



## Science and Technology Committee

### Oral evidence: The science budget, HC 340

Wednesday 15 July 2015

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Members present: Nicola Blackwood (Chair); Chris Green; Liz McInnes; Dr Tania Mathias; Carol Monaghan; Graham Stringer; Derek Thomas; Matt Warman; Daniel Zeichner

#### Questions 1-69

Witnesses: **Jo Johnson MP**, Minister of State for Universities and Science, Department for Business, Innovation and Skills, **Gareth Davies**, Director General, Knowledge and Innovation, Department for Business, Innovation and Skills, and **Philippa Lloyd**, Director General, People and Strategy, Department for Business, Innovation and Skills gave evidence.

**Q1 Chair:** Welcome, everybody. Could I ask those in the gallery to turn off their mobile phones, or turn them to silent? I welcome the Minister and the two directors general to their posts. I think all are new in their positions. I am certainly new to this position, as are other members of the Committee.

I would like to start with a simple process question. Being perhaps an over-zealous new Chair, I decided to read back through some of the plans and strategies of the Department to try to get a sense of the basis on which spending decisions would be made; we are launching an inquiry into the science budget and spending on science. I started with the industrial strategy of 2013, most recently referred to by the Business Secretary as an industrial approach; the national infrastructure plan of 2014, which I think was accompanied by a national infrastructure pipeline; and the science and innovation strategy of 2014. We then had a general election and a Budget, followed by a productivity plan and the Dowling review. The productivity plan announced that we would have a new national infrastructure plan and national infrastructure skills plan. We are also awaiting the Nurse review, even though we had a triennial review which reported in 2014, and we have had various updates and progress reports since then. That is nine major reports in two years. We have had reports and the Dowling review which called for simplification of access to business support, and we have had the learned academies' joint report which calls for long-term stability. I have found it quite difficult to know which of these reports are current reports and what long-term stability is. Some clarity on that would be very helpful.

**Jo Johnson:** First of all, Madam Chairman, congratulations on your election to this position, and welcome also to other members of the Committee. I am very pleased to be able to be here and to shed what light I can on BIS policy with respect to science and innovation. I look forward very much to working with you in coming months.

You highlight a serious programme of work that was in place over the course of the last coalition Government, much of which now continues in the new Parliament under the Conservative Administration. I think the intensity of the work you describe reflects the importance of science and innovation to the Government's economic plan. There is possibly no area more central to the productivity plan than science and innovation, and the programmes of work in train reflect the Government's clear desire to make science and research absolutely front and centre in our plan to lift the productivity of the British economy.

You mention a number of reports and reviews that have either recently come out or are in train and about to come out. The Dowling report on collaboration between universities and businesses came out a week or so ago and had some very helpful recommendations, which the Department is now considering fully and will respond to in due course, but its central recommendation around the simplification of Government schemes to support innovation and the relationship between universities and businesses is one that has been 100% registered. We look forward to responding fully to those recommendations in due course.

You also mentioned the review Sir Paul Nurse is conducting into the operation of research councils. That is a review in process, and Sir Paul is engaging very closely with me and other officials in BIS, as well as with the research councils themselves, to look at how we can maximise the value of the research spending we are making as taxpayers and ensure we get full value for money from it. I expect his report to come out towards the end of the year.

**Q2 Chair:** I do not think there can be any question about the Government's commitment to science; it is just that the volume of policy announcements can feel confusing and uncertain for those on the receiving end, whether it is industry or the science community. While I appreciate that it is indicative of a serious train of work, my question is, which of these reports are current and which are now obsolete?

**Jo Johnson:** To take the big framing document you mentioned, the science and innovation strategy, which came out in late 2014, that is a current document; it remains the strategy of the Department and the Government as a whole, and it informs all our work. That is a current overarching strategy framework within which we are working, and it remains operative.

**Q3 Chair:** That is very helpful. The reason I ask is that the policy framework will be the basis on which spending decisions are made. Some of the messaging that has come out around science is very encouraging. Your predecessor, Greg Clark, made it clear to this Committee that he regarded science as an investment in our future, that it is a good investment and that he would be making the strongest possible case in advance of the spending review. You have given your personal commitment in a recent speech that you will be a champion for British science and research. On that basis, what will be the nature of the ring fence beyond 2015-16, given that the key recommendation of "Building a Strong Future" is long-term stability?

**Jo Johnson:** The Government have a very strong track record in prioritising science at a time of fiscal consolidation across the piece elsewhere. As you know well, in the last Parliament we protected the science budget within the ring fence at a time when we were making discretionary cuts in other Government Departments totalling £98 billion, so the track record speaks volumes.

We also have a manifesto commitment, which the Government will be implementing in full. That indicates that we will be respecting the capital road map we have set out, which consists of a programme of capital spending going out all the way to 2021, so there is a very long-term commitment at a run rate of £1.1 billion a year, totalling £6.9 billion out to 2021. That includes £2.9 billion for grand challenges, which will enable us to fund institutes of great national significance, such as the Alan Turing Centre, the Square Kilometre Array, the Royce Institute and many others. There is a clear programme of capital investment that we can foresee going out until the end of the Parliament.

**Q4 Chair:** That is true and it is very welcome, but obviously capital investment must be matched by resource investment and by fundamental research. There have been issues previously where funding streams have been moved in and out of the ring fence. My question is whether the ring fence will remain the same as it has been previously or if there is any intention to adapt or change it going forward into the spending review.

**Jo Johnson:** Clearly, I cannot pre-empt the spending review, and all of these decisions will be taken in the round by the Chancellor. What we do know is that we could not hope for a Chancellor more committed to science and research than he is. He has made it one of the defining features of his time at the Treasury, and I have every expectation that it will continue to be a major priority for him.

**Q5 Chair:** What about innovation spending? This has remained outside the ring fence, but it has doubled since 2010. I think it has been a major contribution to our productivity plan and our infrastructure plans. As Science Minister, will you be fighting to retain that budget?

**Jo Johnson:** As a Government, we are committed to making sure that we exploit fully the commercial potential of the research and science base in which we are investing so heavily. The innovation budget plays a really important part in that. As you may recall, in our manifesto we commit to important elements of the innovation programme, including expanding our successful catapult network. A number of catapults are in the pipeline, and two were announced earlier this week. We are committing very much to making sure we fully exploit the research base we have, and we are also committed to supporting the university enterprise zones that we set up in the last Parliament.

