times during the course of our inquiry that the Research Councils were not asking researchers to predict the impact of their research when filling out grant applications.[66] At our evidence session on 10 February, Professor Thorpe, Chair of RCUK, and Professor Sterling, Chair of the STFC, stressed that the role of impact within grant applications was as a tie-breaker, alongside value for money, that could be used to choose between two otherwise equally deserving proposals.[67] Such tie-breakers were especially important in a highly-competitive research environment, given that only 25% of proposals ended up being funded.[68]

34. Sir Alan Langlands' assertion that young scientists were enthusiastic about thinking about the impact of their research struck a chord with what Lord Broers had told us the previous week.[69] He had cited the work of the Nobel prize-winning physicist Charles H. Townes, whose invention of the maser was borne out of a very applied, problem-solving approach to research.[70] It was put to us that "if you do look at the great advances that came out of pure science, you find they came out through people who were very interested in impact".[71]

35. The concept of science as problem-solving is in counterpoint to the objection often raised against the use of impact in research proposals; that the great scientists of the twentieth century would not have attracted public funding had they been required to make such an assessment. We put that point to Lord Drayson, who responded that "I think that if you read the biographies of those individuals about what was going on at the time around their laboratories, for example, you get the impression that there was no doubt at the time that the work that they were doing was going to have massive impact".[72] To our knowledge, no analysis of the relationship between the great scientific advances and publicly-funded research has been conducted, but it would doubtless yield interesting results.

36. **If the Research Councils were not encouraging researchers to think about potential impact then it would be necessary for a select committee to recommend that they did. However, misconceptions persist about the role of impact in grant applications and it**

64 Q 38

65 Q 269

66 Ev 15 [Research Councils UK], para 8; Ev 60 [Department for Business, Innovation and Skills], para 28; Ev 236 [Professor Brian Cantor], para ; Q 76 [Professor Thorpe]; Q 168 [Professor Arthur]; Q 267 [Rt Hon David Lammy]

67 Qq 72–73

68 Q 75

69 Q 209 [Sir Alan Langlands]

70 Q 46, Q 52 [Lord Broers], Townes was seeking a very high frequency amplifier, and could not produce one with vacuum valves. The term 'maser' was derived from 'microwave amplification of stimulated emission of radiation'.

71 Q 46

72 Q 270

seems that many assessors and those being assessed think that they are being asked to 'predict' impacts, when in fact the purpose is to stimulate thought about how impact might be developed. It is up to the Research Councils to improve the guidance they provide, and we urge them to act to clear up the misunderstanding. We do not believe that the consideration of pathways to potential impacts should be used as a tie-breaker in grant applications.

37. Lord Drayson told us six times that he was still making the case for science within Government for science's allocation within the next Budget and CSR.[73] Lord Drayson told us that "The lack of data on impact which exists at the moment makes it more difficult to make that case effectively within government".[74] **Given that the very best literature on the subject concludes that reliable quantification of the economic impact of investment in science and research is deeply problematic at best, the suggestion that the Treasury is waiting for 'hard figures' on the benefits of research causes us great concern.**

38. If investment in science does not continue to rise in real terms, not only will the Government have effectively abandoned its aspirations as set out in the *Science & Innovation Investment Framework 2004–2014*, but will start to lose both the progress made over the past six years and also begin to compromise the UK's international standing. There is a growing consensus that increased investment in science is essential. The argument is made not only here but also in the Royal Society's *The scientific century: securing our future prosperity*,[75] and the Council for Science and Technology's (CST) *A Vision for UK Research*.[76]

39. **If funding does not increase, UK-based researchers and institutions may find it harder to participate in projects requiring collaboration and the sharing of international facilities, if commitments to medium and long-term funding cannot be made. If there is even a perception that British science is suffering as a result of cuts, the UK will become a less attractive place for academics to work.**[77] **A similar consequence could very well be that science will be seen once again as a less attractive destination for students contemplating higher education. With all the work that has gone into increasing the demand for science places within HE, it would be an enormous waste of past effort and future potential were cuts to be visited upon the sector.**

73 Qq 246–7, Q 256, Q 269, Q 288, Q 300

74 Q 269

75 The Royal Society, *The scientific century: securing our future prosperity*, 8 March 2010

76 Council for Science and Technology, *A Vision for UK Research*, 1 March 2010

77 Ev 31, para 1.2 [The Russell Group]; Ev 45, para 4.5 [1994 Group]

4 Setting priorities

Picking winners and losers?