**Q6 Chair:** I am very glad you mentioned the catapults; that was where I was going. It was announced in the Budget that more catapults would be opened. The Dowling review and other reviews have been very supportive of the catapults, but they have also said that it is very important that funding of current catapults is not reduced in favour of opening further

catapults. If the innovation budget is not to be increased, how are those catapults to be funded?

*Jo Johnson:* We have announced the opening of two new catapults: the precision medicine catapult in Cambridge and the medical technologies catapult in Alderley Park in Cheshire. We have the resources to do that without compromising any funding for existing catapults, so I do not think there is need for concern on that front. Clearly, I cannot pre-empt spending review decisions that may affect the overall envelope for Innovate UK at this point, but you can be assured that the catapults announced in the last week or so do not in any way affect the budgeting available for the existing catapults.

**Q7 Chair:** Your commitment going forward is that if you are to open further catapults it is not going to involve a change in resource funding, or a reduction in existing funding, to catapults that have already been committed to.

*Jo Johnson:* I cannot pre-empt the spending review, but what I can say, without wanting to bore you by repeating myself, is that the catapults that have recently been announced do not impact on the funding streams in the business cases for the catapults we already have.

**Q8 Graham Stringer:** Minister, you said that the Government had a strong record in investing in science by protecting the science budget in cash terms, and that has to be recognised, but you also said to the House on 14 June that we had fallen behind other countries in the level of our investment per GDP. How do you propose getting us back up the league table compared with other modern economies?

*Jo Johnson:* You are right to point out that we have protected the science spend. That is something of which the Government are intensely proud. We have maintained the science budget in flat cash terms over the course of the Parliament at a time of very severe fiscal consolidation in other Departments. That was a very long-term choice that the Government made.

In terms of the overall quantum of spend, as a country we are spending approximately 1.7% of GDP on science and research. That compares with an average across the OECD of about 2.4% and, as you may point out later, it is some way below the 3% target that the EU as an organisation has set out as an aspiration. What that rather crude comparison of the headline percentage spend overlooks, or does not give much account to, is the incredible efficiency, effectiveness and high returns we get on our science spend as a country. We have a very efficient, well organised and productive science base, and it generates huge returns for us as an economy. We are not slipping down the rankings at all when it comes to, for example, the impact of our research. We are No. 1 in the world in terms of the field-weighted impact of our research. Measured in terms of innovativeness, we are either the first or second most innovative economy in the world, and per unit of resource we generate huge returns from our R and D spend in terms of numbers of spin-offs and numbers of jobs in science generated. Far from falling down the rankings, our priority needs to be to make sure that we maintain the productive and efficient nature of our science spend.

**Q9 Graham Stringer:** That is interesting, but it does not quite answer the question, does it? Do you believe we should be increasing the amount of money per GDP we are spending on science? I do not think there is any difference between us in the direct correlation between investment in science and technology and the growth of the economy in the medium to long term. What I really want to know is, do you have a plan to get us up that table, recognising the high quality of science in this country?

**Jo Johnson:** I think it is important to focus on outputs principally rather than inputs; that is really what we want to measure. We want to measure what we are generating as a society and as an economy from our investment and whether that is sufficient and provides the returns we need as a society, rather than measuring our performance on the basis of how much we are spending on something. Of course, there is potential for these outputs to be lagging indicators, and we would want to be very wary of any slippage there. To the extent that the indicators continue to perform well we can be satisfied that we are investing at an appropriate level, but we would want to be very sensitive to the lagging factor. If that starts to emerge as a risk, we will be very attentive to it.

**Q10 Graham Stringer:** As you say, there have been large cuts in other parts of the Government's expenditure, including in your own Department—£450 million, I understand. Is that going to have any impact on science? How permeable is the membrane between that part of the expenditure and science expenditure?

**Jo Johnson:** The £450 million of in-year savings that BIS will be making in 2015-16 represents about 5% of the Department's non-science resource expenditure and does not affect the science ring fence. The science ring fence maintains itself and is not going to be impacted by the £450 million of in-year savings.

**Q11 Graham Stringer:** Do you think the productivity plan will change any of the scientific priorities within the Department?

**Jo Johnson:** I think the productivity plan underscores the central place that science has for us as an economy. That is one of its key objectives. It also introduces an important programme of work for us as a Department to ensure that the excellence we have in our science base is consolidated and continues. We want to ensure that the very powerful global names we have in science in the golden triangle continue to be globally leading. At the same time, we want to ensure that we address the productivity gaps that have emerged over years and decades in this country. We are obviously very aware that productivity in parts of the country, for example in Manchester, Newcastle and Sheffield, is half that of cities such as London, Oxford and Cambridge. We want to see whether there is a correlation between the intensity of scientific and research activity in those cities and the lower productivity we can see there. What we are proposing in the productivity plan is a series of scientific and innovation audits to enable areas that have lower productivity, or areas that see themselves as having the potential for scientific excellence, to come forward

and, with our help, map their areas of potential excellence so that we can support them in future to become themselves globally leading places of scientific research and innovation.

**Q12 Liz McInnes:** Can I ask you for your reaction to our predecessor's legacy report and the recommendations it made? Specifically, could you give us a sense of where your priorities lie for the promotion of science and also for the education of scientists?

**Jo Johnson:** The last Committee was a very engaged Committee, and took the pulse of science in the UK. I have looked at the legacy report and its recommendations on EU science and STEM diversity, and also taken note of the work it did on antimicrobial resistance. My priority for my time in this post with respect to this part of the portfolio that I hold is to ensure that we do a number of things. There is no country in the world that does not envy us our globally leading centres of scientific excellence, the Oxfords, Cambridges, Imperials, LSEs and so on—everything in the golden triangle and many other parts of the country; but prioritising and addressing the productivity gaps we also see in the rest of the country has to be our focus to ensure that, while we maintain excellence as a driving principle for how we allocate our resources, we also have to ensure that we are giving areas the potential for excellence, to fulfil that potential. Making sure that the Manchesters, Sheffields, Exeters and so on become as great as they possibly can be is going to be the focus, plugging the productivity gaps wherever they are. Productivity is not just about places; as you say, it is also about making sure we are using all the human capital—all the people in this country—and getting a fairer representation of women, and other groups who are presently under-represented in our science base, moving into those activities.

**Q13 Liz McInnes:** I am interested that you mention women. We had quite a high-profile case recently where the role of women in science was questioned. What specific plans do you have to increase the involvement of women in science?