40. During our first session, Lord Broers suggested that "the US is the only country that anymore can pursue all branches of science and technology".[78] He argued that, like other smaller countries, "we have got to bite the bullet and focus a bit more than we do. We still think that we can cover the entire base, but I do not think we can".[79] Professor Brian Cox disagreed, contending that "a nation such as Britain, which is a world leading scientific nation, must maintain investment across the whole portfolio in order to take advantage of developments from wherever they come".[80] Sir Peter Williams expressed both views, when he said that "It is fatuous to think that this country will excel at everything in the twenty-first century", but that "it would be ill-judged of a science minister and, indeed, of your good selves to try and start picking winners around this table".[81]

41. In our final session, Lord Drayson revealed that something very much like this kind of prioritisation was being pursued:

> the Government has worked to identify with industry and the academic community those areas where Britain has real clear strengths, where the markets in those areas are growing strongly and where, therefore, if Britain invests in those areas, both on the supply and the demand side, it is most likely that Britain will succeed in generating future economic growth.[82]

42. Such a strategy is designed not only to capitalise upon those areas of technology with the greatest potential for economic growth, but to avoid repeating the mistakes of the past. Lord Broers had previously given the example of semiconductors:

> When I came back from the States we wanted to start a large institute such as they founded in Belgium, where they did specialise, but we could not do it because Southampton wanted it, Edinburgh wanted it, Cambridge wanted it, Manchester wanted it and we took the AlBi programme and divided it five ways and now we have nothing and Belgium has the number one research semiconductor laboratory in the world.[83]

43. It seems to us that Lord Broers and Professor Cox were talking at cross purposes: their two positions being not inconsistent. **Maintaining a broad portfolio of excellent research need not be mutually exclusive with the Government identifying and seeking to capitalise upon areas in which the UK has the potential for world-leading science, provided that it is done in a transparent and accountable way. Where such areas are**

78 Q 28

79 *As above*

80 Q 31

81 Q 32

82 Q 272

83 Q 30

identified at a national level, they should be funded at a national level. We note the importance of the work of the Technology Strategy Board in this respect.

The Science and Technology Facilities Council

44. Although, as we recall below, particular historic reasons led to it occurring, an early indication of the type of prioritisation that could occur within a research council has already taken place. On 16 December 2009, the STFC announced the outcome of a major prioritisation programme for the period between 2010 and 2015, which had been conducted over a period of six months. The programme includes: a 10% reduction in support for future exploitation grants and a managed cessation of lower priority areas; a 25% reduction in the number of new studentships and fellowships mirroring the overall reduction in the programme since the 2007 baseline; and a rationalisation of projects based on prioritisation and affordability.[84] Later that day, Lord Drayson announced that:

> However, it has become clear to me that there are real tensions in having international science projects, large scientific facilities and UK grant giving roles within a single Research Council. It leads to grants being squeezed by increases in costs of the large international projects which are not solely within their control. I will work urgently with Professor Sterling, the STFC and the wider research community to find a better solution by the end of February 2010.[85]

45. The financial security of the STFC has long been a concern for us and our predecessor Committees. In 2008, the Innovation, Universities, Science and Skills Committee concluded that the budget formed by the combined budgets of the Particle Physics and Astronomy Research Council (PPARC) and the Council for the Central Laboratory of the Research Councils (CCLRC—responsible for large facilities) was insufficient,[86] that the formation of the STFC was rushed to meet the deadline of CSR07,[87] that subsequent cuts were made without reference to the Wakeham review of physics and thus any considered strategy,[88] and that there were serious questions over the ability of the Chief Executive to command the confidence of the scientific community.[89]

46. These problems were exacerbated in October 2009 when it was reported in the Sunday Times on 4 October that the UK's participation in the Large Hadron Collider at CERN could be at risk.[90] On 6 October, Lord Drayson posted a message on the BIS website explaining that "the Government has provided STFC with additional funding to help it meet the financial pressures it has come under as a result of exchange rate fluctuations and

84 STFC, 'Science Programme Prioritisation', www.stfc.ac.uk/pmc/prel/stfc/CouncilNews161209.aspx, 16 December 2009

85 Department for Business, Innovation and Skills, 'Lord Drayson's statement on STFC re-prioritisation exercise', 16 December 2009

86 Innovation, Universities, Science and Skills Committee, Fourth Report of Session 2007–08, *Science Budget Allocations*, HC 215–I, para 39

87 *As above*, para 41

88 *As above*, para 102. A Review of UK Physics was commissioned by Professor Ian Diamond—then Chair of RCUK—at the invitation of the Secretary of State (Rt Hon John Denham MP) on 11 December 2007. The Review was chaired by Professor Bill Wakeham and published its report in October 2008.

89 *As above*, para 108

90 The Sunday Times, 'Cash cuts hit space science', 4 October 2009, page 8

historic over-commitment".[91] We took evidence from Lord Drayson and the Government Chief Scientific Adviser, Professor Beddington, on 14 October 2009, and suggested that rather than compensating the STFC for the loss of funds incurred through exchange rate fluctuation, it would be more appropriate to remove the risk altogether.[92] We were told that such a move was ruled out on the basis of Treasury rules.[93] Instead, the arrangement is that the Research Councils that are the prime bearers of exchange-rate fluctuation risk—STFC and NERC—are covered above and beyond a certain point.[94]

Table 3: STFC subscriptions, 2007–08 and 2008–09 (£,000)