**Jo Johnson:** There is quite a long-standing programme of work to boost the numbers of women going into science, starting in schools and going through to the choices people make as they leave school and prepare to go to university—the kinds of courses they seek to take—and then, on graduating from university, the kinds of career paths they choose and their attraction into scientific careers and their retention and progression in scientific careers. Across the whole life cycle of our STEM activity there is a suite of effective programmes, and they need to be even more effective in future, so that we make faster progress in unplugging the under-representation of women in this area.

**Q14 Chair:** Thank you, Minister. Perhaps we could ask for slightly quicker answers, because we have a few to get through. I have a quick question though. In response to Liz McInnes, you said you wanted to make sure that we were boosting productivity and research excellence in all parts of the country. Does that mean you are going to introduce a regional geographical metric to research funding?

**Jo Johnson:** No, nothing as crude as that. We simply want to help areas identify where they have the potential to become excellent, or the potential for excellence.

**Chair:** That's fine. I just wanted to check.

**Q15 Chris Green:** Big announcements on new capital projects create a lot of excitement among the science community. It also inspires a lot of people to go into science. Over the last Parliament a number of different projects were announced. Will there be room in the spending review for a continuation of that?

**Jo Johnson:** Of capital spending—capital expenditure?

**Q16 Chris Green:** Yes, large projects.

**Jo Johnson:** As I said a few minutes ago, we have outlined a capital road map, which takes us out to 2021, of £6.9 billion; £3 billion of that is for world-class labs and £2.9 billion is for grand challenges—the institutes of national significance—so there is a capital pot there. Obviously, much of that has been committed, but there is still some unallocated funding in the later years of this Parliament.

**Q17 Chris Green:** Once any project is off the ground the initial excitement, the initial push behind the project, needs to be sustained over many years to come. What is being done to ensure that funding is continued for the years following completion of the initial project?

**Jo Johnson:** It is obviously important that the business case presented is fully funded and that there is clarity over the resources that will be available to operate a facility once it is open. That goes without saying. Any facilities that are committed to need clarity over their resource funding as well as their initial capital investment.

**Q18 Chris Green:** That funding will be protected—it will be ring-fenced.

**Jo Johnson:** As I said in my response to the Chair's opening questions, the nature of the science budget will be determined in the spending review, but what we do have is clarity over the capital. We have clarity over the commitment of the Chancellor and the rest of the Government to prioritise science. It runs through the manifesto like words in a stick of rock, as I have said on a number of occasions.

**Q19 Chair:** Is it your priority to fight for the ring fence going forward beyond 2016?

**Jo Johnson:** Of course. We want to ensure that we have a strong science base, but in that respect the Government are absolutely united. It is central to the Government's productivity plan and our ambitions for economic growth.

**Q20 Chair:** As Science Minister, is it your priority to fight for the ring fence—not the Government but you?

**Jo Johnson:** Of course, I want to fight for the most productive science base we can possibly have. That is my job as Science Minister. The Chancellor will make a determination on the nature of the science budget at the time of the spending review.

**Q21 Chair:** Yes, he will, but the way you get funding for your Department is that you go in and fight the Treasury, as I understand it. I am just trying to find out whether or not that is what you will be fighting for. It would obviously make quite a difference to the science community.

**Jo Johnson:** Of course we want the resources to enable us to do the job we have to do, but our focus is on outputs; it is not necessarily just on inputs. Focusing on inputs misdiagnoses the nature of the challenges we face as a society. We want a productive economy, and we want to do it with the resources that are necessary.

**Q22 Chair:** Do you think the ring fence is necessary for the outputs we have been achieving?

**Jo Johnson:** I think the ring fence was a very powerful indication of Government priorities in the last Parliament at a time of significant fiscal consolidation. Obviously, it is for the Chancellor to make that determination in the spending review, and I cannot pre-empt it. I am sure you do not expect me to. All I am saying is that it was a very strong indication of Government priorities in the last Parliament, and it would be a continuation of that if it were to carry on in this Parliament.

**Q23 Derek Thomas:** We have obviously had the Budget and the spending review is coming out. You kindly referred to the two reviews by Professor Dowling and Sir Paul Nurse. I know they are very recent. Have you had any time yet to look at the assessment of what they will cost? Could you also give us some ideas about what, within a restricted budget, would be your absolute top priorities for science and technology?

**Jo Johnson:** As a Department, we are assessing the Dowling report at the moment. It was published only a week or so ago, and we will be responding fully later in the year. I have not made an assessment of the cost. I am not sure whether the Department has done so.

**Gareth Davies:** I think the main thing I took from the Dowling review, and the strongest point in it, was about the complexity of the system. As a relative newcomer in this role, I am struck by the number of different schemes available to small businesses from a range of organisations, not just within BIS but across Whitehall. For a busy small entrepreneur, the time taken to work out what they can apply for, let alone actually applying for it, is a barrier to entry. One of the priorities from the official side has been how we can simplify it so that recipients of these schemes—the small businesses we want to access the science



base—can do so in a much simpler way. Part of that may be addressing the underlying schemes themselves, or hiding the wiring as Dame Ann suggested, so that there is a much simpler approach. There is a lot we can learn as a Department and officials in terms of simplicity, which obviously has an opportunity for reducing cost as much as increasing it.

**Q24 Derek Thomas:** As we simplify the process that small businesses need to go through, can we also look at how we make sure that small businesses across the whole of the country, wherever they might be, particularly in areas like mine in St Ives, have fair access and can get equal support? Would that be something you could do?

*Jo Johnson:* That is a very reasonable request of Innovate UK. It has been making progress in this respect in recent years. Since Innovate UK, previously the Technology Strategy Board, was given its remit in this respect, the proportion of Innovate UK loans going to SMEs has increased substantially. Now more than half of all grants go to SMEs rather than to the bigger businesses that used to get them.

**Q25 Chair:** One of the reasons I asked my opening question was that I was struck by the fact that throughout the Dowling review recommendations there are references to industrial strategy. It is helpful to understand how that will interrelate with the current policy. Whether it will go with the productivity plan or with other documents is not quite clear to me. Is there a view on that?

*Jo Johnson:* We are going to respond fully to the Dowling review later in the year, but, as Gareth was saying, it made some sensible recommendations around simplification. The productivity plan takes note of that central recommendation, and we will be looking in the spending review that is coming up to see how best we can simplify the way Innovate UK operates, so that its schemes become more accessible to the kinds of companies Mr Thomas was talking about.

**Q26 Dr Mathias:** You have a great role, a great job, but you are not in Cabinet, and I find that concerning. The question is, who is looking into all science aspects at Cabinet? Who is looking into brain drains? Who is looking at engineering and pre-school children? It covers so much.

*Jo Johnson:* That is a reasonable question. The Secretary of State for the Department for Business, Innovation and Skills, Sajid Javid, sits at the Cabinet table, and at the Cabinet table you also have the Chancellor of the Exchequer. In those two alone you have very powerful voices speaking up for science, and they are doing a good job of that.

**Q27 Matt Warman:** You mentioned trying to encourage regions where there has not been such strong historic scientific funding. That link is an important role for Government. I understand that, but at the same time, on the idea—the so-called Haldane principle—of experts deciding who to fund and where that funding goes, my suspicion is that the scientific

community is better at making decisions on what science to fund than politicians are, marvellous as we all are in this room. Can you outline how our commitment to the Haldane principle will continue?

**Jo Johnson:** Clearly, excellence is an important guiding principle, as I said earlier, and the Haldane framework that insists on research councils and other independent bodies making the grant determinations is also a very important principle, and we have no intention of interfering with the operation of that important overarching framework. It has always been the case that Governments have set strategic priorities and made allocations between disciplines—for example, in terms of how much money research councils individually receive—that reflect bigger societal considerations, and that will continue to be the case. That does not also mean that Government is not able and should not take steps to help parts of the country that have not received much science funding in the past to map their capabilities, so that they can be better equipped when it comes to grant applications to make their case and to fight for funding. It is not about interfering with the independent grant allocation process; it is about mapping and auditing capabilities and helping regions that have the potential for excellence to fulfil it.

**Q28 Matt Warman:** Linked to that, concerns have been raised previously about how much we are spending on horizon scanning to work out where those next priorities should be. Can you talk a little about your commitment to preserving our ability to scan the horizon for where we should be spending money next?

**Jo Johnson:** I am going to throw that to your next panellist, Sir Paul Nurse, because it is a very important part of the work he is doing in his review of how the research councils operate. The reason his review was commissioned was that we felt the horizon scanning and the strategic thinking function has been at times a bit deficient, and we want to see whether we can harness the efforts of the research councils in a more effective way to achieve precisely what you were going for.

**Q29 Carol Monaghan:** Minister, one of the biggest challenges facing science and research just now is the issue of qualified teachers in schools. What discussions are you having with the Minister for Education about how we are going to tackle the shortage of those teachers in schools?

**Jo Johnson:** The shortage of maths and physics teachers has been a long-standing problem in this country, and in the last Parliament steps were taken to provide funding, from memory £67 million—I might be wrong—to allow for the training of 17,500 maths and physics teachers across our secondary school system. That will help plug the gap we have there. That is part of the work that is ongoing. I will be having discussions with the Secretary of State for Education to see what more needs to be done.

**Q30 Carol Monaghan:** That sounds good on the face of it. I just wonder about the retention of these teachers once they are actually trained. Have people been looking at how these members of staff are supported in the first few years of their teaching careers?

**Jo Johnson:** That is an important point which I will take up with the Secretary of State for Education, unless Philippa has some thoughts on it.

**Philippa Lloyd:** Some of the package was to retrain 15,000 existing teachers and the other was to recruit 2,500 new ones. A review was done last summer with BIS and DFE officials on all this. We did indeed look at retention and also continuous professional development and how to get people in to do teaching initially, even if they might go off to other parts of the career. That is all part of the package of measures that DFE put together, and which the Prime Minister announced. You are absolutely right. Obviously, we need to keep looking at it, because the quality of science teachers needs to increase.

**Q31 Carol Monaghan:** Assuming we have students who are keen to study STEM subjects at universities, first, what are the universities doing to attract top students to STEM careers, and, secondly, how are the universities managing to maintain standards of research and teaching when they are faced with budget challenges and cuts?

**Jo Johnson:** On the university funding for STEM question, the Higher Education Funding Council for England has a grant letter that indicates ministerial priorities in terms of the allocations made to universities. Those priorities set out that STEM is a priority for the Government, and STEM subjects receive additional funding through the Higher Education Funding Council as a consequence to enable universities to offer these critical courses.

**Q32 Matt Warman:** As a follow-up to that, do you think that the higher education sector is going to be able to absorb the funding cuts it is facing, or are we going to see real cuts to what is actually offered?

**Jo Johnson:** Our universities are very sustainably funded. Andreas Schleicher, OECD's head of education, has said that the UK is one of the only countries in the world to have hit upon a way of sustainably funding higher education, as a result of the reforms put in place in the last Parliament. Our universities on a per student basis are better funded now than they were in 2010. They have the resources to provide world-class higher education, and it continues to be a priority for the Government to ensure that they remain sustainably funded for the future. I have every confidence that they are in a position to do the job we need them to do.

**Q33 Chair:** One of the ways just announced for dealing with the cuts in FE is the apprenticeship levy. Do you have any indication of how much that is supposed to raise? We have not heard any figures on that, as far as I am aware. My follow-up is how will that interact with the policy announced before the election by the Home Office about a skills levy for companies that might be recruiting foreign workers, which the Migration Advisory Committee is looking at? I have not heard how those two policies are working.

**Jo Johnson:** The apprenticeship levy is slightly out of my area of responsibility, but, Philippa, you have an overarching sense.

**Philippa Lloyd:** It is slightly outside mine as well. It is meant to raise money to help fund the 3 million-plus apprenticeships that were in the manifesto commitment. This is from memory, so we will have to check—actually I'm not going to give you the number; I think it is about £700 million, but I need to check.

**Q34 Chair:** You can write to us.

**Philippa Lloyd:** Yes.

**Q35 Daniel Zeichner:** I would like to turn to international collaboration. Obviously, UK science does very well in terms of European funding. We have a referendum on the horizon. What kind of assessment have you made of the effect that withdrawal from the European Union would have on UK science?

**Jo Johnson:** I think we can all be very proud of the fact that British scientists and universities do so well at securing an outsize share of the available European funding streams. I think we took 15.5% of the last framework programme, FP7, for example. That is significantly greater than our GDP share or contribution share. We can be proud of that, and we want to continue to ensure that our great institutions can access these important funding streams.

With respect to your specific question, the Prime Minister has set out a clear programme of work to reform our relationship with the European Union, to renegotiate the basis of our relations with the European Union and then set it all out in a referendum. We have every confidence as a Government that he will be successful in that and will be able to recommend, on the basis that we have reformed the relationship with the European Union, that we stay in and continue to have access to those funding streams.