Subscription	2007–08	2008–09	% change
European Incoherent Scatter Facility (EISCAT)	320	322	0.6
Anglo-Australian Telescope (AAT)	496	110	-77.8
European Space Agency (ESA)	67,088	83,947	25.1
European Organisation for Nuclear Research (CERN)	77,835	80,066	2.9
European Science Foundation (ESF)	104	145	39.4
European Southern Observatory (ESO)	19,437	25,753	32.5
Institut Laue Langevin (ILL)	12,719	16,631	30.8
European Synchrotron Radiation Facility (ESRF)	7,026	8,505	21.1
Total	185,025	215,479	16.5

Source: Science and Technology Facilities Council, Annual Report and Accounts 2008–09, HC 776, p 99

47. We received further clarification from Lord Drayson on 16 October 2009 and 12 November 2009.[95] He explained that the STFC had received a combination of loans brought forward from later years in the CSR period and additional funding from other Research Councils, which had needed capital rather than cash earlier in the period. On 16 December 2009, we received a letter from Professor Keith Mason, the Chief Executive of the STFC. In that letter, he explained that the STFC bore the impact of the first £3 million of any exchange rate fluctuations in a financial year. Above that point, the Department for Business, Innovation and Skills took on the risk which between 2008 and 2010 amounted to £45 million. This money did not have to be repaid. The loans were a separate issue, in that they involved bringing money forward from later years in the CSR period in order to better meet the requirements of the Council's programme. These loans comprised £5.9 million near cash and £20.3 million capital in 2008-09, and £19.9 million near cash in 2009-10.

91 Department for Business, Innovation and Skills, Lord Drayson's Online Notepad, 'STFC, The Sunday Times and CERN', 6 October 2009

92 Science and Technology Committee, *Setting the Scene on Science, Engineering and Technology Issues across Government*, Oral and written evidence, HC 1001–i, 14 October 2009, Q 28

93 *As above*, Q 32

94 Science and Technology Committee, *The work of the UK research councils*, Oral and written evidence, HC 102, 4 February 2010, Qq 21–22

95 Science and Technology Committee, HC 1001–i, Ev 13

48. We received several memoranda raising concerns about the outcome of the STFC's reprioritisation, particularly regarding nuclear physics and astronomy.[96] Many of those who submitted memoranda were in favour of a demerger between the PPARC and CCLRC elements of the STFC.[97] Lancaster University observed that "putting two councils together does not seem to be working".[98] The Royal Astronomical Society noted that the "merger [of CCLRC and PPARC] was justified on the basis that the previous arrangement ran the risk that the UK did not fully exploit its investment in large scientific facilities. To date, underfunding has led to STFC failing in this regard".[99] The Institute of Physics suggested that since some of the subscriptions against which grant funding were tensioned were primarily exploited by the Engineering and Physical Sciences Research Council (EPSRC) (ESRF and ILL), there should be a rearrangement of subscriptions within the research councils. When asked if a demerger would be his preferred option, Professor Brian Cox indicated assent.[100]

49. Speaking on behalf of the STFC, Professor Michael Sterling, the Council's Chairman, disagreed. In response to the suggestion of a demerger, he told us that "we would have to live with that if that was the decision, but I do not think that would be the optimal decision".[101] He favoured insuring the risk of exchange rate fluctuations at a higher level.[102] This was the preferred option of, amongst others, the Institute of Physics, and the UK Nuclear Research Groups.[103]

50. On 24 February 2010, Lord Drayson told us that he would "be making an announcement very shortly".[104] On 4 March, it was announced that from the first year of the next spending review (2011–12), BIS would work with the Bank of England to reduce the exposure of the STFC to exchange rate fluctuations. "Indicative planning" for the funding of large facilities would be extended to cover not only the CSR period in question, but the period afterwards as well. **We remain to be convinced that 'indicative planning' over future CSR periods for the use of large facilities will be meaningful if the standard principle of planning on the basis of 'flat cash' allocations continues.**

51. It was also announced that BIS would in future give separate allocations for the separate functions carried out by the STFC. This was intended to put an end to the structural problem of the STFC's grant-giving being financially tensioned against its international subscriptions. Furthermore, the UK's subscription to the European Space Agency would in future be borne by a UK Space Agency.[105] **The structure of the STFC as established in**

96 e.g. Ev 131 [The Royal Astronomical Society]; Ev 138 [UK Nuclear Physics Research Groups]; Ev 140 [UK Space Academic Network]

97 Ev 170 , para 12 [University of Leeds]

98 Ev 119, para 9 [Lancaster University]

99 Ev 133, para 29 [Royal Astronomical Society]

100 Q 66

101 Q 110

102 *As above*

103 Ev 182, para 27 [Institute of Physics]; Ev 139, para 7 [UK Nuclear Research Groups]

104 Q 275

105 Department for Business, Innovation and Skills, 'STFC: New arrangements to provide stability in research funding', 4 March 2010

2007 left much to be desired. We are concerned that the proposals are extremely provisional, depending as they do upon further consultation between BIS, the Bank of England and HM Treasury and the outcome of the next CSR period.