**Q36 Daniel Zeichner:** So you have not made any assessment of the impact it would make.

**Jo Johnson:** We have every expectation of success and of the Prime Minister continuing his record of securing reform in Europe, persuading our European partners that it is in everyone's interest to renegotiate the relationship and then to have a successful referendum result that enables us to stay in a reformed European Union.

**Q37 Daniel Zeichner:** On something as important as this to UK science, surely you need to know what the impact would be. Has any assessment been made?

**Jo Johnson:** I do not want to bore you by repeating myself.

**Q38 Daniel Zeichner:** The answer is no, isn't it?

**Jo Johnson:** I do not want to bore you by repeating myself. We have every expectation of a successful reform and renegotiation.

**Q39 Daniel Zeichner:** So you don't know. Okay. Moving on to the wider world, what actual evidence do you have on whether immigration controls are adversely affecting Britain's ability to attract and retain the best scientific talent?

**Jo Johnson:** Our scientific institutions are globally successful and globally competitive. We have four universities in the world's top 10; we have the most productive science base measured by field-weighted impact. I do not see any evidence that we are bumping up against the constraints you mention.

**Q40 Daniel Zeichner:** You do not have any evidence either way. Have you looked to see?

**Jo Johnson:** I said I do not have any evidence.

**Q41 Daniel Zeichner:** Have you looked? Have you done the assessment?

**Jo Johnson:** I do not see that there is any impact of the kind you mention.

**Q42 Daniel Zeichner:** So we can forward all the complaints that we are getting and you will look at them.

**Jo Johnson:** I am happy to look at any complaints.

**Daniel Zeichner:** Thank you.

**Q43 Chair:** I have a final question. I understand that departmental R and D spending has fallen by about 19% since 1995. A commitment was made in one of the reports that this would be looked at, and how to address it by the CSR. It is also a recommendation in "Building a Strong Future", which we are going to hear about in a minute. Is the work on that in train? Can we have any comments on that, perhaps from Mr Davies?

**Gareth Davies:** You raise a good point about the issue of departmental R and D. We have the new statistics out at the end of the week from the ONS. The important thing to distinguish is the way in which the departmental statistics are pulled together on a different basis from the OECD figures for R and D. It is important to clarify that one is based on the Frascati method; this one is on a wider definition, which includes knowledge transfer as well. The Government Chief Scientist, Sir Mark Walport, who I think is coming before you to give evidence, is looking at this. He works with the Government chief scientists across Whitehall and has a regular session with them. He is working with the Treasury in thinking through how the spending review should operate to ensure that

decisions about departmental R and D, be they changes in either direction, are reflected and add up for the Government as a whole. All Departments have a responsibility to work with the Government Chief Scientist on their R and D budgets. Some of the accounting treatments around ESA 2010—it sounds a bit technical but it is important—which may affect the capitalisation of departmental R and D spend, will also be important for its treatment in the CSR. The overall headline is that it is owned very much by the Government Office for Science and the Government Chief Scientist.

**Q44 Chair:** I understand that, but will there be a redefinition of R and D to ensure that when there is very significant pressure on Departments going forward, because of the CSR, we do not see further squeezing of R and D spend, given that we know that R and D spend has significant benefits, filtering out not just through Departments but also the wider economy?

**Gareth Davies:** Departmental spend is just one aspect of the overall public investment in R and D. A lot of the £10 billion is coming through from spending through BIS in terms of the research councils, HEFCE and directly to universities and the like. It is important to make sure that we look at the R and D spend in the round so that, rather than individual Departments making their own decisions, we look at the connections between them. A good example of this would be the discussion we had at the chief scientists' session two weeks ago, I think, looking at the spend on energy research. There are a number of Departments with interests in energy, such as DECC, DEFRA and also BIS with its impact on business, and also the role of Innovate UK. The important role that Sir Mark Walport will be playing is holding the ring to understand the implications and trade-offs between those decisions.

**Q45 Chair:** How will he be held to account? To whom will he be reporting?

**Gareth Davies:** He reports to the Cabinet Secretary.

**Q46 Chair:** I know, but in terms of parliamentary scrutiny.

**Gareth Davies:** I think he comes before this Committee.

**Q47 Chair:** Thank you very much. That brings questioning of this panel to an end. Thank you, Minister. This is the beginning of our inquiry on science spending. We have ranged a little further than that because it is the first time you have come before the Committee. We are going to hear from a number of other witnesses on this subject, so we may need to ask you to come back and respond to some of the issues that arise. I am very grateful to you for the answers you have given us today, even though they raise a few more questions.

## Examination of Witnesses

Witnesses: **Sir Paul Nurse**, President, The Royal Society, **Professor Richard Parker CBE FREng**, Chair, Research and Secondments Committee, Royal Academy of Engineering, **Lord Stern of Brentford**, President, British Academy, and **Professor Sir John Tooke**, President, Academy of Medical Sciences, gave evidence.

**Q48 Chair:** Welcome, and thank you very much for making time to come here today at rather short notice. We are very grateful to all of you. As you heard from the previous evidence, we are launching an inquiry into science spending in the hope that we can submit some evidence and make a contribution to the CSR in the autumn, given the significance this will have to science and innovation in the United Kingdom. My first question to you collectively, though I hope you will answer individually, is whether you would give the Government marks out of 10 for how they are making progress on their plan for growth in science and innovation. They set out six elements in how they want to make the UK the best place in the world for science and business: first, deciding priorities; secondly, nurturing scientific talent; thirdly, investing in our scientific infrastructure; fourthly, supporting research; fifthly, catalysing innovation; and, sixthly, participating in global science and innovation. Sir Paul, perhaps you might like to start on marking the Government on how well they have been doing since they produced one of their many reports.

**Sir Paul Nurse:** I think that in a time of austerity we would give them seven out of 10. In the brave new dawn that we hope we are entering, I am hoping that they will be more generous to science. We have been a little muted in the past because, compared with other spending cuts, we have been protected. We now have to look forward to what science can bring for society, which is a great deal, and how we can promote the greatest science in the UK. I would like the Chancellor to think of himself as a science chancellor, and I hope he may think about that. I think that in the Chancellor we have somebody who does support science, but we now need that translated into extra cash. We heard the Minister, who I believe also supports science, say that it is a matter for the Chancellor. I am sure, and hope, that he will make the case for that. You did not actually ask him that question, but it is very important that the Minister makes that case because, as was hinted at, our total spend on R and D is now just under 0.5% compared with the OECD and the EU 15 at 0.67%. This is not good. Of course, it is a piece of elastic; I am not saying that there is any really clear value which is the right one, but we are definitely slipping behind, so seven out of 10. Let's try to make it nine out of 10 for the future.

**Professor Parker:** Good morning, ladies and gentlemen. I would agree with Paul. I think seven out of 10 in the current climate is fair. In terms of setting priorities, we had some clear priorities from the previous Government in the eight great technologies, of which there are now 10, and the focus in the industrial strategy on key wealth-producing sectors in the UK. I hope both of those will continue in the new industrial approach.

In terms of encouraging and growing talent in the UK, I think we are doing a good job. It is still a very attractive place for people to come from abroad, if they are allowed to, and bring their talent with them. We need to continue to show we are open for business in that way.

In terms of investment in infrastructure, again we have seen some impressive schemes with the new research institute here in London and the Royce Institute in Manchester, to which the Minister referred. We must remember, as you pointed out, Madam Chair, that the infrastructure alone, if it is not part of a sustained system with revenue spending to follow, support, staff and everything else, is a bit of a waste. The whole system needs to be supported.

The area where they have done well but could do more is on the innovation side. Again, Chair, you pointed out that the innovation budget strays over the edge of the ring fence. It is a vitally important area. We spend just £440 million on Innovate UK, the Technology Strategy Board as was, compared with several billion on creating the research base, so the balance between pulling technology through from our research base into wealth-producing products and services for the UK does not seem to be quite right, and any threat to that would be deeply disturbing. I think seven out of 10 is a fair call in the current climate.

*Lord Stern:* I hope you will bear with me. I spent the night on a plane coming back from Ethiopia.

**Q49 Chair:** You are heroic to be here.

*Lord Stern:* I might be marginally less fluent than I would otherwise have been. It is an example of what investment in research does in the UK. I was talking to the Prime Minister of Ethiopia, a country of nearly 100 million people and a pole of stability in a very difficult part of the world, about the future of their economy. They are going to middle income, probably in the next 10 years, without increasing greenhouse gas emissions, so it is a remarkable story. I am not here to talk about that, but I wanted to underline that what we do as academics internationally is a very important product of the UK's education and research system. I am sure that all the others on this platform have their own examples. I happened to give mine because it was yesterday.

I think the Minister did give reasons to score something like seven out of 10, which is obviously a bit mechanical. He also gave reasons why the basis is there to do much better. I spent three years in the Treasury and I am professor of economics at the LSE, but you do not have to have that to recognise that you expand your areas of activity where the returns are the highest. The Minister said very clearly that this is an extremely productive place. He said it with pride—justified pride. The economics of that are that you invest where the returns are highest. Those are the criteria the Treasury implies, and the Minister has given an example for not just ring-fencing but, rather more positive than that, increasing, because that is the fundamental basis of any serious growth story. In the decade up to the crisis, something like half the UK's growth was around innovation, and that is built on research. This is not a minor thing. It might be minor in terms of the half per cent or so of public GDP that goes in this area, but the returns in terms of the growth of the British economy could be really substantial. The Government have a growth story and a productivity story, but I think it is fair to say that it is work in progress. The growth story has not been fully articulated; some of it has, but this is absolutely key to the growth story. I hope you will ask the Minister again about what the consequences of his statement that our research is so productive are for the allocation of funds to research. He made a very



powerful point, but he did not make it explicitly; he made it implicitly. He should be making it to the Treasury.

**Q50 Chair:** It is notable that the science and research budget has been ring-fenced but the innovation budget has doubled since 2010. Professor Tooke.

**Professor Tooke:** Not surprisingly, I am going to echo the seven out of 10 of my colleagues. Lord Stern has presented a far more articulate economic case for investment in this area. We have a fabulous interdependent ecosystem for the life and medical sciences area. We are probably second only to the US in terms of research output, and in productivity terms we are far more efficient, so investing in strength seems to me an obvious place to go. We know that the investment of public money leverages considerably more. In relationship to the Academy of Medical Sciences, for example, the public investment results in a threefold leveraging of money from other sectors. In a sense, we have been ahead of the productivity debate because we have been doing economic impact studies in the fields of cancer and cardiovascular medicine—we are just launching one in musculoskeletal medicine—which essentially show that for every pound invested there is a direct 10p return in perpetuity. That is not accounting for a broader spillover effect into the economy, which is probably double that amount, so the economic case for further investment is profound.

If I may say one thing about innovation, I am pleased to see in the medical science area the launch of the accelerated access review, which is looking at bringing new medical products into the market sooner so that unmet clinical need can be met, and the life sciences industry stimulated as a result. We are actively involved with that. It is an incredibly important piece of work if we are to retain our pre-eminence in that area.

**Q51 Liz McInnes:** Your joint report “Building a Stronger Future” identified a number of themes and recommendations for Government. Can you identify which of those themes and recommendations you think are the most pressing and urgent that we need to address?

**Sir Paul Nurse:** Madam Chair, we were remiss not to congratulate you and also to welcome all of you on this Committee. I am sure I speak for all of us in saying that we will work as well as we can with you to promote science and what it can do for society. I am sorry; we should have said that.

For me, placing research and innovation at the heart of Government is the crucial one, and everything else will flow from that.

**Professor Parker:** I pick up on a different one, but not because I choose to differ from Paul: to secure prosperity by strengthening public investment in research and innovation. We have already had the discussion on where we sit relative to other OECD countries. As a percentage of GDP, we need to increase our Government expenditure by 25% just to catch up with Slovenia, which I think puts it into the right context. We need to increase it by 60% to catch up with America or Germany. We need to strengthen our base. I do not disagree with the Minister. We have an incredibly efficient and effective system and, despite our low spending, we produce some of the best quality research in the world.

Those two go together, but certainly reducing this expenditure any further in the current spending review would be a major mistake.

**Q52 Chair:** What is your view of the director general's response on governmental R and D?

*Professor Parker:* That it is adequate. As we said, governmental R and D does not stand alone; industry has to do its bit, and as a nation, the industry in the UK underinvests relative to OECD, so we must jointly enhance our investment.

**Q53 Liz McInnes:** One of the recommendations is to strengthen policy by embedding expert advice across Government and building reliable horizon scanning into long-term policy development. Where in Government do you feel there are notable shortfalls in expert advice and horizon scanning?

*Professor Parker:* Again, we have come a long way. The fact that most Departments now have a chief scientific adviser—I think the Treasury is the only lacking one—is a major step forward. When you look at those chief scientific advisers, they all, I think without exception, come from one of the institutions at this table, so the direct advice the Government get from their own scientific advisers is a step forward from the past.