52. **We are not satisfied with the outcome of the STFC's reprioritisation exercise, and consider that any withdrawals from programmes should be suspended at least until such time as the next CSR allocations are known. Otherwise, the budgetary fall-out from the unsatisfactory merger of CCLRC and PPARC will be set in stone.**

5 Higher education

53. The funds allocated by HEFCE to the universities depend upon an annual grant from the Secretary of State for Business, Innovation and Skills. HEFCE states on its website that "Most HEFCE funding is distributed as block grants to institutions, allocated according to formulae which take account of certain factors within each institution, including the number and type of students, the subjects taught and the amount and quality of research undertaken there".[106] The allocation for the financial year 2010–11 was £7,291 million, a reduction from £7,809 million in 2009–10 of approximately 6.5%. On 1 February 2010, HEFCE announced that funding for teaching would be cut by 1.6% in real terms compared to 2009–10. HEFCE will announce the allocations for individual institutions after the March meeting of the HEFCE board.[107]

54. Professor Michael Arthur, Chair of the Russell Group, explained that universities plan on five-yearly cycles, and that one of the "difficulties about the scenario that we are facing is the uncertainty of when cuts will fall and in which budgets against that planning scenario".[108] He went on to say that "I absolutely need to know what is happening in 2011 and 2012 in order to get 2010 right. Against that background, [...] most science departments in the country are on the edge of financial viability".[109]

55. The Minister for Higher Education and Intellectual Property, Rt Hon David Lammy MP, told us that:

> the essential statement of government intent in relation to higher education is contained in *Higher Ambitions* which we published in the autumn. It was a long and extensive consultation that was begun under John Denham [Secretary of State for Innovation, Universities and Skills]. We asked the sector to play a role in setting out the next ten-year vision for the sector, and on [...] said, "Investment in science and innovation is not an intellectual luxury for a developed country; it is an economic and social necessity and an indispensable ingredient of economic success."[110]

Increasing demand for and supply of STEM students

56. The number of students studying science, engineering and technology subjects at undergraduate level depends upon the number taking and passing science A-levels, which in turn is influenced by students having been able to take 'triple' or 'separate' sciences at GCSE level. Provision for teaching separate sciences and A-levels is contingent upon a steady supply of science graduates, resulting in a feedback loop over several years. The Russell Group dealt with this issue in some detail in its memorandum and expressed concern in relation to the number of students studying sciences at A-level in proportion to

106 HEFCE, *Finance & assurance: Funding Higher Education*, www.hefce.ac.uk/finance/fundinghe/

107 Ev 66, para 10

108 Q 160

109 *As above*

110 Q 248

the increase in A-level entries over the past 20 years, and also over the inequality of opportunity for students at non-selective schools to study separate sciences.[111]

57. Sir Alan Langlands told us that "huge government expenditure" had been put into growing science, technology, engineering and mathematics subjects within higher education, in "a strategy designed to deal with market failure", achieved through subsidising the subjects and inducing demand.[112] He was explicit in his assertion that "we must not lose momentum [...] now we have higher numbers of young people study mathematics at GCSE and A levels than we have had for years".[113] The Royal Society noted that the cumulative shortfall in meeting science and mathematics recruitment targets between 2000-01 and 2007-08.[114]

58. The Government set out its strategy for increasing the uptake of STEM subjects at undergraduate level in *Higher Ambitions*, which was published on 3 November 2009.[115] According to the Department's memorandum, it will "provide space for growth in STEM student numbers as demand increases, in a tighter fiscal climate over the next decade", "[ask] HEFCE to maintain a funding system which does not create disincentives for universities to offer STEM provision" and improve "the dialogue between businesses and universities about labour market needs".[116]

59. Effort also needs putting into supporting young scientists beyond their undergraduate years. In the Royal Society's report on *The scientific century: securing our future prosperity*, this point is made very strongly, where it is noted that "the majority of people undertaking a PhD will end up in careers outside scientific research", and that only 0.45% of those gaining PhDs become Professors.[117] **Whilst it would be unrealistic to expect every PhD student to become a Professor, we are concerned that academia is losing some of its brightest and best to alternative careers. The life of a young research scientist needs making more attractive when compared to the bright lights of industry and commerce.**

Funding science within higher education

60. It is generally accepted that the costs associated with the operation of facilities necessary for the teaching of science subjects are higher than those for arts subjects..[118] Nevertheless, the Minister told us that HEFCE had sought to minimise the impact of cuts on science, research and teaching, with cuts falling more on capital than on anything else.[119] Indeed, HEFCE's announcement of the size of the 'pots' for HE funding in 2010–11 on 1 February 2010 was as follows:

111 Ev 30, para 7.6

112 Q 223

113 *As above*

114 The Royal Society, *The scientific century: securing our future prosperity*, p 65

115 Department for Business, Innovation and Skills, *Higher Ambitions*, 3 November 2009

116 *As above*, paras 75–77

117 The Royal Society, *The scientific century: securing our future prosperity*, 8 March 2010, p 14

118 Q 252 [Rt Hon David Lammy MP]

119 Q 250

- a 0.9% cash increase for recurrent grants (teaching, research and HEIF);
- a 14.9% reduction in cash terms in capital funding after adjusting for the £250 million of capital funding that was brought forward from 2010–11 into 2008–09 and 2009–10; and
- a 7% reduction in cash terms in special funding.[120]