One of the main purposes of our institutions is to provide impartial scientific advice, and the strength in that is our fellowships. They are huge in number, and many of them give voluntarily of their time to studies and reports that give that advice to Government. It is a vital part of our role as institutions, and the Government are fairly well set up to receive it. An interesting turn of events is that Juncker has now decided he needs better scientific advice in Europe. I thought Anne Glover did an excellent job trying to advise his predecessor, but, notwithstanding that, they are going to draw on the advice of European institutions like our own to marshal that and feed it through to the European Parliament.

*Lord Stern:* Could I suggest a way of finding out the answer to your question? I am really an academic, but I was in the Treasury for three years. As head of the Government Economic Service I asked my economist members of that service, who were spread across Government, to rate their own Departments—this was rating of a Department by the economists in that Department—on the extent to which policy was based on evidence. The variation across Departments was quite spectacular. It was 10 years ago, so the evidence is probably, possibly, out of date, but DWP was at the top and the Home Office was at the bottom. That is 12 years ago, and it is economics. What I am suggesting is that, if you want to find out the answer to that question, you ask the scientists Department by Department to rate their own Departments. It would be very interesting to see the results.

**Q54 Daniel Zeichner:** I have a similar kind of question. I think the previous Committee had noticed the difference across Government in terms of their seeking your advice and acting upon it. Have you noticed any changes? You refer to 10 years ago, that being the last time. Have you noticed any changes in the way Departments seek your advice and act upon it?

**Lord Stern:** From the point of view of the humanities and social sciences, I will answer. Obviously, my colleagues will answer from the perspective of others. Let me emphasise that the four academies you see here talk to each other all the time. The reason they do so is that their subjects are intimately interrelated. I hope that is obvious. You cannot talk about obesity without talking about behaviour of all kinds, medical and technological science and so on. We could go through it, but I want to emphasise that, while I am replying for the humanities and social sciences, we are all interwoven. Sorry, could you remind me? I am a bit weary. Could you ask me again?

**Q55 Daniel Zeichner:** I quite understand. What differences are there between the various Government Departments? Have they improved at all?

**Lord Stern:** I am sorry, I got diverted into the interweaving. The various Departments that ask the British Academy, often for thoughtful, quiet advice, sometimes ask us to organise public events. I can think of a quiet discussion we had quite recently about productivity. I think it was very productive and came largely from the Treasury and BIS. We have had much bigger events, for example on housing, organised jointly with Government. Over the recent past when I have been closely involved, the reaching out and to-ing and fro-ing between Government and our own academy, the British Academy—I am sure it is true of the others—is quite good. There are many examples. We work quite closely with DFID; we have done quite a lot on constitutional aspects, particularly in the light of—

**Q56 Chair:** I am sorry to interrupt, but we are under pressure of time.

**Lord Stern:** There are many examples, but it is quite good.

**Professor Tooke:** I would echo those remarks. The Academy of Medical Sciences is increasingly sought for its advice on medical science-related matters, and we hold events between the academies; for example, we are hosting a joint academy seminar for Treasury on related issues next week.

As to the point about interweaving advice, I refer back to the accelerated access review. That is not just about science in the strict sense of developing new medicines; it is also about social receptivity to those new developments, which involves the British Academy and the Academy of Medical Sciences working together to provide relevant advice so that the review lands effectively.

**Q57 Daniel Zeichner:** The previous Committee also concluded that the Government Office for Science might be more effective if it was located within the Cabinet Office rather than in BIS. Do you have any views on that?

**Sir Paul Nurse:** Can I answer that, but also slightly broaden the question? There are two aspects to this. One is science for policy; the other is policy for science. Science for policy is, frankly, rather well done in the United Kingdom. We are seen as leaders in the world. Indeed, on the SAM—the European Union initiative—the commissioner for research came

here and talked to us, and what has turned out is very close to what was recommended to him. I think that works well. My personal view is that it would work better if it was cross-cutting in the Cabinet and not simply in BIS.

**Q58 Graham Stringer:** We are all agreed that investing more in science and research will benefit the economy. Have you recommended to Government a particular level of investment across the UK, and, if so, what level was that?

*Sir Paul Nurse:* The Royal Society has not yet. We are working on that. We know it should be higher. It is a bit elastic. We are beginning to trail, but we should come up with a figure.

**Q59 Graham Stringer:** Is it likely to be Slovenia or the United States?

*Sir Paul Nurse:* I think it would be reasonable to aim at least at the OECD average, for goodness sake.

**Q60 Graham Stringer:** In the initial discussions, even if you have not quantified it, what has been the Government's response to the overall argument for an increase in funding?

*Sir Paul Nurse:* You heard the Minister.

**Q61 Graham Stringer:** He did not answer the question. He told us that research was very good.

*Sir Paul Nurse:* What the Minister said was that there was a good track record and that they support science but have not yet committed to an increase. I think that is the answer as to where they are.

**Q62 Graham Stringer:** I thought they might have said something more to you in private and you could let us into the secret.

*Sir Paul Nurse:* If it was in private I would have to keep it private.

*Lord Stern:* I think the goal of the OECD average would be overall, public and private, 3% of GDP. We are quite well below that; it is about 1.67% in total. Taking 1.67% to 3% is a substantial increase.

**Q63 Carol Monaghan:** Have you any concerns about how rigorously the Government have applied the Haldane principle in science budget decisions?

**Sir Paul Nurse:** There is no such thing as the Haldane principle, as I am sure we know. It is a bit of a truism. To remind you, it was 1918, and it said that experts should be involved in expert decisions, about which, frankly, it is very difficult to disagree. It has been interpreted much more starkly to do with the role of politicians in making scientific decisions. My personal opinion is that, when it comes to technocratic decisions, politicians are unlikely to be very useful. When it comes to setting overall objectives, we do indeed need to relate well to politicians. I am personally somewhat concerned that we do not have quite the right forum for those sorts of strategic debates, and that is certainly something I would be thinking about. We have to engage politicians. It is no good trying to put you all over there while we are over here, because that will not be good for society or the UK.

**Professor Parker:** I think the Minister summed it up quite well. The detailed decisions about which programmes are invested in and which researchers are backed by public funding are taken by experts within the research councils and the other bodies. Government have a role to set priorities, to set direction and to emphasise the big challenges facing society, in particular British society. Those two need to come together. A total free-for-all in which researchers do whatever they think is best for society may not be the way forward. As somebody once said, to base policy on doing what is technically right is unwise. To create policy without knowing what is technically right is equally unwise.