61. The nature of the choice raised by reduced funding will be whether to keep high-cost departments open, or to sacrifice them in favour of maintaining an otherwise broad spectrum of subjects. Having largely shaken off the problem of falling demand for undergraduate science places, the high cost of running science departments remains a threat. HEFCE's Strategically Important and Vulnerable Subjects Advisory Group reported to the HEFCE board at the end of January, and HEFCE drew from that report in its memorandum.[121] It concluded that "it will be essential for government and HEFCE to establish a means for ensuring that the upturn in student demand can be accommodated by an increase in provision" and that, although institutions were "reviewing their provision", HEFCE's additional support for high cost STEM subjects and the ring-fence for research funding in STEM subjects would act as disincentives against closure of these areas.[122] Speaking on behalf of the million+ universities,[123] Professor Les Ebdon confirmed that "we are seeing redundancies being announced and indeed departmental closures being talked about".[124] **We recommend that the allocation of teaching funding by HEFCE for STEM subjects should adequately reflect the higher costs of teaching science, so that departments do not require cross subsidisation within universities. In order to deliver the number of science graduates that the UK needs, the Government should in its letter to HEFCE, require that universities deliver the necessary numbers of STEM graduates.**

62. We suggested to the Minister that in fact he could not protect STEM within higher education. He told us that "vice chancellors must then make decisions about the focus of their institutions, understanding that each institution has a different mission".[125] The principle that universities should enjoy autonomy from political interference in respect of academic matters (as opposed to the use of public funds) is not disputed. However, restating the principle of autonomy is not an answer to the problem as it was put to us by several universities giving serious consideration to the closure of key departments. When asked about the cost of science facilities and how cuts to capital might affect them, the Minister told us that:

> I think the context is not a year-zero moment, is it? We have invested round about £6.4 billion in capital in the last ten years. This year we have a capital budget of over £400 million. We have brought forward £250 million from last year as a fiscal stimulus. On any account, when you compare that, say, with the upstream pipeline

120 HEFCE Circular Letter 02/2010, 1 February 2010. Special funds are such as the SIVAG fund discussed in the next paragraph.

121 Ev 66–67, paras 13–20

122 Ev 67, para 19

123 million+ is an association of post-1992 universities, known previously as the Coalition of Modern Universities.

124 Q 190

125 Q 264

> and the capital budget of zero in FE when we came to power and, I think, roundabout £75 million in HE, we are building on ten years of serious commitment to capital.[126]

63. **HEFCE's decision to cut capital grants will disproportionately affect science teaching in universities. We were frustrated by the fact that, when asked about the future, the Minister for Higher Education gave us answers about the past. Decisions about 'different missions' are forced upon universities when the Government, through HEFCE, fails to invest adequately in higher education. If the Government is committed to increasing the number of STEM graduates, it can little afford the closure of science departments within universities.**

The 10,000 'New Industry, New Jobs' initiative

64. In the face of strongly increasing demand for places at universities, on 20 July 2009, the Secretary of State for Business, Innovation and Skills announced an increase in funds for student support for 10,000 additional students in higher education, in aid of the Government's 'New Industry, New Jobs' agenda.[127] Higher education institutions put in bids for the places, and according to figures published by HEFCE, all 10,000 places were allocated.[128] Our predecessor Committee agreed its Report on *Students and Universities* that afternoon,[129] noting its concern that the plan would "have the potential to set an unfortunate precedent in that no additional teaching grant is being made available, particularly for science subjects where the costs are higher".[130] Both the Russell and 1994 Groups opted not to take up any of the allocation, because the places were unfunded.[131]

65. Despite stating that for million+ universities, "the impact was tremendous",[132] Professor Les Ebdon told us that "there is a sense of betrayal that we were told that the student support money had been found and now it would appear from the letters which have been exchanged that in fact the money is coming off this year's HEFCE budget".[133] Having accepted those additional students, the relevant universities will carry the costs of teaching them for the duration of their course. Professor Janet Beer, from the University Alliance, told us that the additional places were managed either within the tolerance band of what numbers could be accommodated or by redistribution of places between years and courses.[134] Sir Alan Langlands described the policy as "fairly hastily contrived".[135]

126 Q 253

127 HC Deb, 20 July 2009, col 87WS

128 HEFCE, Circular letter 17/2009, 31 July 2009, www.hefce.ac.uk/pubs/circlets/2009/cl17_09/

129 Innovation, Universities, Science and Skills Committee, Eleventh Report of Session 2008–09, *Students and Universities*, HC 170–I

130 Innovation, Universities, Science and Skills Committee, *Students and Universities*, para 18

131 Ev 46 [The 1994 Group], para 8.1; Ev 38 [The Russell Group], para 8.2

132 Q 171

133 Q 172

134 Q 170

135 Q 224

66. Sir Alan Langlands, Chief Executive of HEFCE, told us that "the thing that is stopping student recruitment and has stopped the idea of additional student numbers in its tracks right now is that the student support system has run out of money".[136] Further to a commitment made during the Second Reading debate on the Higher Education Act 2004, on 9 November 2009 the Secretary of State for Business, Innovation and Skills announced that Lord Browne of Madingley would lead an independent review of higher education funding and student finance, the terms of reference for which would be:

> The Review will analyse the challenges and opportunities facing higher education and their implications for student financing and support. It will examine the balance of contributions to higher education funding by taxpayers, students, graduates and employers. Its primary task is to make recommendations to Government on the future of fees policy and financial support for full and part-time undergraduate and postgraduate students.[137]

Lord Browne's review will report in the autumn, after the General Election.

67. **We put our concerns over unfunded and unsustainable growth in the number of science places to the Minister, who told us that "there has always been unfunded growth in and around the system".[138] As an observation, that is undoubtedly the case, but for the Government actively to encourage unfunded and unsustainable growth in a period immediately before cuts in investment as a matter of policy is something entirely different. Sir Alan Langlands's description of the move as "fairly hastily contrived" was, in our view, accurate.**

68. If cuts are pursued, the debate over concentration of resources within 'centres of excellence' will once again come to the fore. The Government's memorandum made clear that it was in favour of "more, rather than less, research concentration, especially in the high cost, scientific disciplines".[139] **We are in principle in favour of the concentration of research on the basis of excellence, provided that it is concentrated wherever excellence is found.**

69. Both Research Councils and universities are exploring ways of increasing collaborative working to reduce costs. The Research Councils are aiming to reduce expenditure on overheads through the creation of a Shared Services Centre (SSC). The Research Councils are each migrating their administration, HR and finance functions to the SSC, and in our scrutiny of their annual reports reported varying stages of transfer. In the long term, the SSC is expected to deliver cost savings to the Research Councils' budgets. However, we have received indications that there may be issues with cost overruns, and wrote to the Minister to establish what the current position is.

70. As far as the universities go, our predecessor committee advocated the introduction of a "hub and spoke" approach to science provision between universities, with regional

136 Q 225

137 HC Deb, 9 November 2009, col 4WS

138 Q 294

139 Ev 59, para 20

facilities being shared between multiple institutions.[140] That recommendation was rejected by the Government on the grounds that encouragement would more likely come across as imposition.[141]

71. During our inquiry, we were told by Professors Les Ebdon and Steve Smith that universities were giving serious consideration to the sharing of back-office facilities, but were hesitant to do so because of VAT impediments.[142] We put the universities' concerns over VAT and sharing services to the Minister, who told us that he was looking at it in the context of discussions with the Treasury ahead of the Budget.[143] **We urge the Department to press the Treasury to make it easier and more financially viable for universities to collaborate and cut costs where they can.**

140 Science and Technology Committee, Eighth Report of Session 2004–05, *Strategic Science Provision in English Universities*, HC 220–I, Ch. 6

141 Science and Technology Committee, Second Special Report of Session 2005–06, *Strategic Science Provision in English Universities: Government Response to the Committee's Eighth Report of Session 2004–05*, HC 428, p 18

142 Q 190 [Professor Les Ebdon]; Q 214 [Professor Steve Smith]

143 Q 291 [Rt Hon David Lammy MP]

6 Conclusion

72. It was reported on 12 March 2010 that Lord Mandelson had "drawn a line in the sand" with regard to cuts to the science budget".[144] If this is confirmed by the Budget, this will be welcome news indeed. However, it is important that science funding continues to grow, if the country is to make the most of its scientific potential. On the question of when the impact of cuts to the science budget could become apparent, Dr Tony Peatfield, Director of Corporate Affairs for the Medical Research Council, told us that "it depends how big they are. If they are large you will notice them, potentially, very quickly".[145] For the wider economy, "there would be less feed-through from the basic research into clinical practice, for example, so clinical trials and things would not be happening [...] It could be quite quick; I would have though within a year or two, certainly, you would notice fairly significant changes".[146] **At a time when, according to the Government's previous arguments, public investment in science should be increasing, the prospect of cuts looms large over the UK's science base. The Government is committed to supporting business investment in research and development through the taxation system, but the very existence of such businesses depends upon the size and strength of the science base underpinning them. If the Government fails to properly support the science base, there will be no companies to give tax breaks to.**

73. The Minister told us in no uncertain terms that "science is absolutely central to the delivery of the achievement of [...] growth".[147] **Failure to continue to increase investment in science would be both counterintuitive and counterproductive. Much good progress will be lost and the size of cuts to science are unlikely to make a significant dent in the deficit. We cannot at present reconcile the Government's policy ambitions with its actions, and call upon the Government to increase spending on science within the next Budget, if it truly is committed to the principle of a knowledge-based economy.**