**Professor Tooke:** Research is fundamentally a creative enterprise, and there is a real danger that if it is over-managed you stifle that creativity. It is none the less incredibly important that the science effort is informed by the problems that society needs to address, but it should not be directed by that same body. Setting those strategic priorities, particularly foresight work, needs to involve those who are deeply involved in the process of science.

**Q64 Carol Monaghan:** To what extent do you think that the pursuit of excellence in science and research has been compromised by a Government focus on supporting particular technologies and sectors for economic reasons?

**Professor Parker:** There is a balance to be struck between curiosity-driven and challenge-driven research. Both are necessary. We would not have the strong science base we have today without historic investment in purely curiosity-driven research. Equally, there is a need to focus research on things that create value in the short term. Those need to be kept in balance and in check. The role of Government in that is not to interfere with excellence. There can be excellence in industrially focused research and there can be excellence in curiosity-driven research, and I think that excellence should triumph whatever area of research one is looking at. I think the bodies that look after the excellence in our research have done a good job of maintaining that in recent years.

**Lord Stern:** Society's problems change. We have much bigger problems around obesity and ageing as a result of the way in which society has changed, and it seems very reasonable for Governments to say that they would like to see stronger focus on that. The stories would in part come from researchers about the nature of these problems, and it seems quite natural for the Government to come back with priorities. The detail of how

grants are allocated within those general areas is, I hope, something that would be left largely for the experts.

Madam Chair, would you allow me to correct one number? I must apologise for my bleary state. The UK's total for research is about 1.7%; the OECD average is about 2.4%, and the top half dozen, which we identified in "Building a Stronger Future", are around 3%. I would suggest that a reasonable target for a country that has research and excellence in universities at its core would be for the top half dozen. That is where the 3% would be. The OECD average would be 2.4% and we are about 1.7%. Within these stories it is roughly one public to two private. There is leverage there.

**Chair:** That is a very helpful clarification. Thank you.

**Q65 Matt Warman:** I am interested in the role of the research councils. Just to be on the safe side, I should probably say that a long time ago the BBSRC funded my wife's PhD.

We have had the triennial review and Sir Paul's own report. Could you talk briefly about whether you feel we are getting the balance right on the distribution of funding among the research councils? Some of them are under more political focus than others, if you like.

**Sir Paul Nurse:** Perhaps I may comment first, because it was mentioned, on the triennial review. That was essentially a review of quangos carried out by civil servants and is not in the same category of review that I hope I can carry out, which is more like the Waldegrave-Dainton type of review, just to put that right.

It is interesting to note that the essential spending between the seven research councils remains rather stable over quite a few years. You have to wonder what that means, but it suggests that history may have quite a big impact on the future. That is certainly how some would interpret it. Personally, I think it might indicate that we need greater focus on overall strategic thinking and that maybe we do not have in our present structures the proper forum for those sorts of discussions to take place. It is not the easiest issue to deal with, because we need long-term stability but we also need agility. We need a way of dealing with that so that we can move with the times while not upsetting where we are. I do not think we are in a perfect situation, although I do think the research councils work very effectively in much of what they do; but we have to pay attention to the higher-level strategic thinking, which I think would address your question.

**Q66 Matt Warman:** I have a very quick supplementary related to research councils and the role of women in science in particular. The relentless soft money problem is one of the things driving people out of a scientific career. Do you think there is a role for the research councils to try to get over that hurdle?

**Sir Paul Nurse:** This is a very complex issue. There is not a simple answer, because the research engine is young people; the research engine is graduate students and postdocs, and in a stable funding environment it is very difficult to promise long-term careers for all the talented individuals that we need not only in the research engine but society as a whole. My answer would be that we need to focus on other issues as well, such as

recognising the very profitable skill set that a scientist gains and working on how that can be exported into other parts of society, so that we recognise that it is not a failure to leave the scientific endeavour but we are exporting skills elsewhere that are needed. We should not shirk from that because it will require funding and it will need resource, but in the end we will be able to attract better people and place them in other parts of society where it will be very useful. My answer is not quite the usual career development award, which is also important, but this as well.

**Q67 Chair:** Sir Paul, do you have a deadline for submitting your review?

*Sir Paul Nurse:* I think they said after the summer, which I certainly would agree with. I believe that in Government circles autumn is before Christmas. I was going to have something by autumn, but hopefully something where the general shape is in place after the summer so that discussions can take place before the spending review.

**Q68 Chair:** Do you have any commitment from the Treasury about whether your recommendations will be taken on board for the CSR?

*Sir Paul Nurse:* No, but it has been indicated to me that Government would like to have some sense of where this review is going before the spending review, if possible. Whether that means they would actually read it and listen to it I cannot say, but it is at least a promising start.

**Q69 Chair:** How do you respond to the Minister's comments about hoping that we will move more in the direction of boosting research and innovation in other geographical locations than the golden triangle?

*Sir Paul Nurse:* The issue of place has got slightly out of hand, in the sense that it is not a difficult problem to solve, as long as the strategic thinking is improved. What I would probably like to see is an improvement in strategic capacity in the research councils so that they could comment more seriously—in a greater way—on this issue. Simply to say, “Well, let's get a call from six northern universities,” is not the way to do it. They are a contribution to it, but the research councils should have a sense of the overall research landscape, which perhaps they do not have yet, but some auditing is going on elsewhere in Government that would help that. We need a more joined-up approach to the issue of place and greater strategic thinking, and then I think it will just fall out.

*Professor Tooke:* We need to combine the exploitation of niche excellence in regions throughout the UK with the need to be globally competitive, which inevitably means there need to be relatively few areas where there is comprehensive concentration of scientific capability. A real challenge and yet an opportunity for the UK is to leverage the whole of the UK as a science base, acting as a macro-cluster, as it were. We could do that; we have some preconditions which make that very possible. In the health field, we have an NHS which could be more fully exploited as a science base; we have fabulous networked infrastructure across England in particular through the National Institute for Health

Research; and we have the Francis Crick Institute, which serves a training need for the nation. I think the challenge is how you balance this very real requirement for regional economies and regional centres of excellence but link them effectively with other more globally competitive centres.

**Chair:** Thank you very much. Sir Paul, Professor Parker, Lord Stern and Professor Tooke, I am very grateful to you for making the time, at what was very short notice, to come and speak to us today and respond to the Minister's first evidence to the Select Committee. I am very grateful for your commitment to assisting this Committee as we go forward with our first inquiry on the science budget. We may write to you with further questions as we go forward. We are hoping to submit in time for the CSR, as I hope you are too, Sir Paul, with your review. We will now bring this session formally to a close.