144 Financial Times, 'Science budget to be spared from cuts', 12 March 2010

145 Q 125

146 Q 126

147 Q 246

Conclusions and recommendations

Introduction

1. The announcement of a £600 million cut across higher education and science budgets was most unwelcome. Not only does it appear to be an entirely arbitrary figure imposed by Treasury diktat, but it undermines the Government's previously good record on valuing science and higher education. (Paragraph 5)

Funding science in the UK

2. These issues—the ring fence, tracking spend on science, etc.—are extremely important and we regret that we have not had time to devote a full and detailed inquiry to them. Our successor committee may—especially in the context of a new Parliament—consider exploring the full breadth of science funding in detail. (Paragraph 8)

The Government's ambition and international comparators

3. Although gross expenditure on research and development has increased since 2004, the Government is some way off its target of 2.5% of GDP being spent on R&D by 2014. Indeed, the annual rate of change would have to double between 2009 and 2014 compared to 2004 and 2008 if the target were to be met. Such a doubling could only be met if public sector investment were to increase dramatically. Any cuts to the rate of increase, with the attendant decline in private sector investment, would be seriously damaging. (Paragraph 21)

The Research Excellence Framework

4. We commend the lengths to which HEFCE has gone in order to consult and seek to meet the concerns of the academic community with regard to the inclusion of a retrospective assessment of impact within the Research Excellence Framework. We fear that their efforts may be in vain. It is our view that however meritorious the idea of awarding funding on the basis of past impact may or may not be, the difficulties associated with capturing past impacts effectively and allocating funds fairly on the basis of them will be insurmountable. (Paragraph 31)

Pathways to impact

5. If the Research Councils were not encouraging researchers to think about potential impact then it would be necessary for a select committee to recommend that they did. However, misconceptions persist about the role of impact in grant applications and it seems that many assessors and those being assessed think that they are being asked to 'predict' impacts, when in fact the purpose is to stimulate thought about how impact might be developed. It is up to the Research Councils to improve the guidance they provide, and we urge them to act to clear up the misunderstanding. We do not believe that the consideration of pathways to potential impacts should be used as a tie-breaker in grant applications. (Paragraph 36)

6. Given that the very best literature on the subject concludes that reliable quantification of the economic impact of investment in science and research is deeply problematic at best, the suggestion that the Treasury is waiting for 'hard figures' on the benefits of research causes us great concern. (Paragraph 37)

7. If funding does not increase, UK-based researchers and institutions may find it harder to participate in projects requiring collaboration and the sharing of international facilities, if commitments to medium and long-term funding cannot be made. If there is even a perception that British science is suffering as a result of cuts, the UK will become a less attractive place for academics to work. A similar consequence could very well be that science will be seen once again as a less attractive destination for students contemplating higher education. With all the work that has gone into increasing the demand for science places within HE, it would be an enormous waste of past effort and future potential were cuts to be visited upon the sector. (Paragraph 39)

Picking winners and losers?

8. Maintaining a broad portfolio of excellent research need not be mutually exclusive with the Government identifying and seeking to capitalise upon areas in which the UK has the potential for world-leading science, provided that it is done in a transparent and accountable way. Where such areas are identified at a national level, they should be funded at a national level. We note the importance of the work of the Technology Strategy Board in this respect. (Paragraph 43)

The Science and Technology Facilities Council

9. We remain to be convinced that 'indicative planning' over future CSR periods for the use of large facilities will be meaningful if the standard principle of planning on the basis of 'flat cash' allocations continues. (Paragraph 50)

10. The structure of the STFC as established in 2007 left much to be desired. We are concerned that the proposals are extremely provisional, depending as they do upon further consultation between BIS, the Bank of England and HM Treasury and the outcome of the next CSR period. (Paragraph 51)

11. We are not satisfied with the outcome of the STFC's reprioritisation exercise, and consider that any withdrawals from programmes should be suspended at least until such time as the next CSR allocations are known. Otherwise, the budgetary fall-out from the unsatisfactory merger of CCLRC and PPARC will be set in stone. (Paragraph 52)

Increasing demand for and supply of STEM students

12. Whilst it would be unrealistic to expect every PhD student to become a Professor, we are concerned that academia is losing some of its brightest and best to alternative careers. The life of a young research scientist needs making more attractive when compared to the bright lights of industry and commerce. (Paragraph 59)

Funding science within higher education

13. The allocation of teaching funding by HEFCE for STEM subjects should adequately reflect the higher costs of teaching science, so that departments do not require cross subsidisation within universities. In order to deliver the number of science graduates that the UK needs, the Government should in its letter to HEFCE, require that universities deliver the necessary numbers of STEM graduates. (Paragraph 61)

14. HEFCE's decision to cut capital grants will disproportionately affect science teaching in universities. We were frustrated by the fact that, when asked about the future, the Minister for Higher Education gave us answers about the past. Decisions about 'different missions' are forced upon universities when the Government, through HEFCE, fails to invest adequately in higher education. If the Government is committed to increasing the number of STEM graduates, it can little afford the closure of science departments within universities. (Paragraph 63)

15. We put our concerns over unfunded and unsustainable growth in the number of science places to the Minister, who told us that "there has always been unfunded growth in and around the system". As an observation, that is undoubtedly the case, but for the Government actively to encourage unfunded and unsustainable growth in a period immediately before cuts in investment as a matter of policy is something entirely different. Sir Alan Langlands's description of the move as "fairly hastily contrived" was, in our view, accurate. (Paragraph 67)

16. We are in principle in favour of the concentration of research on the basis of excellence, provided that it is concentrated wherever excellence is found. (Paragraph 68)

17. We urge the Department to press the Treasury to make it easier and more financially viable for universities to collaborate and cut costs where they can. (Paragraph 71)

Conclusion

18. At a time when, according to the Government's previous arguments, public investment in science should be increasing, the prospect of cuts looms large over the UK's science base. The Government is committed to supporting business investment in research and development through the taxation system, but the very existence of such businesses depends upon the size and strength of the science base underpinning them. If the Government fails to properly support the science base, there will be no companies to give tax breaks to. (Paragraph 72)

19. Failure to continue to increase investment in science would be both counterintuitive and counterproductive. Much good progress will be lost and the size of cuts to science are unlikely to make a significant dent in the deficit. We cannot at present reconcile the Government's policy ambitions with its actions, and call upon the Government to increase spending on science within the next Budget, if it truly is committed to the principle of a knowledge-based economy. (Paragraph 73)

Formal Minutes

Wednesday 17 March 2010

Members present:

Mr Phil Willis, in the Chair

Mr Tim Boswell	Dr Brian Iddon
Dr Evan Harris	Graham Stringer

The Committee considered this matter.

Draft Report (*The impact of spending cuts on science and scientific research*), proposed by the Chair, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 73 read and agreed to.

Summary agreed to.

Resolved, That the Report be the Sixth Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

Written evidence was ordered to be reported to the House for printing with the Report.

[Adjourned till Monday 22 March at 4.00pm.

Witnesses

Wednesday 3 February 2010 *Page*

Lord Broers, **Professor Brian Cox**, School of Physics and Astronomy, University of Manchester, **Nick Dusic**, Director, Campaign for Science and Engineering, and **Sir Peter Williams**, Vice-President, The Royal Society Ev 3

Iain Gray, Chief Executive, Technology Strategy Board, **Dr Tony Peatfield**, Director of Corporate Affairs, Medical Research Council, **Professor Michael Sterling**, Chair, Science and Technology Facilities Council, and **Professor Alan Thorpe**, Chair, Research Councils UK Ev 15

Wednesday 10 February 2010

Professor Michael Arthur, Chair, The Russell Group, **Professor Janet Beer**, **Chair**, University Alliance, **Professor Les Ebdon**, Chair, million+, and **Professor Paul Wellings**, Chair, The 1994 Group Ev 47

Dr Alastair Hunter, President, University and College Union, **Sir Alan Langlands**, Chief Executive, Higher Education Funding Council for England, **Professor Adrian Smith**, Director General, Science and Research, Department for Business, Innovation and Skills, and **Professor Steve Smith**, President, Universities UK Ev 73

Wednesday 24 February 2010

The Rt Hon Lord Drayson, Minister for Science and Innovation, and **The Rt Hon David Lammy MP**, Minister of State for Higher Education and Intellectual Property, Department for Business, Innovation and Skills Ev 81

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33	Professor Leslie Ann Goldberg	Ev 102
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48	Dr Marta Mazzocco, Dr Alexander Strohmaier and Prof. Eugene Ferapontov	Ev 226
49	Peter Merrill	Ev 230
50	Met Office	Ev 232
51	million+	Ev 25
52	Motor Neurone Disease Association	Ev 201
53	National Physical Laboratory	Ev 123
54	Open University	Ev 207
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85	Dr Rob W van Nues	Ev 97
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89	Professor Tim Wess, Head of School of Optometry and Vision Sciences, Cardiff University	Ev 125
90	Alan Wood	Ev 178
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Second Report	The work and operation of the Copyright Tribunal	HC 245 (HC 637)
Third Report	Withdrawal of funding for equivalent or lower level qualifications (ELQs)	HC 187–I (HC 638)
Fourth Report	Science Budget Allocations	HC 215 (HC 639)
Fifth Report	Renewable electricity-generation technologies	HC 216–I (HC 1063)
Sixth Report	Biosecurity in UK research laboratories	HC 360–I (HC 1111)
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First Special Report	The Funding of Science and Discovery Centres: Government Response to the Eleventh Report from the Science and Technology Committee, Session 2006–07	HC 214

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Second Special Report	The Last Report: Government Response to the Thirteenth Report from the Science and Technology Committee, Session 2006–07	HC 244
Fourth Special Report	Investigating the Oceans: Government Response to the Science and Technology Committee's Tenth Report of Session 2006–07	HC 506 [incorporating HC 469–i]